April 28, 1925. 1,535,111

G. B. DOREY

DOOR LOCKING MECHANISM

Filed May 31, 1923 3 Sheets-Sheet 1

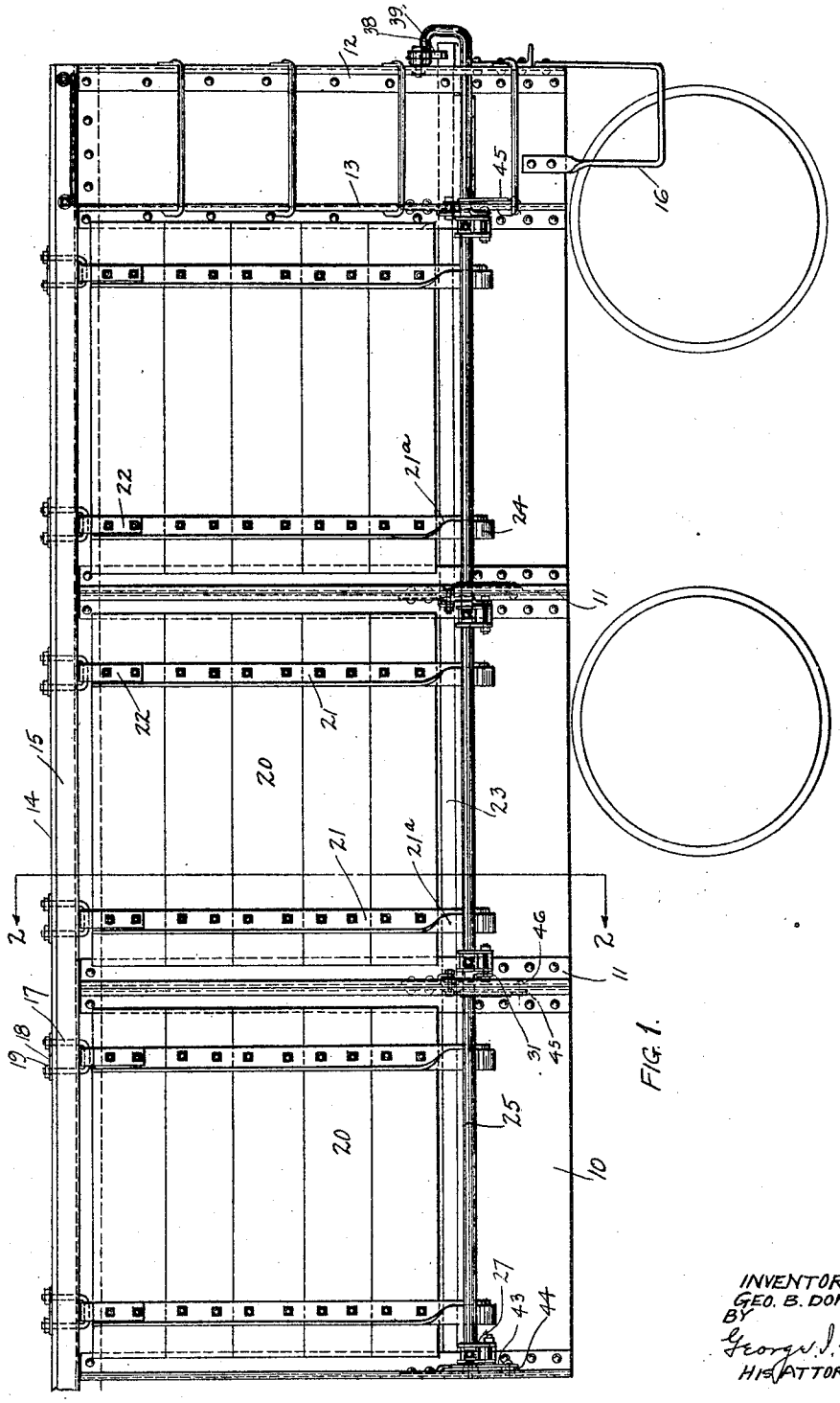


FIG. 1.

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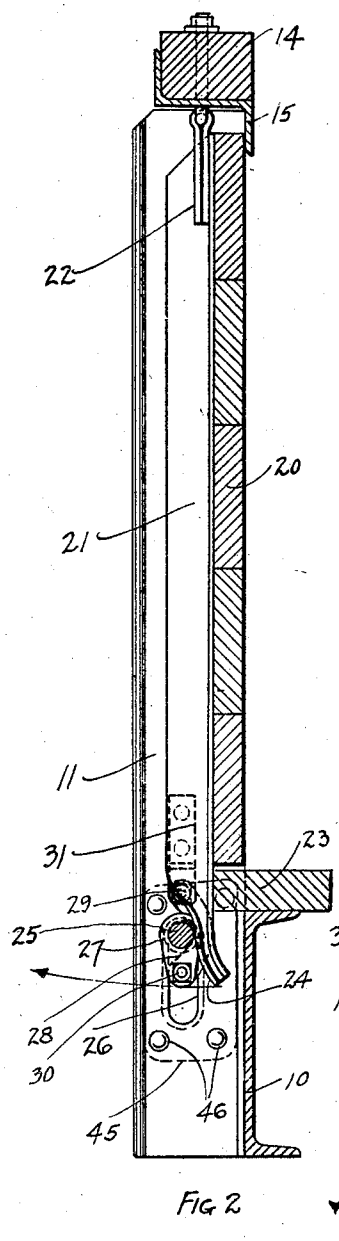


FIG 2.

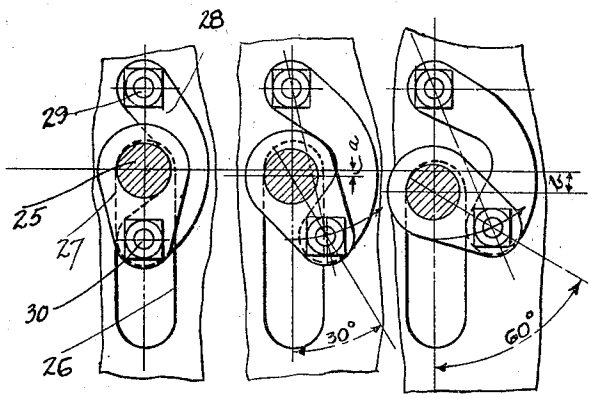


FIG 3. FIG. 4. FIG 5.

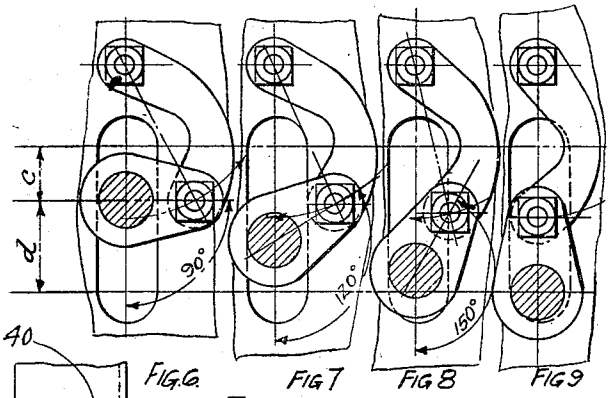


FIG. 6. FIG 7 FIG 8 FIG 9

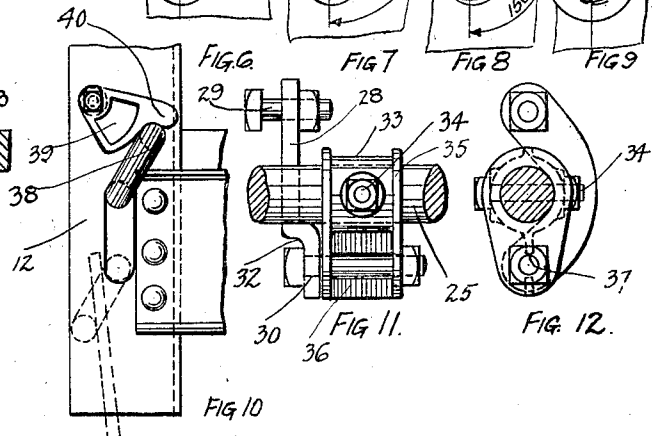


FIG 10 FIG 11. FIG. 12.

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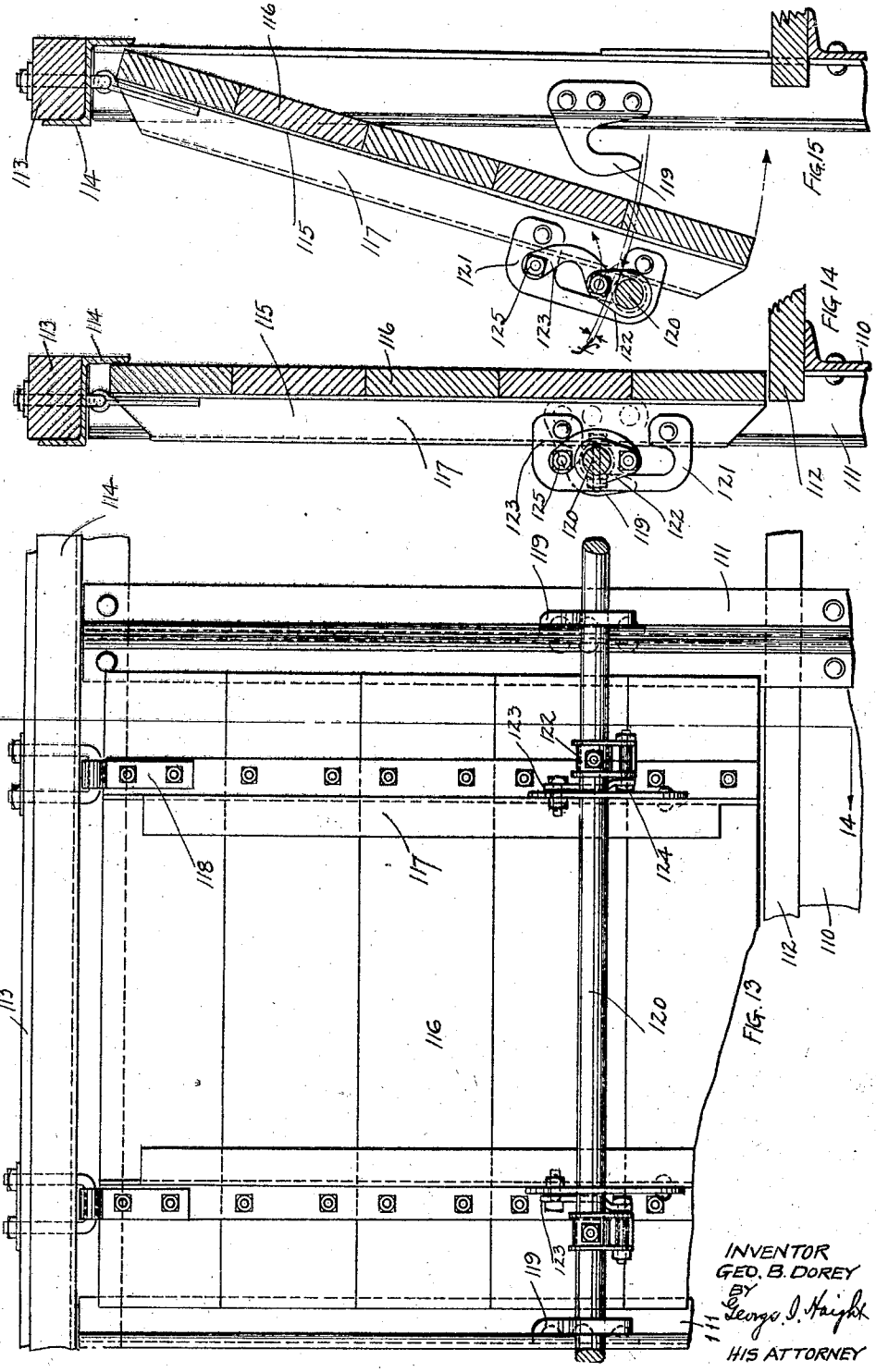
1,535,111

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DOOR LOCKING MECHANISM

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3 Sheets-Sheet 3



Patented Apr. 28, 1925. 1,535,111

UNITED STATES PATENT OFFICE.

GEORGE B. DOREY, OF CHICAGO, ILLINOIS, ASSIGNOR TO ENTERPRISE RAILWAY EQUIPMENT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

DOOR-LOCKING MECHANISM.

Application filed May 31, 1923. Serial No. 642,468.

To all whom it may concern:

Be it known that I, GEORGE B. DOREY, a subject of the King of England, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Door-Locking Mechanisms, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to improvements in door locking mechanisms, and more particularly mechanisms for side dumping doors used in cars of the gondola and like types particularly adapted for discharging ballast by means of unloading plows and wherein the doors are adapted to be opened by the discharging load and returned to closed position under the influence of gravity. The novel features of my invention pertain more particularly to the means employed for causing a translatory movement of a locking shaft.

An object of my invention is to provide a mechanism which will operate to engage the doors when not fully closed and bring the same to a fully closed position.

A further object of my invention is to provide a mechanism which will act differentially in the operation of the side doors, providing for the greatest power at the end of the door closing operation and at the commencement of the door opening operation.

Further objects and advantages of my invention will be hereinafter more fully described and particularly pointed out in the specification and claims.

In the drawings forming a part of this specification, Figure 1 is a side elevational view of substantially one-half of the side of a side unloading car showing the side doors closed and the locking mechanism in normal locked position. Figure 2 is a sectional elevational view, on an enlarged scale, taken through one of the side doors and substantially on a line corresponding to line 2—2 of Fig. 1 illustrating the side door locking mechanism in normal locked position. Figs. 3 to 9 inclusive are diagrammatic views illustrating various positions of the door locking mechanism on an enlarged scale, Fig. 3 illustrating the locking shaft in normal locked position; Fig. 4 illustrating the position of the shaft after a revolution of 30° from locked position; Fig. 5 after 60° revolution from locked position; Fig. 6 after 90° revolution from locked position; Fig. 7 after 120° revolution from locked position; and Fig. 8 after 150° revolution from locked position; while Fig. 9 illustrates the position of the shaft in normal release position with the locking shaft moved out of the path of the door. Fig. 10 is a fragmentary view of the end of the car illustrating the locking shaft in locked position. Fig. 11 is an illustration, as viewed on the side of the car, showing in assembly relation, one of the crank arms secured to the shaft and the connecting link secured to the said crank arm. Fig. 12 is a side view of the mechanism, in assembly relation, as shown in Fig. 11. Fig. 13 is an enlarged elevational side view of a portion of the side of the car showing the locking mechanism as carried by the door and movable therewith. Fig. 14 is a sectional view through the door in locked position and is taken on a line corresponding substantially to line 14—14 of Fig. 13. And Fig. 15 is a sectional view similar to Fig. 14 through the door but showing the same in open position.

Referring first to Figs. 1–12, the car shown therein, only a portion of which is illustrated, consists of a framework which includes side sill 10, side stakes 11, corner post made up of vertical corner members 12 and another member 13 spaced therefrom a sufficient distance to provide for a ladder therebetween, and a top member 14 supported on a longitudinally extending top member 15 secured to the side stakes and corner post. Ladder rungs extend between members 12 and 13 and near the bottom thereof a sill step 16 is disposed. Side doors, such as will be more fully described hereinafter, are swingingly mounted on the side frame by means of U bolts 17 supported from the side frame member by means of washer plates 18 and nuts 19.

The side doors are disposed between the stakes, and each is preferably formed of boards 20 battered together by reinforcing members 21 having hinge straps 22 secured at the hinged edge of the door. Said members 21 are preferably formed of angles with one flange bolted to the boards and, at the

free edge of the door, the angles are preferably flattened by folding the flanges together as shown at 21ª and extending the folded portion downwardly below the free edge of the door and below the floor 23 of the car. Said downwardly extending portion of each member 21 is bent inwardly and is preferably formed of arcuate shape as shown at 24 for the purpose hereinafter fully explained.

Outward movement of the side doors is prevented by the interposition of a shaft 25 between the doors and a portion of the car structure. A preferred way of disposing the shaft is by placing the same in elongated slots 26 in the side stakes of the car and moving the shaft in the said slots in the manner hereinafter described. It is to be understood that crank arms 27 are rigidly secured to the shaft and preferably adjacent each side stake, and a connection made between each of said crank arms and a portion of the car structure by means of a link 28 which is pivoted to the car structure by means of pivot 29 and to the crank arm by means of pivot 30. Each of the links 28 is preferably made of hook shape in order that a straight line joining the pivots 29 and 30 may pass through the transverse axis of the shaft 25 when the latter is in locking position with respect to the side doors, as shown best in Figure 3.

The links 28 are preferably pivotally mounted on the side stakes and above the slots 26, brackets 31 being suitably attached to the stakes in order to place the link carrying pivots 29 in double shear. At the lower portion thereof, the links 28 are bent as indicated at 32 for the purpose of accommodating the head of pivot 30, as shown in Fig. 11. While the crank arms 27 may be of any suitable form, it is particularly desirable to make these members as simple as possible and in order to attain this object, it is preferable to make each one substantially as shown in Figs. 11 and 12, that is, with a body portion 33 fitting over the shaft 25 and through which a bolt or rivet 34 is adapted to pass and through the shaft 25 for the purpose of effecting a rigid connection between these members. At each end of the body portion, flanges 35 are disposed and connected by webs 36, said webs being perforated at 37 for the reception of the pivot 30 which extends through the length of the arm, thereby providing a very stable bearing for the said pivot.

The end of each shaft 25 is formed with a loop 38 adapted to receive an operating bar or tool for the purpose of producing leverage and rotating the shaft. A cam 39 is pivotally mounted on the corner stake 12 and adapted to engage the loop 38 in order to maintain the shaft 25 in locked position and prevent the same from turning due to the vibration of the car while in transit. The swing of said cam 39 is limited by means of a finger 40 formed thereon which is adapted to engage the loop 38 of the shaft 25, as shown in Fig. 10.

In a car of the type disclosed, having a shaft extending over a plurality of doors, the force of the load in the car pressing outwardly against the doors generally makes the opening of the same a difficult operation and one which imposes considerable strain on the door operating mechanism. In the mechanism which I have designed, these difficulties are minimized by providing a differentially acting mechanism wherein the turning force exerted to open the doors is most efficient at the commencement of the door opening operation. Conversely, this also applies during the door closing movement wherein, during the final stage of the upward movement of the shaft, a very limited amount of turning movement exerts tremendous power operating to force the shaft upwardly, said differential action being accomplished by increasing the amount of turning movement necessary to displace the shaft a given distance as the same progresses towards its final closed position. In order to more fully illustrate this feature of my invention I have included in the drawings, Figs. 3 to 9 inclusive, illustrating the various relative positions of the shaft at intervals of 30 degrees of rotation, the position in Fig. 3 illustrating the shaft in locked position with the pivotal points of the mechanism and the axis of the shaft being in a straight line. In Fig. 4, illustrating the position of the shaft after the same has been rotated anti-clockwise through an arc of 30°, it will be observed that the shaft has descended only a very limited distance as indicated by the reference character "A". During such rotation of the shaft in a counterclockwise direction, it will be observed that the shaft descends downwardly but the pivotal point 30 moves upwardly due to the fact that the link 28 also moves in a counterclockwise direction. After rotation of the shaft through the next 30 degrees or from 30° to 60° as indicated in Fig. 5, the total downward displacement of the shaft is equal to the distance "b"; substantially three times the distance "a" shown in Fig. 4, while the link 28 continues its upward movement in a clockwise direction. After rotation of the shaft through the next 30 degrees, or from 60° to 90°, the total downward displacement of the shaft is indicated by the distance "c" or slightly more than 2½ times the distance "b" shown in Fig. 5. The position of the shaft in this location marks the limit of the upward movement of the link 28, the said link thereafter descending by rotating in a clockwise direction and permitting the shaft to descend more rap-

idly as shown in Figs. 7 and 8 wherein the total rotation of the shaft is indicated as 120° and 150° respectively. Continued rotation of the shaft through an additional arc of 30° brings the shaft to normal release position shown in Fig. 9 wherein the loop 38 at the end of the shaft assumes the position indicated by dotted lines in Fig. 10, the shaft in this position being free of the door as shown in Fig. 9.

Assuming now that the shaft is in the normal release position as shown in Fig. 10 in dotted lines, an operating bar 41 is inserted in the loop and rotation of the shaft effected in a clockwise direction as indicated by the arrow 42. Rotation of the shaft in the indicated manner moves the same upwardly and into contact with the arcuate portion 24 of the door braces 21. While I have shown this inwardly directed portion of the door brace as of arcuate shape it may be made straight or partly straight and partly curved, the object of the same being to cause engagement between the doors and shaft even when the former are in partly opened position, the shaft then operating to wedge the doors to fully closed position. During the first 90° of rotation of the shaft to effect closure of the doors, the shaft is moved vertically through the distance "d" as indicated in Fig. 6 whereas during the second 90° of rotation the shaft moves only through the distance "c" consequently it will be seen that the device is extremely efficient, the shaft moving rapidly through the first 90° of motion when there is comparatively little opposition to the vertical movement of the shaft, outside of lifting the weight thereof and possibly wedging one or more of the doors to the fully closed position. During the final 90° of motion or moving the shaft through the distance "c", the shaft may be called upon to exert considerable wedging effort to make a tight joint but the differential action heretofore explained furnishes the required power without requiring additional effort on the part of the operator. As the shaft moves into final closed position, the cam 39 drops into locking position by its own weight over the loop 38. The shaft 25 may be made to extend throughout the length of the car in one piece or may be divided at or near the center of the car in the manner shown in Fig. 1 when a suitable abutment 43 is secured to the stake and adapted to engage the end of the shaft. The abutment in this instance consists of a bar spaced from the stake a short distance by means of washers 44. The metal removed to form the slots does not materially weaken the stakes, but in order to compensate for such slots, bearing plates may be used as shown at 45, being securely riveted to the stakes by a plurality of rivets 46.

I have shown in Figs. 13 to 15 inclusive, the same device as carried by the door instead of by the framework of the car. In said figures, 110 indicates the side sill, 111 the side stakes, 112 the floor of the car, 113 the top member, 114 the top rail member, 115 the swinging side door formed of side boards 116, united by door battens 117 and hinge straps 118 secured to the hinged end of the door. While only one door is shown, it will be understood that a number of such doors may be used with an operating shaft extending from one door to the other.

The locking mechanism proper consists of hook members 119 secured to the stakes and an operating shaft 120 carried by the doors and adapted to move in guides 121 secured to the door. The shaft 120 is adapted to assume a position between the hook members 119 and the door battens 117 as shown in Fig. 14 and when the door is in the open position, the shaft is adapted to swing therewith and clear of the hook as shown in Fig. 15, said clearance being designated by the reference character "f".

The mechanism whereby the shaft 120 is moved consists of crank arms 122 rigidly secured to the shaft and by means of pivots 124 to the links 123 whereby a link joint is effected between the door and shaft. Each of said links is pivotally connected to the door preferably to the guide 121 by means of pivot 125. The shaft is moved from normal release position to locked position by rotating through an arc of approximately 180 degrees in the manner heretofore explained.

Although I have shown and described what I now consider the preferred manner of carrying out the invention, 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 railway car, the combination with a supporting framework; of a swinging side door; a shaft adapted to assume a position between the side door and a portion of the supporting framework; a link pivoted to the supporting framework; and a crank arm rigidly secured to the shaft and pivoted to the aforesaid link the aforesaid shaft being adapted to be moved by rotation thereof about the pivot securing the crank arm to the link.

2. In a railway car, the combination with a supporting framework comprising vertical stakes and a top rail member; of a swinging side door hinged to the top rail member and disposed between the stakes; elongated slots in the stakes; a shaft passing through the slots in the stakes and adapted to be raised and lowered in the slots to assume a position in the path of the swinging side door; and differentially acting means for raising and lowering said shaft.

3. In a railway car, the combination with

a plurality of stakes having elongated slots therein; of swinging side doors disposed between the stakes; a shaft movable in the aforesaid slots and having a link connection with the stakes, whereby the shaft is raised by rotation thereof from a position out of the path of the door and moved in the path of the door.

4. In a railway car, the combination with a side frame including a side stake having an elongated slot therein; of a swinging side door pivoted to the side frame; a shaft movable in the slot and adapted to assume a position in the path of the door and having a crank arm rigidly secured thereto; a link pivotally mounted on the stake substantially in alignment with and above the slot; and a pivotal connection between the crank arm and the link whereby rotation of the shaft will effect a turning movement about the said pivot and move the shaft in the slot.

5. In a railway car, the combination with a supporting framework; of a swinging side door; angles, each having one flange secured to the said door and the lower portion of the outstanding flange folded over the adjacent flange thereof and providing wedge portions; and a shaft adapted to be moved in the path of the said wedge portions of the angles.

6. In a railway car, the combination with a supporting framework; of a swinging side door; angles, each having one flange secured to the said door and the lower portion of the outstanding flange folded over the adjacent flange thereof, said double thickness of angle being curved inwardly and downwardly; and a bodily movable shaft adapted to assume a position between a portion of the supporting framework and the outer sides of the aforesaid curved portions of the angles in order to wedge the door to closed position.

7. In a railway car, the combination with vertical stakes; of a side door; a shaft movable between the door and members rigid with respect to the stakes; a crank arm rigidly secured to the shaft; a link pivotally secured at one end to the stake and pivotally secured at the opposite end to the crank arm, said crank arm being adapted to be rotated to move the shaft, the shaft being adapted to assume a position below the link when the door is in open position.

8. In a railway car, the combination with vertical stakes; of a shaft movable between the door and members stationary with respect to the stakes; a crank arm rigidly secured to the shaft; a link pivotally secured at one end to the stake and pivotally secured at the opposite end to the crank arm, said crank arm being adapted to be rotated to move the shaft, the shaft being adapted to assume a position intermediate the pivotal points of the aforesaid link when the doors are in closed position.

9. In a door locking mechanism, the combination with a shaft adapted to have bodily movement in an elongated slot; of an arm secured to the shaft; a link connection between the arm and one end of the slot whereby the shaft is caused to move in the slot in a straight line, the said link being arcuate shape, whereby the axis of the shaft may lie between the pivotal axes of the link and substantially in a straight line joining the same.

10. In a railway car, the combination with a member having an elongated slot; of a shaft adapted to have a translatory motion therein; a crank arm rigidly secured to the shaft; and a link member disposed to one side of the crank arm and pivoted thereto and pivoted also to the member having the elongated slot.

11. In a car of the character described, the combination with a pivotally supported door member and a fixed member extending along an edge of the door when the latter is in closed position, one of said members having an elongated slot extending substantially parallel to the line of the door member when the latter is in closed position and the other member having a shoulder in line with the slot when the door member is in closed position; of a shaft extending through said slot and adapted to both rotate therein and move bodily lengthwise of the slot, said shaft having a radially extending arm rigid therewith; and means, connected at one end to said member having a slot therein, at a point opposite the end of said slot nearest the pivotal axis of the door, said means being connected at its other end to said radial arm, said shaft being adapted to engage said shoulder when the door is in closed position to thereby retain the door in such position.

12. In a railway car, the combination with a supporting framework; of a swinging side door; a shaft adapted to assume a position between the side door and a portion of the supporting framework, said shaft being bodily movable; a guide adapted to control the movement of the shaft; a link adapted to have pivotal movement about an axis having fixed relation to said guide; and a crank arm secured to the shaft and pivoted to the link, the said shaft being adapted to be moved by rotation thereof about the pivot securing the crank arm to the link.

In witness that I claim the foregoing I have hereunto subscribed my name this 26th day of May, 1923.

GEORGE B. DOREY.

Witnesses:
FRANCES SAVAGE,
HARRIETTE M. DEAMER.