April 12, 1932. G. B. DOREY 1,853,673

LOAD DISCHARGING CAR

Filed March 8, 1928 3 Sheets-Sheet 1

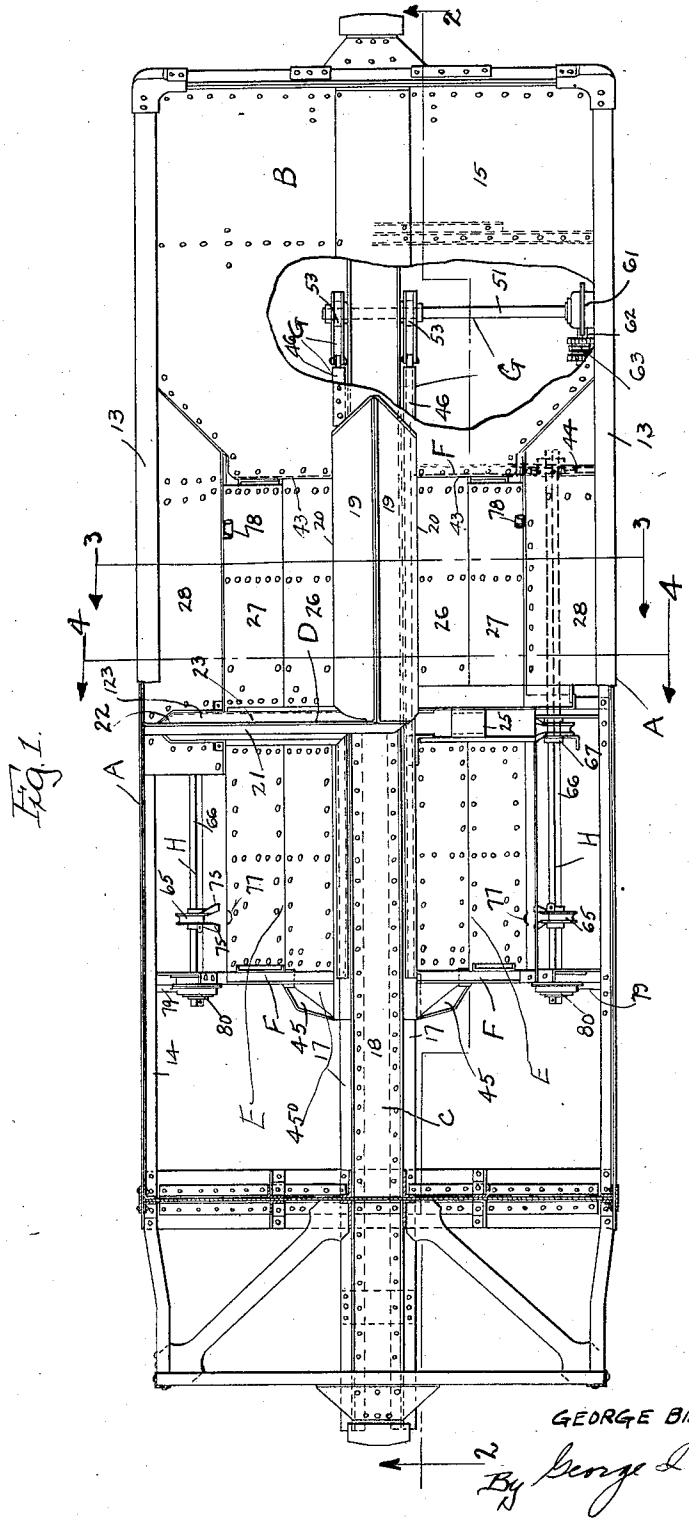


Fig. 1.

Inventor:
GEORGE BINET DOREY
By George L. Haught
Atty.

April 12, 1932. G. B. DOREY 1,853,673

LOAD DISCHARGING CAR

Filed March 8, 1928 3 Sheets-Sheet 2

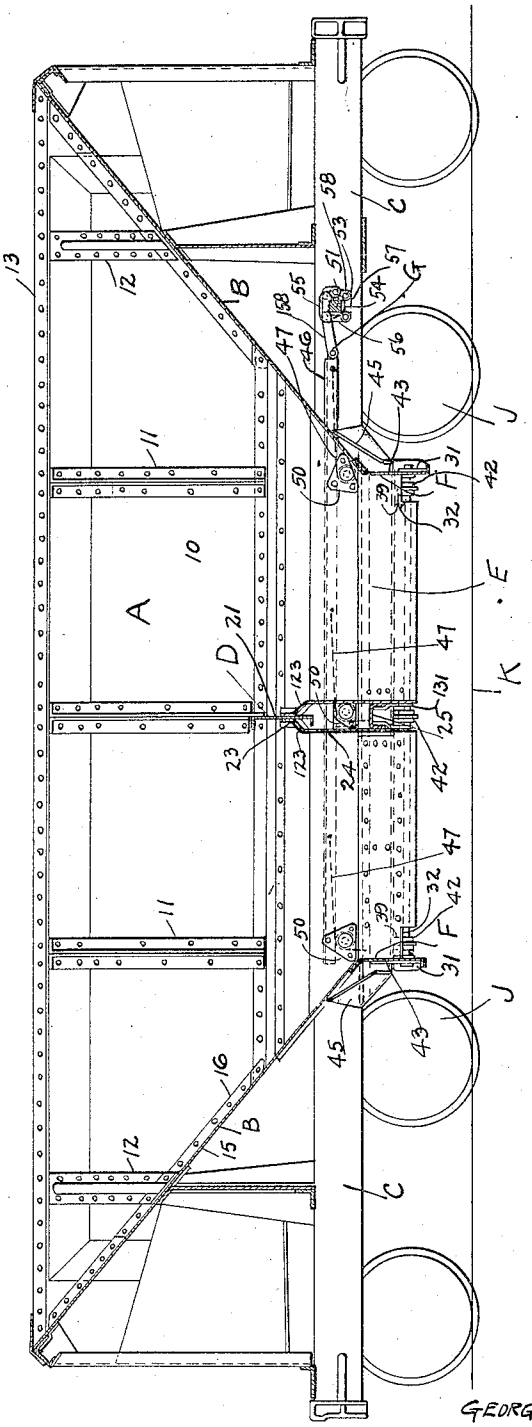


Fig. 2.

Inventor:
GEORGE BINET DOREY
By George L. Haight
Atty.

April 12, 1932. G. B. DOREY 1,853,673

LOAD DISCHARGING CAR

Filed March 8, 1928 3 Sheets-Sheet 3

Fig. 3.

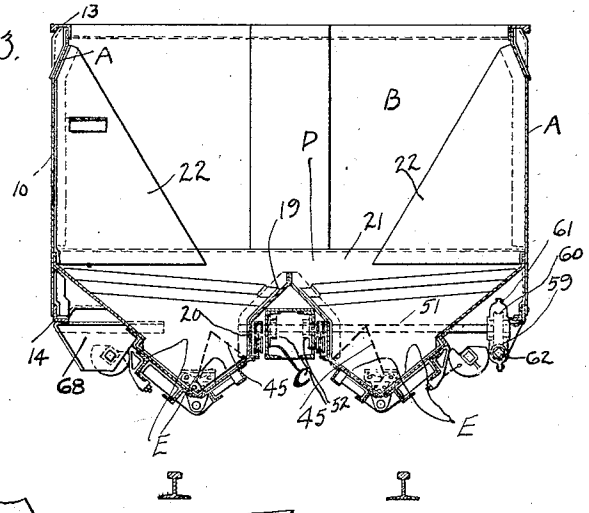


Fig. 4.

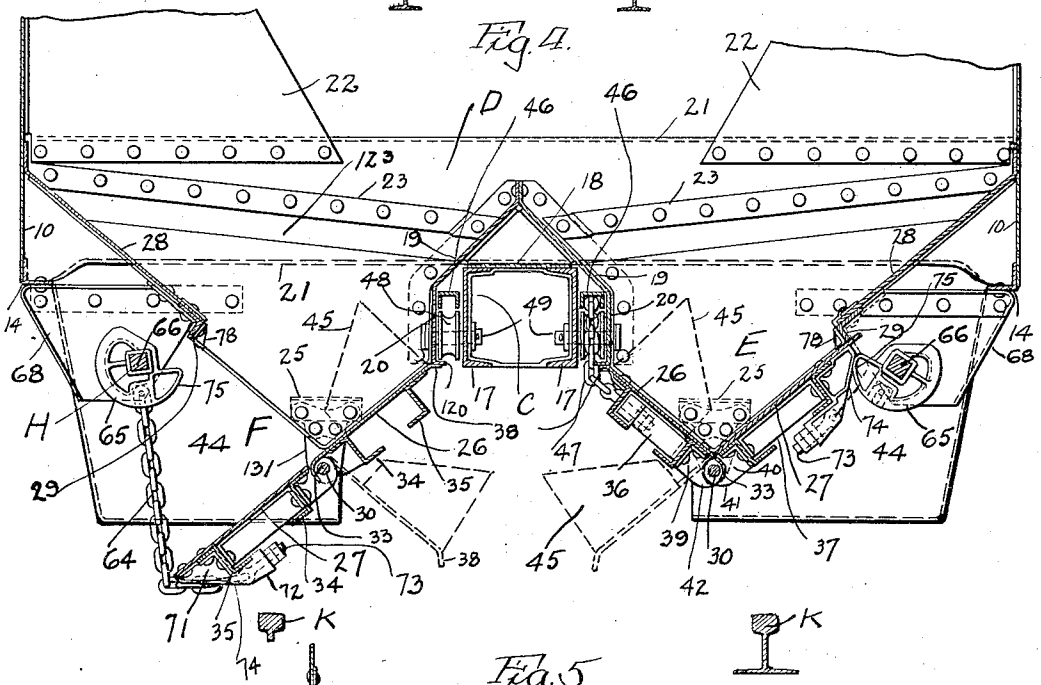
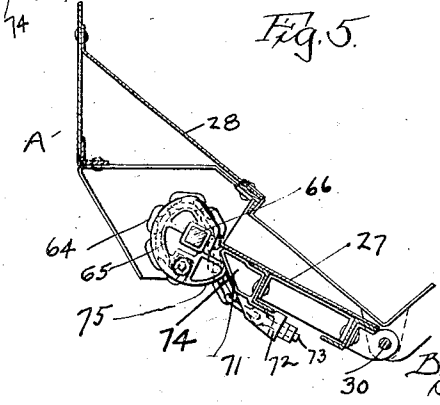


Fig. 5.



Inventor:
GEORGE BINET DOREY
By George L. Haight
Atty.

Patented Apr. 12, 1932 1,853,673

UNITED STATES PATENT OFFICE

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

LOAD DISCHARGING CAR

Application filed March 8, 1928. Serial No. 260,022.

My invention relates to improvements in load discharging cars, and especially to that type adapted to discharge ballast between the rails, or to the sides thereof, or to either one or both sides simultaneously with the center. In cars of the identified type, it is customary to discharge the load while the train is in motion, the operator walking at the side of the train while operating the doors, and it is therefore essential that the door operating mechanisms for such cars should be safe and convenient in operation and permit of the door openings being perfectly graduated, whereby the doors may be held in any adjusted position and the flow of ballast controlled and discharged in the exact quantities required.

It is an object of my invention to provide a simple car of the type described which will discharge ballast in such a manner as to obviate flooding of the rails.

Another object of my invention is to provide means for deflecting the flow of ballast which normally occurs at the ends of the doors and direct the same beyond the outer edge of the doors and clear of the rails.

A still further object of my invention is to provide improved door operating and locking means whereby the door mechanisms will be self-locking and positively support the doors in their closed position.

Still another object of my invention is to provide a car having doors and door operating devices which will permit of the doors being opened with their free edges adjacent the road-bed, thus ensuring the placement of ballast clear of the rails, and also provide for a rugged door construction which may plow through the unloaded ballast without becoming distorted.

Other and further 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 plan view of a car showing my improvements incorporated therein, the left-hand portion of the car having the flooring removed, and certain sections of the right-hand portion being broken away for the purpose of better illustrating the interior arrangement of the parts. Figure 2 is a longitudinal sectional view through the car, showing portions thereof in elevation, and is taken on a line corresponding substantially to the line 2—2 of Figure 1. Figure 3 is a transverse sectional view taken through the car on a line corresponding substantially to a line 3—3 of Figure 1. Figure 4 is an enlarged transverse sectional view taken through the lower portion of the car on a line corresponding substantially to the line 4—4 of Figure 1, the inner doors being indicated in the open position by dotted lines. Figure 5 is a fractional sectional view of a portion of the car showing the parts illustrated in Figure 4, with the door in partially open position, and the door lifting arm of the mechanism in engagement with the door.

As shown in the drawings, A—A denotes the side walls of the car; B—B the sloping end walls of the car; C the longitudinal center sill; D the transverse cross-tying structure; E—E hopper structures on the opposite sides of the center sill; F—F transversely extending hopper end walls; G door operating mechanism for the center doors; H door operating mechanism for the side doors; J the wheels of the car; and K—K the rails on which the car rests.

Each side wall A of the car includes side sheeting 10, side stakes 11 and 12, and upper and lower reinforcing marginal members, as indicated at 13 and 14, respectively. Each sloping end wall B, includes sloping end sheeting 15 flanged upwardly, as indicated at 16, for attachment to the car side walls. The center sill C includes two channel members 17—17 having a top cover plate 18, and a surmounting ridge having inclined and vertical wall sections, as indicated at 19 and 20, respectively. The vertical wall section 20 is spaced an appreciable distance outwardly of the center sill and the space between said wall 20 and the center sill is bridged by the inclined wall section 19. The vertical wall 20 is reinforced at its lower margin with an inwardly directed flange, as indicated at 120.

The transverse cross-tying structure D in-

cludes a channel-shaped member 21 extending transversely from side to side of the car and is connected at each end with the car side by side gussets 22. On each side of the member 21 are ridge plates 23 each formed with an inclined shedding portion 123 and a vertically depending wall portion 24, the latter being made to conform to the shape of the hopper, said vertical wall portions 24 being spaced apart from each other an appreciable distance and braced by brackets 25.

Each hopper structure E, at opposite sides of the car, includes a lower V-shaped section having inner and outer discharge openings, respectively adapted to be closed by a continuous inner door 26 and a continuous outer door 27. Above the doors, each hopper on the inner side thereof is defined longitudinally by the ridge above the center sill structure C, and on the outer side by a sloping floor 28, which slopes downwardly from its adjacent side wall A. The lower margin of each said sheet 28 is spaced upwardly an appreciable distance from the associated outer door and reinforced by an angular-shaped member 29 furnishing a lip or margin. Said inner and outer doors are hinged on a common pivot center disposed below the inverted apex of the V-shaped hopper, and which preferably consists of a longitudinally extending shaft member 30, supported in brackets 31 and 131, respectively disposed at the ends of the hopper and at the central cross-tying structure D, the doors being suitably cut away, as indicated at 32, to clear said brackets. The inner doors 26 are flanged at 33 concentrically with respect to the center of the shaft 30, and the rear edges of the outer doors are tangent to said concentric flange 33. The doors 26 and 27 are rigidified longitudinally by beam members 34 and 35, respectively disposed adjacent the hinge and free edges of the doors, and said doors are further braced transversely by a series of braces, as indicated at 36 and 37. The outer marginal edge of each inner door is deflected to present, as at 38, a suitable rigidifying means or flange for the edge of the door, said flange when the door is in closed position being adapted to abut against the inwardly directed marginal flange 120 of the center sill structure. The doors 26 and 27 are respectively mounted on the shaft 30 by means of hinge brackets 39 and 40. The hinges 40 on the outer doors 27 are formed of a plurality of walls 41—41 spaced apart from each other a sufficient distance to straddle hinge 39 on the inner door, the latter being preferably formed of a single wall 42 of appreciable thickness.

The doors 26 and 27 are each preferably adapted to extend continuously from end to end of the hopper and beneath the transverse central rigidifying structure D. At each end of the base of the hopper there is disposed the transverse end hopper wall F, which includes a vertical end wall plate 43, said wall adjacent the inner door 26 of the hopper being shaped to conform to the contour of the hopper, and adjacent the outer door said plate is extended beyond the outer edge of the outer door 27, as indicated at 44 in Figure 4 for the purpose of presenting a baffle plate adapted to prevent overflow of ballast at the end of the said outer door when the latter is in open position. Each inner door 26 is longitudinally extended at its opposite ends beyond the end walls F of the hopper structure E, the projected portions increasing in extent from the hinge to the free edge of the door, thus providing a door extension, indicated at 450, projecting beyond the end wall F at each end of the door of substantially triangular shape. At the outer margin of each extension 450 there is formed an upwardly disposed baffle plate 45 which lies at an angle to the related hopper end wall F and outwardly of the same, thus providing increased length for the door, with the minimum length adjacent the hinged axis of the door, and diverging to provide the maximum length along the free edge thereof.

The pair of inner doors 26 are raised and lowered in unison by means of the door operating mechanism G, which includes, for each of the inner doors 26, a longitudinally extending drawbar 46 preferably formed of inverted U-shape, having connected thereto a series of flexible connections 47, such as chains, which extend over pulley wheels 48 and are secured at their free ends to the door 26. The pulley wheels 48 are mounted on pivot pins 49 which extend through brackets 50 and the center sill webs. The bars 46 on the respective sides of the center sill are moved in unison by means of a rotary shaft 51 which extends through the center sills and is pivotally mounted therein in bearings 52, said shaft projecting toward one side of the car to permit operation thereof. Self-locking winding linkage mechanism, as indicated at 53, connects each of the bars 46 with the said shaft 51. The mechanism 53 includes square hubs 54 on the shaft 51, around which wind links 55, 56, 57, 58 and 158, the latter being the terminal link member, and formed of hook shape whereby a straight line passing through the pivots at the respective ends of said terminal link member 158 will pass slightly beyond the center of the shaft 51, and lie on the far side of the axis of rotation of said shaft, when the mechanism is in locked position, thus rendering the mechanism self-locking. The shaft 51 is actuated from the side of the car by means of a worm wheel 59 (Figures 1 and 3) and gear 60 carried at the lower part of the car side and preferably enclosed in a housing 61, said worm and gear being disposed out of the path of movement of the outer doors. The worm wheel 59 is preferably actuated by a short longitudinally

extending shaft 62, said shaft being preferably provided with suitable ratchet and lever mechanism for rotating the same, as indicated conventionally at 63.

The operation of the mechanism controlling the inner doors 26 is as follows: Assuming the doors to be in closed position, as indicated at the right in Figure 4, and the mechanism G positioned as in Figure 2, the operator, through the medium of shaft 62 and the worm and gear mechanism, rotates shaft 51 in a counter-clockwise direction, as viewed in Figure 2. As the shaft is rotated in an unwinding direction, the drawbar 46 is moved longitudinally, due to the weight of the doors and lading acting on the same, through the flexible connections 47. The unwinding action of the mechanism is continued until such time as the mechanism is fully released, when the inner doors will be in position, as indicated by dotted lines in Figure 4. The raising of the doors is a reversal of the door lowering operations, being accomplished by rotating the shaft 51 in a clockwise direction until the hooked link 158 assumes its locked position with reference to the shaft 51, which, of course, holds the doors 26 closed.

Each of the outer doors 27 is adapted to be operated independently of the other outer door and of both inner doors 26. The operation of each of said doors is through the medium of the mechanism H. Each of the mechanisms H includes flexible connections, such as chains 64, adapted to wind on sheaves 65 carried on a longitudinally extending shaft 66, said shaft 66 being mounted adjacent and above the free edge of the related door and supported at the cross-tying structure in a bearing 67 carried by bracket 68 and supported at its ends by bearing members mounted on the baffle plates 44. There are preferably three flexible connections 64 to each door, each of said connections being connected to the associated sheave 65 and to the bracket member 71 on the door, said member 71 being secured to the beam member 35 and extended beneath and rearwardly thereof, as indicated at 72. The extension 72 is adapted to receive the threaded end 73 of the flexible connection 64, whereby the length of the connection may be adjusted. Adjacent the free edge of the door, the bracket 71 is provided with members having load bearing surfaces 74 inclined with reference to the main plane of the door. Said bearing members 74 are disposed on opposite sides of the flexible connection, and in alignment with lugs 75—75, which are fixed relatively to, and disposed on either side of each sheave 65 and constitute extensions thereof. With the doors in closed position, the lugs 75—75, which are of arcuate form, engage beneath the oblique load bearing surfaces 74 on the door in such a manner that the outward thrust of the door under the load supported thereby is directed toward the axis of the operating shaft 66, thus eliminating any tendency for the shaft to rotate or twist when the doors are in closed position. At each of the flexible connections 64, the door 27 is coped, as indicated at 77, for the connection to extend therein, and a sealing bracket 78 is disposed on the lower edge of the sloping floor 28, in alignment with the said cope, for the purpose of sealing said opening when the door is in closed position.

The operation of the mechanism H, assuming a door 27 to be in the open position, as shown on the left hand half of Figure 4, is as follows: To close the door, the shaft 66 is rotated in a counter-clockwise direction and the connection 64 winds on the sheave 65 until such time as the laterally projecting lugs 75 come in contact with the bearing surfaces 74 on the door, at which time the flexible connections 64 are then relieved of the weight of the door, and continued rotation of the shaft in the indicated direction causes the lever arms, as presented by the sheave lugs 75, to lift the door above the level of the shaft, and arcuate surfaces of the lugs 75 wedge beneath the door, locking the same in tightly closed position. This arrangement provides for a self-locking mechanism, and also for lifting of the door above the level of the shaft in a simple manner, and thus renders unnecessary large and cumbersome brackets on the underside of the door such as would be liable to distortion by coming in contact with the unloaded ballast. The operation of each longitudinal shaft 66 is effected from the side of the car by a short transverse shaft 79, said shaft being operatively connected by means of worm and gearing enclosed in a housing and indicated conventionally at 80.

The arrangement of worm and gearing for the inner and outer doors, permits of the gradual opening of the doors whereby they may be maintained in any adjusted position and the flow of ballast controlled and limited to the exact quantities desired. The mounting of the doors and the proportioning of the doors in relation to the rails K eliminate the tendency to flood the rails during the unloading of ballast, as the disposition of the adjacent hoppers to each other and to the rails is such that the ballast only commences to flow freely over the edges of the doors when the same are in position to limit the sloping sides of a pile of ballast, so that the pile will be confined to below the top of the rail, assuming the slopes of the pile to be based on a 1½ to 1 base to height ratio, which is an accepted standard ratio for ballast.

In order to ensure against flooding of the rails, during ballasting, it is essential that excessive flow of ballast at the ends of the doors should be guarded against, and to this end the baffle plates 44 are disposed on the car structure at the ends of the outer doors 27, and a novel construction is employed for the

center or inner doors 26 which provides for lengthening the doors beyond the end walls F of the hopper, whereby the material which would normally flow from the ends of the hopper is diverted and placed beyond the free edge of the doors. The extension 450 on each inner door which thus projects beyond the end wall of the hopper, is of triangular formation, diverging outwardly from the hinge edge of the door towards the free edge thereof, whereby the door increases in length as the free edge is approached, thus providing a door having a greater length at its free edge than at the pivotal end thereof. At each end of each door the upwardly extending baffle plate 45 is preferably formed by flanging the door upwardly, said baffle lying at an angle to the end hopper wall, and formed to diverge outwardly from the hinge end thereof and also formed with its greatest depth adjacent the free edge of the door, thus providing for maximum interception of ballast at the point of greatest door opening. This arrangement, by diverting the end flow of material from over the end of the door to the outer edge thereof, increases the length of the dumping platform, thereby allowing the ballast to spread out, and insures a more even flow of the discharging material. The diverging construction of the door also enables the door in any of its positions to clear the wheels J and the spacing of the baffle plate 45 outwardly from the hopper wall permits adequate clearance beneath the sloping hopper end wall B for the reception of a baffle plate of extended depth when the door is in closed position.

What I claim is:

1. In a load discharging car adapted to discharge ballast adjacent the rails, the combination with a longitudinally extending hopper including a transversely extending hopper end wall and a longitudinally extending door, said door in closed position being adapted to incline upwardly and inwardly and movable to a downwardly inclined position; of means for preventing the overflow of discharging material from over the end of the door and causing said material to discharge over the free edge of the door, said means including: an extension on the door projecting beyond the hopper end wall; and a baffle plate rising upwardly from said door extension, said baffle plate lying at an angle to the transverse hopper end wall.

2. In a load discharging car, a longitudinally extending hopper including transversely extending hopper end walls and a door extending between said hopper end walls and formed with upwardly extending baffle plates at each end thereof, said baffle plates extending at an angle to the hopper end walls whereby said plate will flare outwardly and be spaced away from the hopper end wall at the free edge of the door a greater distance than near the hinge end thereof.

3. In a load discharging car adapted to discharge ballast adjacent the rails, a hopper including a hopper end wall and pivotally mounted door projecting beyond the hopper end wall, said projecting portion of the door being formed to present increasing door area as the distance from the pivotal center of the door increases for the purpose of intercepting the flow of the load beyond the hopper end wall and directing the overflow beyond the free edge of the door and free of the rails.

4. In a load discharging car adapted to discharge ballast adjacent the rails, a longitudinally extending hopper having transversely extending walls at each end and a pivotally mounted door extending continuously between the end walls and projecting beyond the same, said projecting portion of the door increasing in length as the distance from the pivotal center of the door increases, whereby a triangular door platform is provided at each end of the hopper for the purpose of intercepting overflow of the load at the ends of the hopper and directing the ballast beyond the free edge of the door.

5. In a load discharging car adapted to discharge ballast adjacent the rails, the combination with a center sill; of V-shaped hoppers on each side of the center sill, each of said hoppers including an outer and an inner door pivoted on a common pivotal hinge center, the inner doors of the respective hoppers being adapted to be operated in unison; a transverse wall at each end of the hopper, said wall being disposed inside of the ends of the inner doors whereby the inner doors extend beyond the hopper end walls and intercept the flow of ballast issuing at the ends of the hopper and direct the same beyond the free edge of the door and free of the rails; end baffle plates on the inner doors adapted to confine the ballast on the doors, said baffle plates diverging outwardly from the hinge edge of the doors and lying at an angle to the hopper end walls.

6. In a railway car, the combination with a center sill; of a longitudinal hopper disposed on each side of the center sill, each said hopper including a door hinged outwardly of the center sill and having its free edge extended inwardly towards the center of the car; and means for operating said doors in unison from the side of the car, said means including: a bar on each side of the center sill extending lengthwise of the car, flexible elements connecting each bar with its associated door, pulleys adapted to deflect the flexible elements from a straight line path, a winding shaft extending transversely of the car, winding connections on the respective sides of the center sills connecting the bars and transverse shaft, and means at the side of the car for actuating the transverse shaft.

7. In a railway car, the combination with a center sill; of a longitudinal hopper disposed on each side of the center sill; each of said hoppers including a door which in its closed position extends upwardly and inwardly from its pivotal center towards the center sill with its free edge spaced an appreciable distance from the lower edge of the center sill; a hood-shaped member extending over the center sills and adapted to bridge the space intermediate the center sill and free edge of the door at an incline; door operating means disposed beneath said hood-shaped member at the side of the center sill, said means including: a series of pulleys; a bar extending lengthwise of the car above the said pulleys; flexible elements connecting the bar and door, said elements extending above the pulleys; and means for controlling the movement of said bar from a position adjacent the side of the car, said means including: a transversely extending shaft; self-locking linkage winding mechanism connecting the bar and transverse shaft; and a worm and gearing for actuating the transverse shaft, said worm and gearing being disposed at the side of the car.

8. In a railway car, the combination with center sills; of longitudinally extending hoppers disposed on the opposite sides of said center sills, each of said hoppers having an inner and an outer door hinged adjacent the lower portion of said hopper and movable in open position to present downwardly inclined load shedding platforms; means for raising the inner doors of the respective hoppers in unison and retaining the same in a closed position, said means including: a longitudinally extending bar disposed at each side of the center sill; a series of pulleys disposed in alignment with each of said bars; and flexible connections extending over said pulleys and connecting the bars and doors; and means for moving the respective bars longitudinally in unison, said means including a transverse shaft extending through the center sills and outwardly to the side of the car; self-locking linkage mechanism connecting each bar with said transverse shaft; and worm and gearing disposed on the end of the shaft adjacent the side of the car whereby the door openings may be controlled and maintained in any adjusted position from the side of the car.

9. In a railway car, a door adapted normally to lie in an upwardly and outwardly inclined position and movable to a downwardly inclined open position with its free edge adjacent the road bed; a shaft pivotally mounted outwardly beyond the free edge of the door and below the level of same when the door is in closed position; a connection extending between said shaft and door to raise the same; and a door engaging member movable with the shaft and adapted to engage the door at a predetermined point and relieve the flexible connection of the weight of the door, said member having a curved seat adapted to seat beneath the door.

10. In a railway car having a sloping floor door adapted when in closed position to incline upwardly and outwardly from its pivotal center and movable to a downwardly inclined position with its free edge adjacent the road bed; the combination with a winding shaft mounted in parallelism with the free edge of the door and disposed below the level of said door edge when in closed position; a winding sheave carried by the shaft; a flexible connection extending between the sheave and the door, said connection being adapted to wind on the sheave to raise the door; and means fixed relatively to the sheave at an appreciable distance from its center of rotation and adapted to engage with the door at a pre-determined point to lift the same above the level of the shaft and relieve the flexible connection of the weight of the door.

11. In a car of the character described having two longitudinal hoppers formed of V-shape, each of said hoppers having an inner and an outer door hinged on a common pivotal center, raising means for the inner pair of doors of the respective hoppers, said raising means including: longitudinally movable members, flexible connections extending between the movable members and the doors, pulley wheels on the car structure adapted to deflect the connections from a straight-line path; and raising means for the outer doors, said raising means being adapted to be actuated by longitudinally extending shafts having flexible connections extending therefrom to the respective outer doors; and worm and gearing for the said center doors arranged adjacent the side of the car and out of the path of the side doors and side door raising means.

12. In a railway car, the combination with longitudinally extending hoppers; of doors for said hoppers, said doors being transversely movable for opening and closing said hoppers; and operating means for said doors, including: longitudinally movable drawbars connected with said doors, and a transversely extending worm operated shaft operatively connected with said drawbars, the connections between said drawbars and shaft including self-locking linkage adapted to cooperate with said shaft to lock the doors in closed position.

13. In a railway car, the combination with means providing a dumping opening; of a door adapted to open and close said opening; and operating mechanism for said door, including: a shaft rotatably mounted adjacent the free edge of said door, said shaft being provided with a sheave having eccentric lugs thereon adapted to engage said door

to lift the same when nearly closed, there being a flexible connection between said sheave and said door; and worm mechanism for rotating said shaft.

14. In a car of the character described having two longitudinally extending hoppers formed of V-shape, each of said hoppers having a pair of transversely movable doors for discharging material either centrally of the rails or to the outer sides of the rails; a winding shaft extending transversely of the car and operable from one side of the same, connections extending lengthwise of the car from the winding shaft to the centrally discharging doors, said connections including means for deflecting movement of the connections from a straight line path; and a longitudinally extending winding shaft for operating the outer doors, said latter winding shaft being disposed outwardly of said outer doors and having flexible extensions extending therefrom to said doors.

15. In a car of the character described, the combination of two longitudinal hoppers formed of V shape, each including inner and outer movable walls, the inner walls of the respective hoppers being adapted for center discharge and outer walls for side discharge; means for independently operating the hoppers for center and side discharge, each said operating means including operating shafts and flexible connections extending from the shafts to the respective doors; one of said operating means having its flexible connections and operating shaft arranged to wind lengthwise of the car and the other of said operating means being arranged to wind transversely of the car.

16. In a railway car of the character described, the combination of two longitudinally extending hoppers formed of V-shape, each of said hoppers having movable doors for discharging material either centrally of the rails or to the outer sides thereof, flexible connections connected to the centrally discharging doors and extending lengthwise of the doors, actuating means for said flexible connections including an operating shaft extending transversely of the car; and operating means for the side discharging doors including flexible connections extending transversely of the car and longitudinally extending operating shafts connecting therewith.

In witness that I claim the foregoing I have hereunto subscribed my name this 2nd day of March 1928.

GEORGE B. DOREY.