LOAD DISCHARGING CAR

Filed June 13, 1936

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My invention relates to improvements in load discharging cars.

An object of my invention is to provide an improved load discharging car of a type requiring tightly fitting doors, for the haulage of bulk material such as cement, which under certain conditions is liable to cause and under other conditions will arch and pack very tightly above the discharge openings and can only be discharged through bottom outlets after the arch has been ruptured.

Another object of my invention is to provide an improved sliding door or gate, and operating means therefor whereby the door may be conveniently operated and controlled from the side of the car.

Still another object of my invention resides in the arrangement of hoppers and sloping floor sheets in relation to discharge outlets, whereby the flow of material through the outlets may be controlled and the possibility of the material arching in the outlets reduced to a minimum.

A further object of my invention is to provide means for holding the load against leakage while the car is in transit and to provide protection against the entrance of foreign substances such as wind, moisture, cinders, etc., adjacent the hopper door and openings.

A further object is to provide a frame for the hopper door, which can be manufactured at a reduced cost by use of rolled parts or members shaped and assembled for the purpose.

A further object is to provide certain features and details of construction, such as will be more fully pointed out hereinafter and claimed.

My invention will appear more fully from the following description and the accompanying drawings which illustrate one embodiment of the invention.

In the drawings,

Fig. 1 is a side view of a sufficient portion of a hopper car to include four hoppers in the bottom thereof, two of the hoppers being illustrated as disposed, one on each side of the transverse center of the car; the left-hand hopper frame and door are shown in section;

Fig. 2 is a transverse section of the car illustrated in Fig. 1, showing the hoppers disposed on each side of the longitudinal center of the car;

Fig. 3 is an enlarged vertical detail section through the hopper door and frame, taken substantially on the line 3—3 of Fig. 9;

Fig. 4 is an enlarged detail view in elevation, of the portion of the door frame and mechanism as seen from the line 4—4 of Fig. 9, looking in the direction of the arrows;

Fig. 5 is a detail sectional view similar to a portion of Fig. 3, illustrating the door in retracted or open position within its frame;

Fig. 6 is a detail section substantially on the line 6—6 of Fig. 4;

Fig. 7 is an enlarged transverse detail section substantially on the line 7—7 of Fig. 1;

Fig. 8 is a detail section on the line 8—8 of Fig. 7;

Fig. 9 is an enlarged transverse vertical section on the line 9—9 of Fig. 1;

Fig. 10 is an enlarged plan view of the door frame parts, door and door-opening and locking means, in their assembled relation, the door being shown in closed and locking position;

Fig. 11 is an enlarged detail view in elevation, of the swinging shield or shutter;

Fig. 12 is an end view of the shield shown in Fig. 11; and

Fig. 13 is a detail vertical section substantially on the line 13—13 of Fig. 11.

Referring more particularly to Figs. 1 and 2, A indicates the side walls of the car. Each of the 25 hoppers are made up of outer and inner side walls B and C respectively, and end or cross walls D and E respectively. The inner side walls C are substantially vertical, and the outer side walls B slope downwardly and inwardly. The end walls D and E are both sloping, the walls D sloping downwardly. These hopper walls terminate at their lower ends in a discharge opening which is surrounded by a frame illustrated generally in Fig. 10, in which the door or gate F is arranged to slide in a direction longitudinally of the car. The longitudinal direction of the movement is much preferable, but it will be obvious that the parts may be arranged to provide for transverse movement of the doors if desired, without departing from the invention.

The door frame is rectangular in form and is made up of inner and outer side members G and H respectively, and cross members J and K respectively. The cross member K, however, is made in the two parts K' and K" (Figs. 3, 4 and 5), spaced apart to provide therebetween an opening through which the hopper door F slides in its movement to and from closed position. These parts K' and K" of the cross member are joined at their ends to the side frame members G and H so as to maintain them in their proper relation. The side frame members G and H extend longitudinally beyond the cross member K to provide support for the sliding door F throughout its en-
tire movement from closed to open position, and the ends of these extensions G and G are connected by a member G which is L-shaped in cross section and which acts as a brace for the frame extensions and also as a limit stop for the sliding door in its opening movement.

The hoppers are made as large as possible consistent with the provision of the proper slope of the walls thereof for the easy flow of the material. The arrangement and construction of the hoppers is such as to minimize the packing of the material in the bins above the outlet openings, due to arching. One of the difficulties encountered in connection with the handling of bulk cement and similar material, is due to the fact that the material flows very freely when first loaded, and therefore provision is to be made for the prevention of leakage and for restricting the flow in the desired quantities. On the other hand, when the material has been hauled over a long distance, there is a tendency for the lading to arch and pack in the bins, thereby necessitating the use of large openings and the application of external force to initiate the free flow of the material. The use of large discharge outlets, however, is not conducive to a proper control of the material as it issues from the outlets, and I have therefore embodied in my construction features of the hoppers and door opening which are such as to provide the restricted outlets where free flow of material is desired, and also minimize the liability for the material to arch in the hoppers above the openings. It will be noted that I retain a discharge outlet of standard dimension but having a comparatively small area, and I dispose the control door on a higher plane and at a location where the opening is of such increased size to break the arch. However, the size of the actual opening through which the material leaves the hopper, is smaller than the area of the opening in the plane of the door, the size of this opening being confined by certain limitations to that which provides for the discharging of the load into a receptacle which is attached to the frame. For this reason the members of the frame are sloped to correspond to the slope of the hopper walls to which the frame is attached, and the portion of the frame below the plane of the sliding door is provided with means by which a suitable receptacle can be attached to the frame. For this purpose the lower margin of the frame members are formed to receive a suitable receptacle. The inner member H has a slot 8 formed on its inner wall, and the part K of the cross member has a similar slot 9 formed therein, whereas the outer member H has an outwardly turned flange 10 and the cross frame member J has a flange 11 to provide suitable means for attaching the receptacle to the door frame. The inner and outer longitudinal side frame members are formed, as shown in Figs. 7 and 9, to provide ledges or shoulders 12 and 13 on their inside walls. These ledges serve to support the marginal edges of the door F and provide surfaces upon which the door can freely slide. In the inner frame member G portion thereof, the ledge 12 is offset inwardly to provide an upper shoulder 14 to prevent any upward movement of the door. In the case of the outer frame member H, however, the lower margin 15 of the sloping wall B of the hopper overhangs the edge of the door and serves the same purpose of limiting or preventing upward movement of the door. Above these ledges the inner and outer side frame members and the cross frame member J are formed with flanges which are suitably attached, preferably by riveting, to the respective hopper sheets or walls, the flange of the inner frame member G being vertical and acting as a brace for the outer frame member H and the cross member J being inclined to conform to the slope of the hopper sheets. The cross member J of the frame is likewise formed to provide a ledge 16 which supports the forward leading edge of the door when the door is in closed position, as shown more clearly in Figs. 3 and 8.

The part K of the cross member K has a horizontal flange 17 which forms the lower margin of the slot or opening 18 through which the door moves and supports the underside of the door. The upper part K of the cross member K is formed as an angle member, and one of its walls forms a sloping flange corresponding to the hopper sheet to which it is attached. The lower edge of this flange forms the upper margin of the slot 18 through which the door moves.

The upper surface of the door carries a raised ridge 19 extending across the door and engaging the lower edge of the sloping wall of the part K to provide a limit stop to the closing movement of the door and at the same time to provide a seal for the door slot when the door is in closed position.

The underside of the door is provided with a series of teeth 20 which extend transversely of the door and lie along the full width of the door or sufficient length for the purpose as desired. The door is actuated by pinions 21 which engage the teeth 20 and which are carried upon a transverse shaft 22. The shaft is square in section but carries round bushings 23 at its opposite ends, which are mounted in a large bearing block 24 provided to the inner and outer door frame members G and H. The outer end of the shaft carries a socket member 25 having a hole 26 into which a bar can be inserted for turning the shaft to thereby move the door in either direction.

In order to seal the door opening or slot 18 against the entrance of dirt, moisture, cinders, etc., after the door is in closed position, I provide a swinging shield or shutter member 27 which extends transversely of the frame and fills in the space between the lower surface of the door and the angle member K of the cross frame member K, as shown more clearly in Figs. 3 to 6. This shield consists of a plate member the upper margin 28 of which is rounded to rotate in the inner corner formed by the angle of the walls of the part K. The bearings for this swinging shield are formed by clips 29 which are riveted to the cross member part K and which extend through slots in the shield and support the shield for swinging movement. The lower margin of this shield is beveled as at 30 to conform to the bevel at the edge of the door. The shield normally occupies a substantially vertical position immediately behind the margin of the door. In opening, as the door starts moving, the shield is swung by the door and rides up on the upper surface of the door, a shoe projection 31 being provided. This shoe is formed to ride on a shelf at the proper angle so that it will not bind or otherwise interfere with the closing movement of the door. In the closing movement of the door, the shield rides upon the upper 70 surface of the door, but as the door reaches its closed position the shield swings downwardly and follower 32 is formed to follow the opening. This shield also forms part of a locking device for locking the door in closed po-
sition. As shown more clearly in Figs. 4, 6 and 9, the shield adjacent its outer end carries an extension 32 which is adapted to be engaged by a locking dog 33. This locking dog is pivotally mounted on a casting 34 which is attached to the frame member, so that the dog can be swung into and out of its locking position. The parts are so arranged that when the door is in its closed position and the shield is in closed or vertical position, the dog can be swung about its pivotal axis, and its engaging member 35 which engages the top edge of the outer frame member H and serves as a limit stop for the dog in both of its positions, as shown more clearly in Fig. 4.

The frame member H has a key-shaped slot 37 in a position corresponding to the locking position of the dog, and the dog has a corresponding slot which registers with the slot 37 when the dog is in locking position, and the locking pin 38 is adapted to be inserted through these registered slots to lock the dog against movement. This locking pin has a suitable head 39 at one end and at its other end a lug 40 which passes through the registered key slots and holds the pin against displacement. This lug has a slot for the usual car seal.

The forward or leading margin of the door is beveled as at 45 to provide an upwardly sloping surface and a comparatively sharp edge for the door. This beveled surface extends across the door to points adjacent the side edges of the door, and at these points the side edges, at the extreme forward edge of the door, Figs. 9, 8, and 10, are inwardly beveled as at 46. The purpose of this arrangement is to displace the closing movement of the door any material which may have lodged on the door-supporting ledges 12, 13 and 16, thereby preventing this material from interfering with the normal free movement of the door. This beveled edge is at all times in contact with the load, and as the door approaches the closed position the formation of the edge of the door causes the material upward along the slope of the hopper end wall. It will be noted that the angle of the bevel 45, with relation to the slope of the wall of the hopper, is slightly in excess of 90°, thus providing for the easement of the material in advance of the door and preventing undue packing of the lading at the ends of the ledges or under the door. It will also be noted that the vertical inwardly directed bevels 46 act, as the door moves, to direct the material inwardly from the vertical walls of the ledges.

In order to further ease the movement of the material which the edge of the door scrapes from the supporting ledges, there is provided (Fig. 8) grooves 47 in the inner walls of the frame members G and H, into which the material is moved. These grooves are located at the end portion of the closing movement of the door and provide definite relief for this portion of the door movement.

I claim:

1. In a railway car, the combination with a discharging hopper, a sliding door at the lower portion adapted to close the opening, said hopper having means forming a slot through which said door slides, a swinging shield positioned adjacent said slot for preventing dust, rain or moisture from reaching the load through said slot in the closed position of said door, said shield having means engageable by the door to swing the shield when the door is moved to open position, means for locking said shield and door in closed position, said means including a pivotally mounted element having a portion adapted to be swung into engagement with said shield, and means for locking said pivotal element.

2. In a railway car having a discharging hopper, a frame adapted to form the discharge opening of said hopper and presenting in a self-contained unit a funnel-shape frame having flanges on four sides for attachment to the hopper sheets, said frame having a sliding door and runways for said sliding door; rack and pinion means for moving the door, including an operating shaft for rotating the pinions; bearings for the shaft; a swinging shield for preventing the entrance of wind, moisture and dust and abutting the outer edge of said door, means engageable by the door when moved to open position for swinging said shield, and a pivotally locking member adapted to engage the swinging shield member and hold it in position against movement by the door when the latter is in closed position.

3. In a railway car the combination with a discharging hopper, a frame adapted to enclose the hopper at the bottom thereof and have within its walls a slide door, walls of said frame having shelves therein for supporting the slide door, means above the slide door at the sides thereof to prevent upward movement of the door, means forming an unobstructed escavement space for the material within said walls at their sides near the ends adjacent the front edge of the closed door and communicating with the interior of the hopper, the said slide door having its front edge beveled for a part of its length to form an inward wedge and beveled at its extreme front side edges to form inward wedges, said wedges acting when the door moves toward closing position to push any left-over material resting upon the shelves forward and upward into said escavement space whereby the said left-over material does not interfere with the closure of the door to its final closed position.

4. In a railway car, the combination of a discharge hopper having side and cross walls, a slideable door, a frame having side walls and cross walls, and adapted to enclose the hopper at the bottom thereof, the side walls of said frame extending outwardly beyond one hopper cross wall a sufficient distance so that the frame includes within its confines the door in either the closed or open position of said door, the said side walls of the frame having shelves therein for supporting the slide door at the bottom thereof throughout their length, means above the car door to prevent upward movement of the door, an abutment on the upper side of the door at its outer end to form a seal with a cross wall of the frame when the door is in closed position, a swingable sealing member hinged from the said cross wall of the frame and abutting the outer end of the door when closed, means engageable by the door for automatically swinging the sealing member to open position upon movement of the door, and means for locking the said sealing member in contact with the door whereby the door is held in its fixed closed position.

5. In a railway car for hauling dry materials in bulk and releasing the same for discharge by gravity, the combination of a frame, a movable
slide door within the frame, means for moving the slide door from closed to open positions and return, a swingable shield member attached to the frame and having means in the path of the door engaged by the door in its opening movement for automatically swinging said member, the said swinging member in its closed position forming a shield against the entrance of dust, air and moisture adjacent the door, and a locking device including a movable cam for holding the swinging member in its closed position.

6. An article of manufacture adapted for application to a railway car for hauling dry materials in bulk and releasing the same for discharge by gravity, a frame, a movable slide door within the frame, means for moving the slide door from closed to open positions and return, a swinging shutter suspended from the frame and adjacent the outer edge of the movable door when in closed position, the said shutter being automatically raised to an open position by the outward movement of the door and closed by gravity when the slide door has been moved to closed position whereby the shutter provides a shield against cinders, dust, air, and moisture from the load within the car.

7. As an article of manufacture adapted for application to a railway car for hauling dry materials in bulk and releasing the same for discharge by gravity, a frame, a movable slide door within the frame, means for moving the slide door from closed to open positions and return, a swinging member suspended from the frame and automatically movable by the car door in its opening movement and resting in engagement with the end of the car door when closed, a wedging member cooperative with said swinging member for locking the door from outward movement when the door is in closed position, the said swinging member forming a shield against cinders, dust, air, or moisture, reaching the load within the hopper through the frame opening through which the movable car door passes.

8. As an article of manufacture adapted for application to a railway car for hauling dry materials in bulk and releasing the same for discharge by gravity, a frame having a slot therein, a movable slide door included within the confines of said frame in either its closed or open positions, said door being movable through said slot, means for moving the slide door from closed to open position and return, a shield suspended from the frame adjacent said slot and automatically movable by the slide door in its opening movement for stopping cinders, dust, air, and moisture from entering the interior of the frame through said slot, and interengaging means in the frame and door for stopping the movement of the door when in either its fully closed or fully opened position.

9. In a railway car adapted for transporting bulk cement and the like, the embodiment of a hopper, a frame member enclosing the hopper at the bottom thereof and having an opening therein for the discharge of the load and extending on one side of the hopper outwardly therefrom a distance sufficient to support in open position a cooperable slide door of size suitable for closure of the said frame opening, the said frame having integral bearing surfaces for supporting the door at two sides thereof in its open and closed positions, and at its front edge when in closed position, projections on the frame inwardly and above the door along the sides thereof for preventing upward movement of the door, said frame having a free unobstructed space at the closure end of the door whereby any material resting upon the bearing surfaces will with the forward movement of the door move forward and upward into said space, means for moving the said slide car door, an abutment stop integral with the door and engagement with the frame for stopping movement of the door to closed position and for forming a seal between the door and frame for stopping cinders, dust, snow or moisture from entering the hopper, a supplemental seal suspended from the frame and automatically movable by the door in its opening movement, and a wedging cam for contact with the supplemental seal for holding it against the door and the door against the frame to prevent outward movement of the said supplemental seal and door.

10. As an article of manufacture adapted for application to a railway car for transporting dry materials in bulk and releasing the same for discharge by gravity, a frame structure attachable as a unit to the hopper and comprising walls for enclosing the lower ends of the hopper walls and including and supporting within it confines a movable slide door in both its closed and open positions, the side walls of said frame structure being rolled steel angle sections for supporting the door and the load thereon, and having vertical flanges extending downwardly below the lower edges of the hopper walls and reshaped at the lower edges thereof for the attachment of a conveying receptacle, and having horizontal flanges at their inner edges providing bearing surfaces for the said slide door, said horizontal flanges having their outer edges reshaped to extend upwardly along the sides of the hopper door and parallel the hopper walls for attachment thereto, cross-tie members secured at the extreme ends of the side members adapted to limit the maximum movement of the door, an intermediate cross-tie member for supporting the hopper wall and forming a stop for an abutment on the car door, said intermediate cross-tie member and door abutment co-operating when the door is in closed position to form a seal for preventing cinders, dust, air, and moisture from entering the hopper, and a swinging shield carried by said intermediate cross-tie member and positioned in the path of the door to be automatically moved to inoperative position as the door is moved to open position.

11. In a railway car adapted for transporting bulk cement and the like, the embodiment of a hopper, a frame member enclosing the hopper at the bottom thereof and including within its confines a movable slide door in both its closed and open positions, said slide door being cooperative with the frame for moving the slide door, a shield normally preventing cinders, dirt, air and moisture from entering the hopper through clearances between the frame and door when the door is in closed position, and having means engageable by the door upon its opening movement to automatically move the shield to an open position, and means for locking said shield in closed position.

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