

May 14, 1963

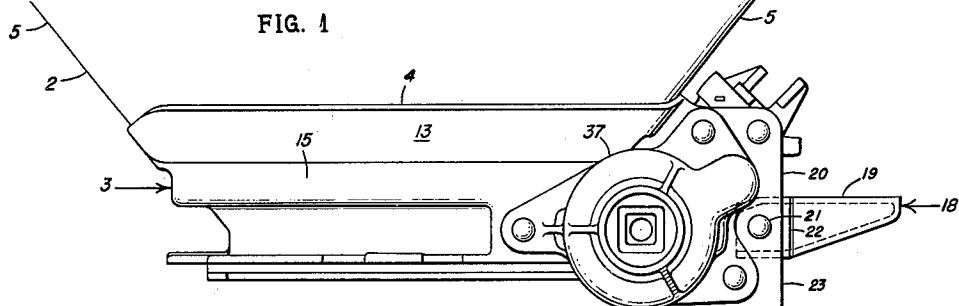
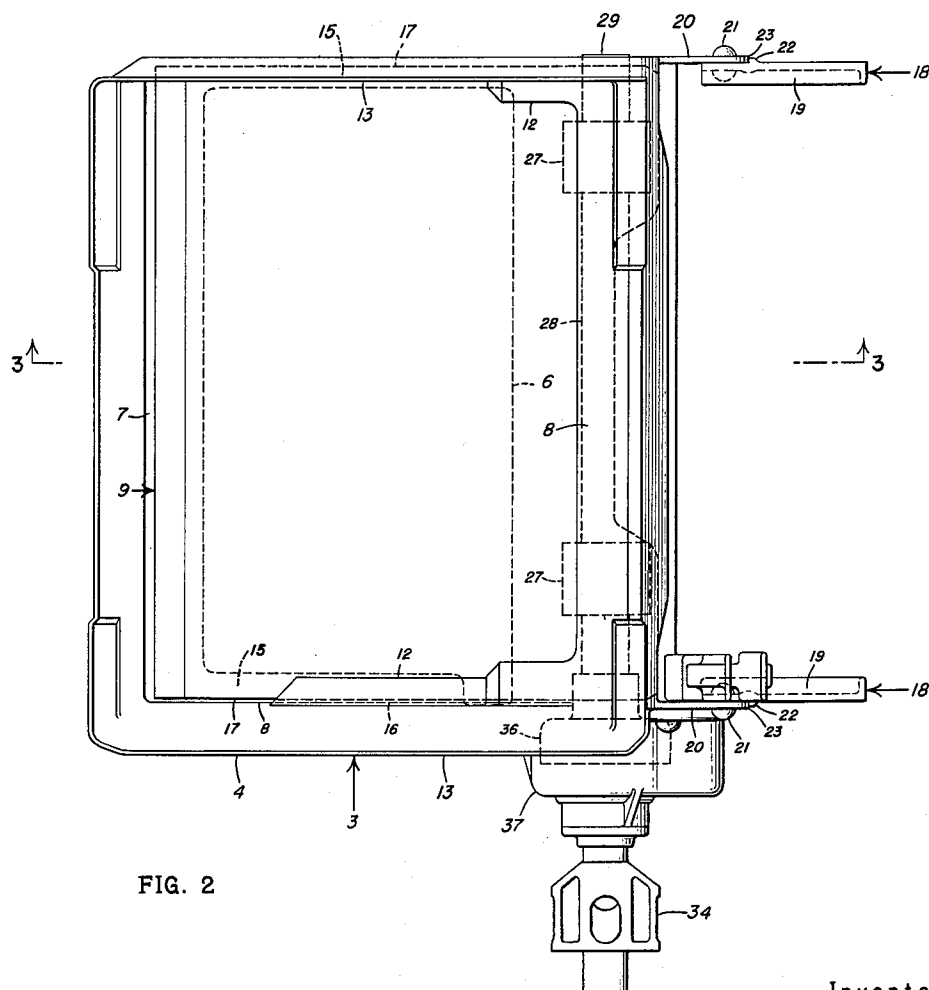
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3,089,435

SLIDING HOPPER GATE ASSEMBLY

Filed June 9, 1959

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 3

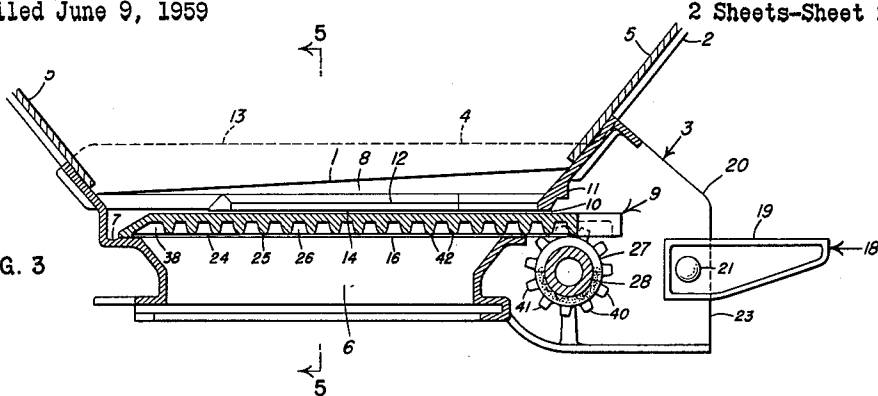


FIG. 4

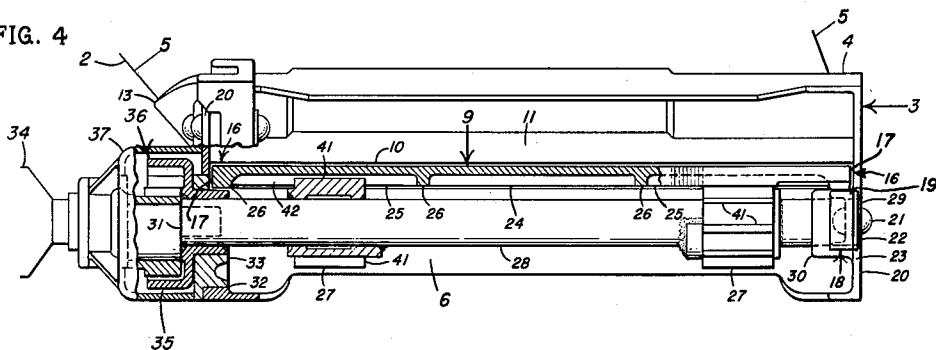


FIG. 5

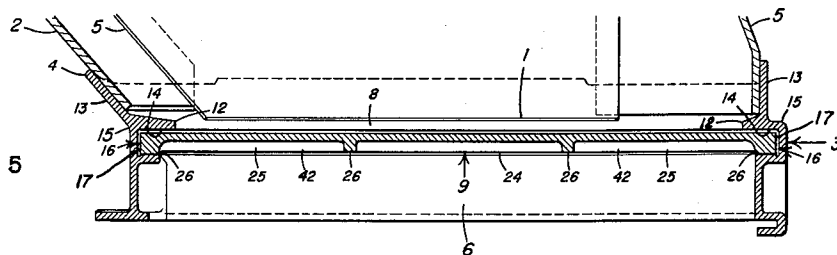
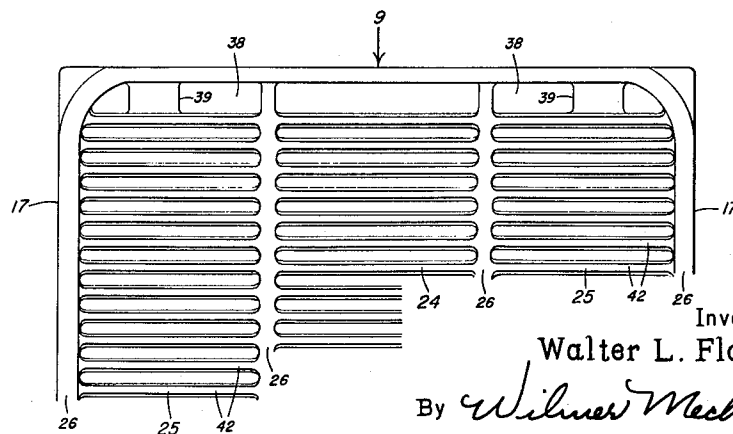


FIG. 6



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1

3,089,435

SLIDING HOPPER GATE ASSEMBLY

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7 Claims. (Cl. 105-282)

This invention relates to slide gate assemblies for railway hopper cars and has for an object the provision of an improved slide gate assembly which, in its means for supporting a gate in open position, is simpler and less expensive than but equal in effectiveness to a conventional assembly.

Another object of the invention is to provide an improved slide gate assembly wherein the drive means by which the gate is moved between open and closed positions is of such construction and arrangement as itself to limit outward movement of the gate without detriment to the latter's installation and removal.

An additional object of the invention is to provide an improved slide gate assembly wherein outward movement of the gate is limited by the assembly's drive means and the gate in open position is supported, in lieu of the conventional extensive supporting framework, on cantilever means supported entirely on the frame of the assembly surrounding the discharge opening in the hopper to which the assembly is applied.

Other objects and advantages of the invention will appear hereinafter in the detailed description, be particularly pointed out in the appended claims and be illustrated in the accompanying drawings, in which:

FIGURE 1 is a side elevational view of a preferred embodiment of the improved slide gate assembly of the present invention applied to a hopper;

FIGURE 2 is a top plan view of the assembly of FIGURE 1 removed from the hopper;

FIGURE 3 is a vertical sectional view taken along the lines 3-3 of FIGURE 2, but with the assembly applied to a hopper as shown in FIGURE 1;

FIGURE 4 is a front elevational view of the assembly of FIGURE 1 with portions broken away and shown in section to more clearly illustrate certain of the details of construction;

FIGURE 5 is a rear elevational view of the assembly of FIGURE 1; and

FIGURE 6 is a fragmentary bottom plan view of the slide gate of the preceding figures.

Referring now in detail to the drawings, in which like reference characters designate like parts, the improved slide gate assembly of the present invention is designed to control the discharge of lading through the bottom or discharge opening 1 of a bottom-opening hopper 2, such as is found in a covered hopper car. As in a typical assembly employed for the purpose, that of this invention has a frame 3 of conventional generally rectangular or box shape which surrounds or embraces the bottom opening 1 and has its upper portion 4 welded or otherwise fixed to or made rigid with the side sheets or sides 5 of the hopper 2 about that opening. Also conventionally, the frame 3 projects or extends below the hopper 2 and terminates downwardly in an open-bottomed chute 6 forming its lower portion.

Interiorly, the frame 3 has a horizontal shelf or ledge 7 encircling its vertically directed central aperture 8 and seating below the bottom opening 1 of the hopper 2 a slide gate or door 9 which is slidable, shiftable or reciprocable horizontally on the shelf to closed and open positions through a horizontally elongated slot 10 in the frame's front wall 11. Supported within the frame 3 on the shelf 7, the gate 9 is guided in its movement relative thereto by a pair of lips or flanges 12, each integral with and in-

2

standing therealong inwardly from the slot 10 toward the wall's inner extremity. Each overlying or overhanging and having an underface 14 substantially paralleling the adjacent or corresponding side 15 of the associated shelf 7, the lips 12 with the underlying portions of the shelf sides and the included, vertically extending portions of the side walls 13, form a pair of inwardly opening or confronting guide channels or ways 16 at opposite sides of the frame and fitting or receiving the sides 17 of the gate 9.

The vertical spacing between the sides 15 of the shelf 7 and the underfaces 14 of the related lips 12 is such that the gate 9 is free to slide in the guide channels 16 but at the same time is resisted in vertical angling or canting relative to the frame as it moves outwardly through the slot 10 to open position. This resistance imposed by the lips 12 to vertical angling of the gate 9 relative to the frame 3 is in part responsible for the simplicity of the present relative to the conventional slide gate assembly. Were this a conventional assembly, the slide gate 9 would be supported outwardly of the frame 3 as it moved toward closed position on a pair of transversely spaced side rails connected at their inner ends to the frame and suspended at their outer ends on hangers fixed to and depending from the upper part of the hopper 1. In place of this expensive framework, there is employed in the present assembly cantilever means fixed to or rigid with and supported wholly by the frame 3, the preferred form being a pair of transversely spaced cantilever guide or side rails or supports 18, each aligned with one of the sides 15 of the shelf 7 and extending or projecting substantially parallel to each other outwardly from the front wall 11 of the frame preferably to a point slightly beyond the center of gravity of the gate 9 in open position so as to minimize or, under normal conditions, eliminate stress on the lips 12. Lying wholly below the level of the gate 9 and having flat, uninterrupted upper faces 18 coplanar with the shelf 7, the side rails 18 conveniently are fixed to a pair of vertically directed, transversely spaced side brackets, webs or plates 20 integral with and outstanding from the frame 3 at opposite sides of its front wall 11. Each of the rails 18 is readily attached to one of the brackets 20 by a rivet 21 and held against pivoting about its rivet by an integral vertically directed shoulder 22 engaging the correspondingly directed front edge 23 of its bracket.

For shifting or driving it between open and closed positions, the gate 9 has or carries on its undersurface or underside 24 one or a plurality and preferably a pair of longitudinally extending, transversely spaced racks or rack bars 25, each reinforced at the sides by a pair of longitudinally extending transversely spaced ribs 26 and each engaged by a pinion or pinion gear 27. The common drive or pinion shaft 28 to which the pinions 27 are fixed or keyed has one end 29, here its inner end, journaled in one of the side brackets 20, conveniently in a sleeve or socket 30 formed integrally therewith and at its other or outer end 31 projects or extends through an aperture or opening 32 in the other bracket and is journaled in that bracket by a bearing 33 insertible from without into and removably seated in the opening. Depending upon the force desired or required in a particular installation to be applied through it for imparting movement to the gate 9 through the pinions 27 and racks 25, the shaft 28 may be connected to the usual operating capstan 34 either directly or, for increased mechanical advantage, through suitable gearing 35, such as that shown in my copending application, Serial No. 754,834, filed August 13, 1958. Designed particularly for applications in which the additional mechanical advantage is needed in opening the gate 9 and regulating discharge of lading from the hopper 2, the illustrated assembly uses as its gearing 35, the gearing of that application and correspondingly has the inner gear 36 fixed to the outer end 31 of its shaft 28 and the

gearing or gear train 35, as a whole, housed or contained in a housing 37 riveted or otherwise removably attached to the confronting side of the apertured bracket 18.

Ordinarily, the ribs 26 at the sides of the racks 25 would prevent the pinions 27 from being disengaged from the racks except by sliding the gate 9 outwardly through the slot 10. It is this characteristic that in the conventional assembly requires stops to be fixed to the side rails on which the gate is partly supported in open position after the assembly is installed in order to limit the outward movement of the gate. In the assembly of this invention, on the contrary, the lateral play or spacing between each pinion 27 and the ribs 26 confining the sides of its rack 25 is made such, relative to the penetration or extent of the projection of the inner end 29 of the drive shaft 28 into the fixed sleeve 30 by which it is journaled in one of the side brackets 20, that the shaft, on outward axial shifting within the limits permitted by that play, will be pulled out of or disengaged from the sleeve. At the same time, the bearing-seating aperture 32 in the other side bracket 20 is made of sufficient radial extent relative to the shaft 28, at least downwardly of the latter's axis, as to enable the shaft, on disengagement from the sleeve 30 and unseating of the insert bearing 33, to be dropped to the level at which the pinions 27 will be disengaged from or clear the racks 25. Consequently, it is possible, by removing the means by which the insert bearing 33 and shaft 28 are normally held in operative position, here the housing 37, to disengage the drive means from the gate 9 without moving the latter.

The vertical, downward or radial, as well as limited axial shiftability of the shaft 28 relative to the frame 3 and thus the gate 9 is here utilized to enable the pinions 27, in the normal or operative position or condition of the shaft, not only to drive but to limit the outward extent of movement of the gate and so eliminate the need for the usual stops on the guide rails 18. This is accomplished by blocking or interrupting a groove 38 in and at or adjacent the inner end of one or each of the racks 25 by a downwardly facing abutment or shoulder 39 disposed to engage a crown 40 of a tooth 41 of the related pinion 27 and, in conjunction with the restraint imposed on upward movement or displacement of the gate by the slot 10 and guide channels 16, lock or block the pinion against further rotation in a direction to shift the gate 9 outwardly. Such locking of either pinion 27 against further rotation in turn serves to lock the gate 9 against further outward movement due to the intermesh of the adjoining tooth or teeth 41 and 42 of the pinion 27 and rack 25, respectively. With this construction, the gate 9 is drivable between open and closed positions and, while normally determined in its open position by the abutment or abutments 39, is readily applied to or removed from the frame 3 simply by dropping the pinions 27.

From the above detailed description, it will be apparent that there has been provided a slide gate assembly which is both relatively simple and inexpensive in construction and effective in operation. It should be understood that the described and disclosed embodiment is merely exemplary of the invention and that all modifications are intended to be included which do not depart from either the spirit of the invention or the scope of the appended claims.

Having described my invention, I claim:

1. In a slide gate assembly having a frame fixable to a hopper of a hopper car about a bottom opening therein, the combination of a slide gate slidably mounted in said frame, rack means fixed to said gate, a shaft carried by said frame, pinion means fixed against relative movement to said shaft and engaging said rack means for driving said gate between open and closed positions, said shaft being shiftable relative to said frame for disengaging said pinion means from said rack means and enabling removal of said gate, and groove-interrupting abutment means on said rack means and engageable with said pinion means

for limiting outward movement of said gate relative to said frame.

2. In a slide gate assembly having a frame fixable to a hopper car about a bottom opening therein, the combination of a slide gate slidably mounted in said frame, rack means fixed to said gate, a shaft carried by said frame, pinion means fixed against relative movement to said shaft and engaging said rack means for driving said gate between open and closed positions, said shaft being shiftable relative to said frame for disengaging said pinion means from said rack means and enabling removal of said gate, means connected to said rack means and engaging with said pinion means for limiting outward movement of said gate relative to said frame, and means connected to said frame for supporting said gate in open position.

3. In a slide gate assembly having a frame fixable to a hopper of a hopper car about a bottom opening therein, the combination of a slide gate slidable horizontally in said frame rack means on and extending longitudinally of an underside of said gate, shaft means on said frame below said gate, pinion means fixed against relative movement to said shaft means and engaging said rack means for driving said gate between open and closed positions, said shaft means with said gate in closed position being shiftable relative to said frame for disengaging said pinion means from said rack means and enabling removal of said gate, and means interrupting a groove in one of said rack and pinion means and engageable with the other of said means for limiting outward movement of said gate relative to said frame.

4. In a slide gate assembly having a frame fixable to a hopper of a hopper car about a bottom opening therein, the combination of a slide gate slidably mounted in said frame, rack means fixed to said gate, a shaft carried by said frame, pinion means fixed against relative movement to said shaft and engaging said rack means for driving said gate between open and closed positions, said shaft with said gate in closed position being shiftable relative to said frame for disengaging said pinion means from said rack means and enabling removal of said gate, means fixed to said gate and engageable with said pinion means for limiting outward movement of said gate relative to said frame, and spaced cantilever means removably attached to and connected only through said frame for supporting said gate in open position.

5. In a slide gate assembly having a frame fixable to a hopper of a hopper car about a bottom opening therein, the combination of a slide gate slidably mounted in said frame, rack means fixed to said gate, a shaft carried by said frame, pinion means fixed against relative movement to said shaft and engaging said rack means for driving said gate between open and closed positions, said shaft with said gate in closed position being shiftable relative to said frame for disengaging said pinion means from said rack means and enabling removal of said gate, means fixed to said gate and engageable with said pinion means for limiting outward movement of said gate relative to said frame, and cantilever means fixed to and outstanding from said frame and connected only therethrough for supporting an outer portion of said gate in the open position thereof.

6. In a slide gate assembly having a frame fixable to a hopper of a hopper car about a bottom opening therein, the combination of a slide gate mounted for horizontal sliding in said frame, rack means fixed to said gate and reinforced at sides by rib means extending longitudinally therewith, an operating shaft carried by said frame, pinion means fixed against relative movement to said shaft and engaging said rack means for driving said gate between open and closed positions, said shaft with said gate in closed position being shiftable relative to said frame for disengaging said pinion means from said rack means and enabling removal of said gate, means fixed to said gate and engageable with said pinion means for limiting out-

5

ward movement of said gate relative to said frame, and cantilever means fixed to and outstanding from and connected only through said frame and lying wholly below said gate for supporting a outer portion of said gate in the open position thereof.

7. In a slide gate assembly having a frame fixable to a hopper of a hopper car about a bottom opening therein, the combination of a slide gate slidable horizontally in said frame, means on said frame overlying and limiting upward relative movement of said gate, rack means on 10 and extending longitudinally of an underside of said gate, a shaft mounted on said frame below said gate, pinion means fixed against relative movement to said shaft and engaging said rack means for driving said gate between open and closed positions, means connected to said rack 15 means and engageable with said pinion means for limiting

6

outward movement of said gate relative to said frame, said shaft being shiftable relative to said frame for disengaging said pinion means from said rack means and enabling removal of said gate, and spaced cantilever means 5 removably attached to and connected only through said frame for supporting an outer portion of said gate in the open position thereof.

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