



May 22, 1962

G. C. MEYERS ETAL

3,035,530

LOCK FOR ENCLOSED SLIDING HOPPER GATE

Filed May 15, 1958

5 Sheets-Sheet 2

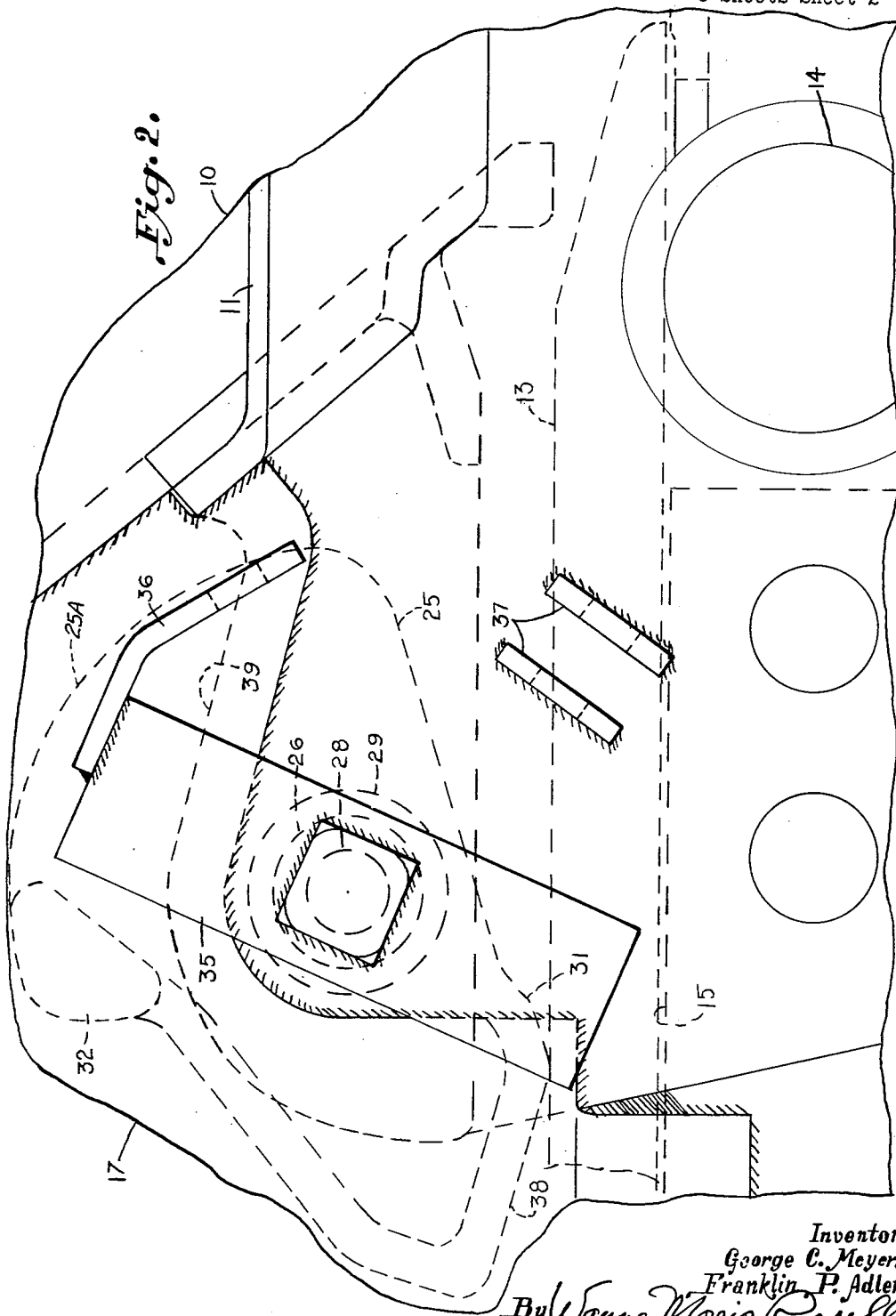


Fig. 2.

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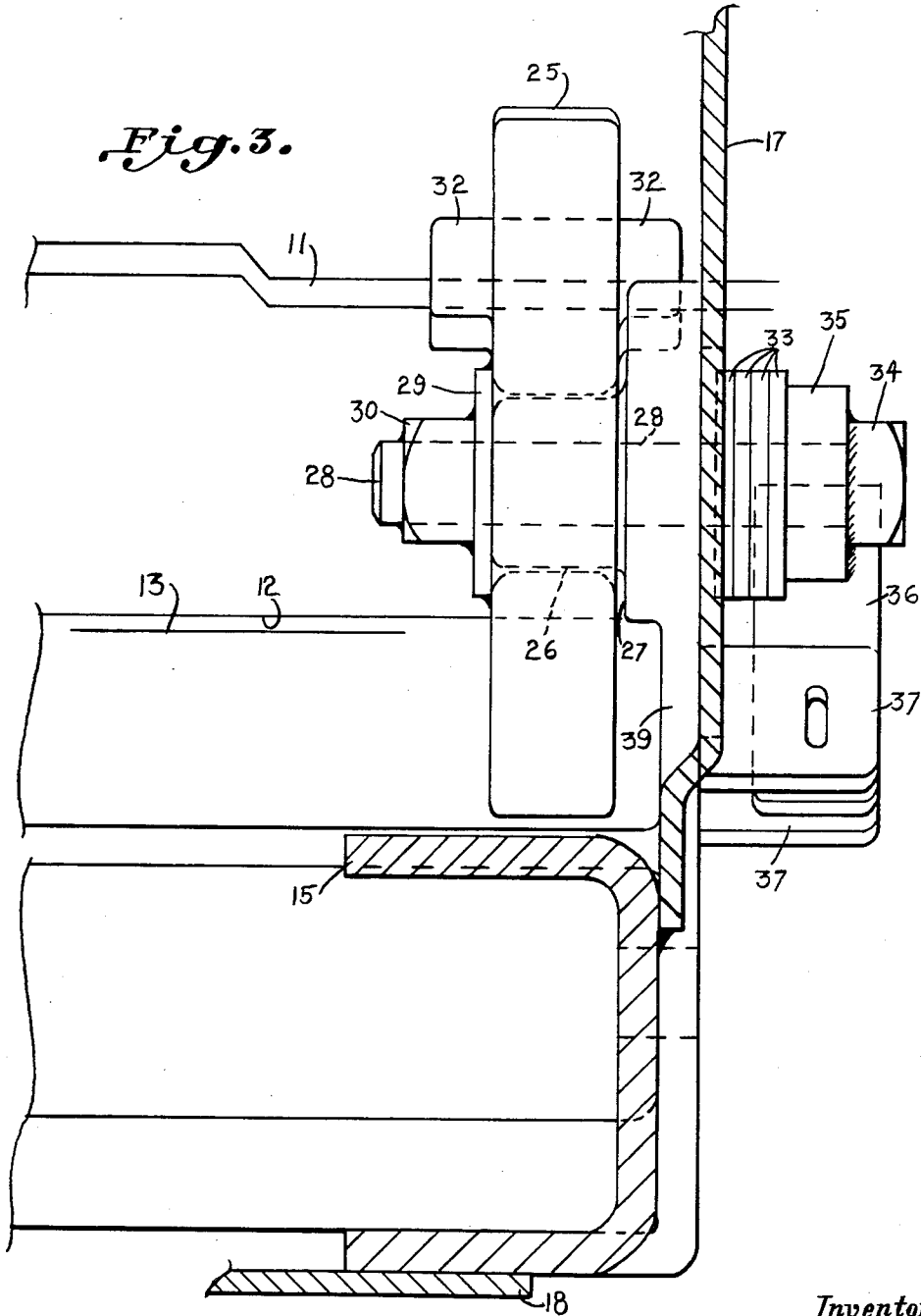
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5 Sheets-Sheet 3



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5 Sheets-Sheet 4

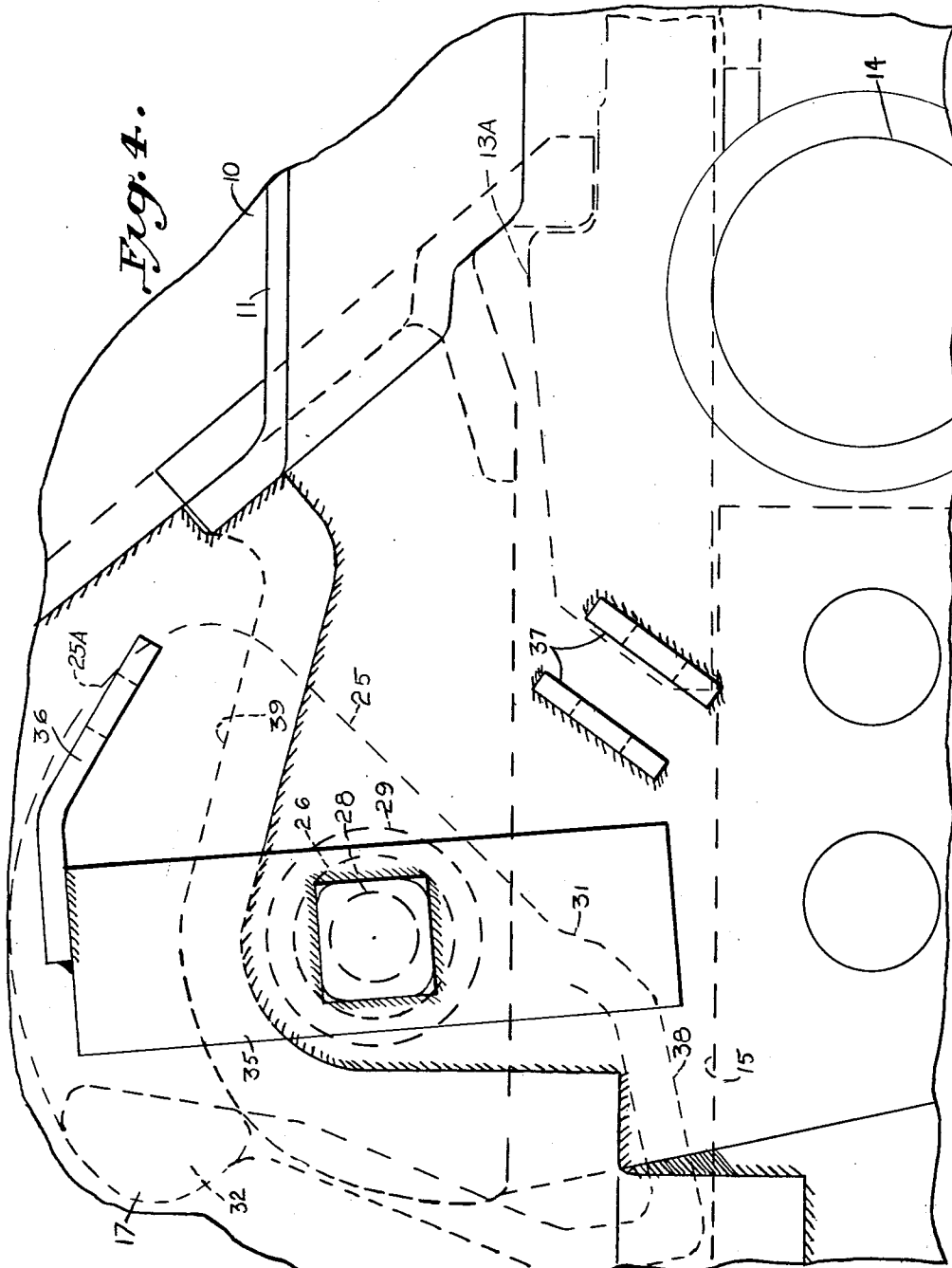


Fig. 4.

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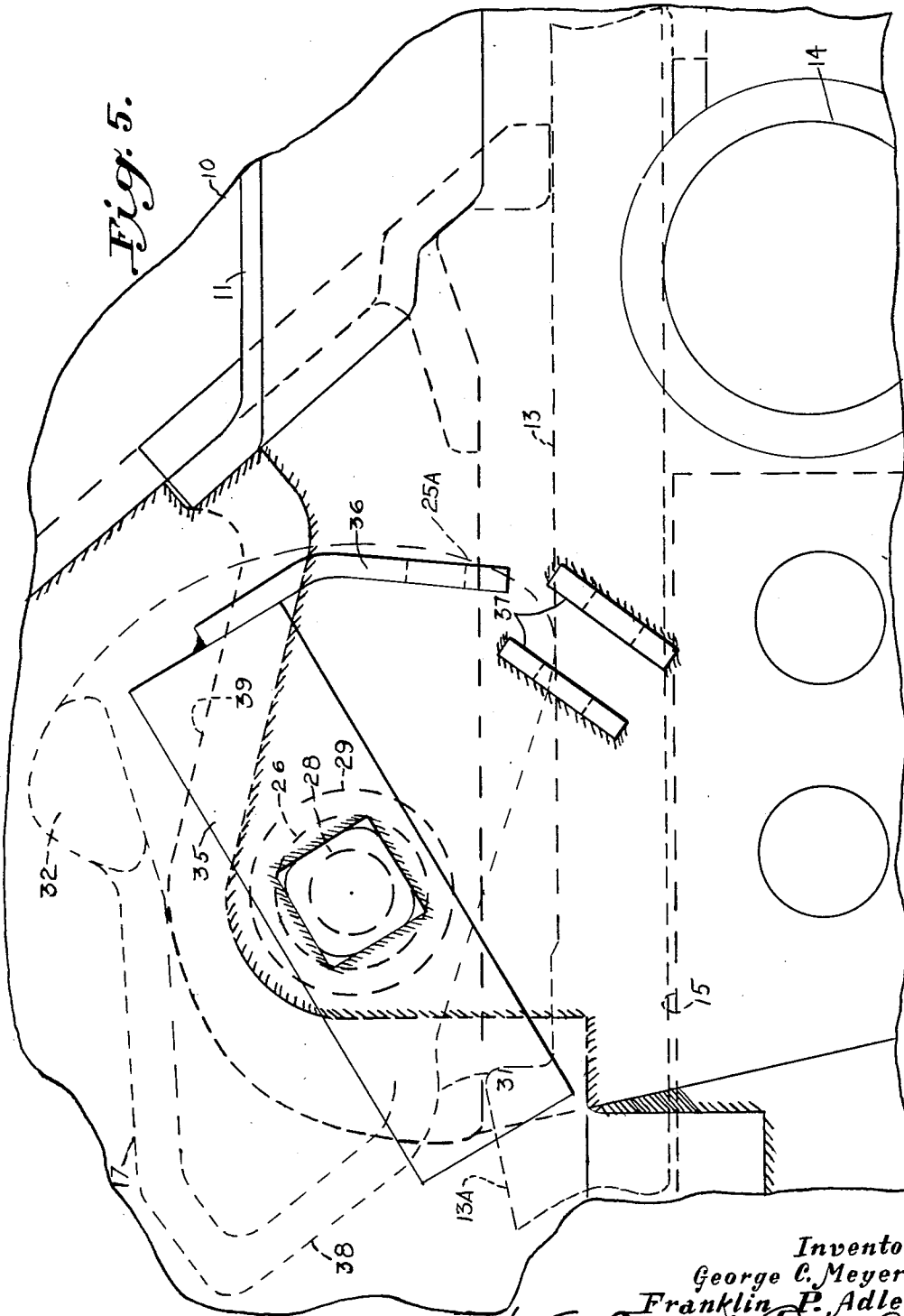
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LOCK FOR ENCLOSED SLIDING HOPPER GATE

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5 Sheets-Sheet 5

*Fig. 5.*



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3,035,530

**LOCK FOR ENCLOSED SLIDING HOPPER GATE**  
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 Ind., assignors to Pullman-Standard Car Manufacturing  
 Company, Chicago, Ill., a corporation of Delaware  
 Filed May 15, 1958, Ser. No. 735,564  
 9 Claims. (Cl. 105—308)

This invention relates to the sliding gates for the hopper outlets of railway hopper cars and has for its particular purpose the provision of mechanism for locking the gate in closed position.

More particularly the invention is directed to a lock mechanism for the sliding gate of a hopper outlet for vehicles where the gate and locking mechanism are enclosed by a sanitary closure for the sliding gate and outlet.

The primary object of the invention is to provide a lock mechanism for an enclosed sliding gate and which is operable exteriorly of the enclosure.

The invention has for its principal object the provision of locking mechanism for the sliding gate of a vehicle hopper outlet wherein the lock mechanism is disposed within an enclosure for the gate and having actuating and sealing means exteriorly of the enclosure.

A further object of the invention includes the provision of a locking cam adapted to assume in addition to full released and fully locked positions, intermediate positions on either side of the pivotal center of the cam and to move automatically to locked position when the gate is moved past the cam.

The foregoing and other objects of the invention are attained by the mechanism and arrangement illustrated in the accompanying drawings wherein:

FIG. 1 is a general side elevational view of a vehicle hopper outlet having an enclosure for the sliding gate with the locking and sealing mechanism of this invention applied and shown in the locked position under seal in the closed position of the gate;

FIG. 2 is a fragmentary detail view to larger scale showing the seal removed and the lock released with the sliding gate in partially open position;

FIG. 3 is a detail sectional view also to larger scale taken on the line 3—3 of FIG. 1 and showing the locking cam engaged behind the sliding gate in closed locked position on the inside of the enclosure and the lock operating handle and the seal plate and seal lugs on the outer side of the enclosure;

FIG. 4 is a fragmentary detail view to larger scale showing the locking cam swung to its rearmost position; and

FIG. 5 also a fragmentary detail view, shows the cam in a forward position where it is adapted to move to locked position behind the gate as the gate reaches fully closed position.

This invention contemplates a sanitary hopper discharge outlet for vehicles having a sliding gate fully enclosed within a housing accommodating the opening movement of the gate and provides a lock mechanism for cooperation with the gate in the fully closed position on the inside of the housing with an operating handle having a seal plate cooperable with sealing lugs on the outside of the housing. The lock on the inside of the housing is actuated by the operating handle on the outside of the housing both to lock the gate in the fully closed position and to release the gate for opening movement. The seal plate associated with the operating handle automatically enters the sealing lugs when the lock is moved to the locked position behind the fully closed gate whereby a seal member may be entered through the lugs and plate thereby to seal the gate against unauthorized opening.

Referring to the drawings 10 represents a railway vehicle hopper wherein the bottom discharge opening is defined by a frame 11 which encircles the bottom of the hopper and is provided with a slideway 12 for a sliding gate 13 adapted to cover and uncover the discharge opening when the gate is in the closed and open position respectively. As shown in FIG. 1, the frame 11 extends below the slideway 12 in which the gate 13 operates and the bottom opening is adapted to be covered by a removably mounted sanitary plate (not shown). The sliding gate 13 is actuated between open and closed positions by means of the operating shaft 14 in the usual manner. When the gate is in the open position it is supported on rearward extensions 15 which may be attached to the frame 11 with their gate supporting surfaces substantially on a level coincident with the level of the slideway 12. The sliding gate 13 is provided with a raised rear edge portion 13A which functions with the locking mechanism of the gate as will be hereinafter described.

The rearward extensions 15 are connected adjacent their rearmost extremities with the hopper structure 10 by means of generally upwardly inclined supports or frame members 16 and a generally triangular shaped side wall plate 17 is secured by welding to the rearmost extensions 15, the frame members 16 and to the hopper structure 10 whereby to enclose the sides of the space into which the sliding gate 13 is received in its open position. A bottom cover plate 18 secured by welding to the underside of the rearward extensions 15 encloses the bottom side of this space. The rear side of this enclosure is completed by fixed and removable plates attached to the frame members 16. A fixed plate 19 covers the upper portion of the rear opening and is secured by welding to the frame members 16 and to the hopper structure. An outwardly directed lip 20 at the bottom of the fixed plate provides a watershed overlying the upper edge of the removable plate 21 which is releasably secured to the frame members 16 by means of bolts 22. The removable plate 21 enables the removal of the sliding gate 13 through the rear of the enclosure when necessary while otherwise maintaining the full sanitary enclosure for the chamber housing the gate in its open position.

The sliding gate 13 is adapted to be locked in the fully closed position and the locking mechanism for the gate is disposed within the rear enclosure but the operating mechanism and the seal arrangement for the lock are located on the outside of the enclosure whereby the gate may be actuated between open and closed positions from the side of the vehicle and the locking and sealing mechanism also actuated from the outside of the enclosure. A locking cam 25 is utilized for the purpose of securing the gate in its fully closed position covering the bottom discharge outlet of the hopper 10. The cam is located inside the rear enclosure and is pivotally mounted on a trunnion embossment 26 for movement in a plane parallel to the adjacent side wall 17. The trunnion 26 is provided with a shoulder 27 which maintains the cam 25 in spaced relation to the side wall. The trunnion 26 and the shoulder 27 are axially perforate and in the form shown a bolt 28 extends entirely through the shoulder and trunnion from the outside of the enclosure to provide a shaft or axle by means of which the cam 25 is actuated. A plate or washer 29, as best shown in FIG. 3, is secured by welding to the cam 25 and the nut 30 which is threaded on the bolt 28 and fixed with respect thereto by welding is securely fixed to the member 29 by welding so that the bolt 28, nut 30, washer 29 and the cam 25 form an integrated assembly whereby rotation of the bolt will cause the cam to be actuated to lock or unlock the gate 13.

The bolt 28, from its connection with the cam, extends through the trunnion 26 and shoulder 27 to the exterior of the enclosure with the bolt finding bearing in the trun-

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nion and shoulder. On the outside a plurality of plain washers 33 are disposed on the bolt and act as thrust bearings. These washers are mounted freely on the bolt and serve also as spacers outwardly of the side of the enclosure. The head 34 of the bolt retains an elongated operating handle 35 mounted on the shank of the bolt between the head and the washers 33. The handle 35 is securely welded to the bolt head 34 whereby to provide a rigidly integrated assembly including the cam 25, washer 29, nut 30, bolt 28 and the handle 35 and which assembly acts in its entirety as a unit so that movement of the operating handle on the outside of the enclosure results in a similar movement of the locking cam on the inside of the enclosure.

When the sliding gate is in the fully closed position the locking cam 25, shown in the released position in FIG. 2, may be rotated to a position of positive engagement behind the rear edge of the gate as shown in FIG. 1, thereby providing an absolute bar to rearward movement of the gate and locking the gate in the forward or fully closed position. Means are provided for sealing the cam in this position whereby to prevent any unauthorized opening of the gate. A seal plate 36, bent at the angle shown in FIG. 2, is integrated with the operating handle by means of welding and is located at that end of the handle whereby the handle is overbalanced in a direction tending to move the cam toward the locked position which will act to supplement the action of the cam in moving to the locked position automatically as the gate is closed. The seal plate 36, when the cam is moved from the position shown in FIG. 2 to that illustrated in FIG. 1, enters between the seal lugs 37 whereupon a seal 40 may be engaged through the aligned openings provided in the lugs and the seal plate. With a sealing member thus engaged the locking cam cannot be released from the position positively preventing opening movement of the gate.

In the operation of the locking mechanism when the gate 13 is fully closed and the mechanism sealed, the seal is removed and the cam is rotated by means of the handle 35 to a fully released position with the cam swung to its rearmost position as indicated in FIG. 4. In this position one of the balancing lugs 32 rests on a rearwardly extending bracket 39 on the frame 11 thereby to prevent any further counter clockwise movement of the cam 25. The operating shaft 14 is then actuated to move the gate rearwardly. As the gate is moved in the opening direction the raised rear edge portion 13A thereof engages the projecting portion 31 on the rear working surface of the cam and lifts the cam over the rear edge of the gate to the position indicated in FIG. 2 where it rides on the upper surface of the gate as the rearward movement thereof is continued to the full open position. In this position of the cam the balancing lugs 32 are to the rear of the pivotal center of the cam so that the weight of the cam is overbalanced to the rear. When the gate is actuated toward its closed position the raised rear edge portion 13A thereof will engage the sloping portion 38 to kick up the rear portion of the cam and throw the balancing lugs 32 beyond the pivotal center so that the weight of the cam is overbalanced toward the front as indicated in FIG. 5, whereby the cam is then in position to move automatically to locked position as the gate reaches its fully closed position. In the locked position the curved latching surface 25A overlaps the raised rear edge 13A of the gate 13 and thus prevents the gate from moving rearwardly to open position as shown in FIG. 1. When the cam moves to locked position the balancing lug 32 rests on the bracket extension 39 to prevent any further clockwise movement of the cam and limit the final position of the cam to one blocking opening movement of the gate 13 but preventing the cam from being driven into binding relationship with the gate.

It will be noted that the mounting trunnion 26 and the shoulder 27 for the locking cam 25 are integral with the rearwardly extending bracket or wall portion 39 of the

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bottom frame 10 so that the locking mechanism may be assembled with the frame structure. However, the locking cam is accessible from the interior of the rear enclosure through the opening afforded by the removable plate 21 where it may become necessary to have access thereto after final assembly of the enclosure. The side wall 17 of the enclosure is secured by welding to the bracket or wall portion 39 of the frame 10 in a manner whereby the edge of the wall 17 skirts the cam shaft 28 and seal mechanism so that the wall 39, in effect, becomes an integral part of the side wall of the enclosure.

From the foregoing it will be seen that there has been provided a locking mechanism for an enclosed sliding gate of a railway hopper car discharge opening which provides for the ready actuation of the locking mechanism exteriorly of the gate enclosure with the lock disposed interiorly of the enclosure and wherein a multi-position locking cam is provided adapted to assume a full release position and intermediate positions on either side of the pivotal center of the cam and to move automatically to locked position when the gate is fully closed.

What is claimed is:

1. In combination with a railway vehicle hopper having a bottom discharge opening and a horizontally sliding gate mounted on the hopper, means for moving said gate between an open position uncovering said opening and a closed position closing said opening, a housing enclosing said gate when said gate is in the open position, said housing including a generally horizontal bottom cover plate beneath the gate when in open position, generally vertical side wall plates adjacent respectively opposite side edges of the gate, and a rear wall connecting the rear edges of the side wall plates, said rear wall comprising a fixed upper plate portion and a removable lower plate portion to provide access for the removal and replacement of said gate, a locking cam mounted inside said housing releasably engaged with the gate to lock the same in the closed position, and an actuating handle operably connected with said cam mounted exteriorly of said housing for releasing said cam.

2. In combination with a railway vehicle hopper having a bottom discharge opening and a horizontally sliding gate mounted on the hopper, means for moving said gate between an open position uncovering said opening and a closed position closing said opening, a housing enclosing said gate when said gate is in the open position, said housing including a generally horizontal bottom cover plate beneath the gate when in open position, generally vertical side wall plates adjacent respectively opposite side edges of the gate, and a rear wall connecting the rear edges of the side wall plates, said rear wall comprising a fixed upper plate portion and a removable lower plate portion to provide access for the removal and replacement of said gate, a locking cam mounted inside said housing releasably engaged with the gate to lock the same in the closed position, an actuating handle operably connected with said cam mounted exteriorly of said housing for releasing said cam, a seal lug fixed on the outside of said housing, and a cooperating seal plate fixed on said handle in juxtaposition to said lug in the engaged position of the locking cam.

3. In combination with a vehicle hopper having a bottom discharge opening and a horizontally sliding gate mounted on the hopper, means for moving said gate between an open position uncovering said opening and a closed position closing said opening, a housing enclosing said gate when said gate is in the open position, said housing including a generally horizontal bottom cover plate beneath the gate when in open position, generally vertical side wall plates adjacent respectively opposite side edges of the gate and a rear wall connecting the rear edges of the side wall plates, said rear wall comprising a fixed upper plate portion and a removable lower plate portion to provide access for the removal and replacement of said gate, a pivot trunnion on the inner side of said housing,

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a locking cam pivotally mounted on said trunnion engageable with said gate to lock the same in the closed position, an operating shaft extending axially through said trunnion to the outside of said housing and operably connected at its inner end to said cam for releasing the same, and an actuating handle on the outside of said housing operably connected to the outer end of said shaft.

4. In combination with a vehicle hopper having a bottom discharge opening and a horizontally sliding gate mounted on the hopper, means for moving said gate between an open position uncovering said opening and a closed position closing said opening, a housing enclosing said gate when said gate is in the open position, said housing including a generally horizontal bottom cover plate beneath the gate when in open position, generally vertical side wall plates adjacent respectively opposite side edges of the gate and a rear wall connecting the rear edges of the side wall plates, said rear wall comprising a fixed upper plate portion and a removable lower plate portion to provide access for the removal and replacement of said gate, a pivot trunnion on the inner side of said housing, a locking cam pivotally mounted on said trunnion engageable with said gate to lock the same in the closed position, an operating shaft extending axially through said trunnion to the outside of said housing and operably connected at its inner end to said cam for releasing the same, an actuating handle on the outside of said housing operably connected to the outer end of said shaft, a spacer bearing about said shaft between said handle and the housing, a seal lug on the outside of the housing, and a seal plate on said handle in juxtaposition to said lug in the engaged position of the locking cam.

5. In combination with a vehicle hopper having a bottom discharge opening and a horizontally sliding gate mounted on the hopper for closing said opening and operable to an open position uncovering said opening, said gate having a raised top portion adjacent its rear edge, a box-like housing fully enclosing said gate in the open position, a pivot trunnion on the inner side of said housing, a locking cam pivotally mounted on said trunnion, said cam including a portion having a latching surface generally facing said gate at one side of the pivot mounting of said cam, a projecting portion on said cam at the opposite side of said pivot mounting and a balance weight intermediate said portions, said latching surface being engageable with said raised top portion of said gate in the closed position thereof, said cam being mounted and arranged normally to assume a plurality of individual operating positions including fully released, fully locked, and respectively intermediate positions with said balance weight at respectively opposite sides of the pivot mounting of the cam, an operating shaft extending axially through said trunnion to the outside of said housing and operably connected at its inner end to said cam, an actuating handle on the outside of said housing operably connected to the outer end of said shaft, a seal lug on the outside of said housing, a seal plate on said handle adjacent one end thereof in juxtaposition to said lug in the locked position of the locking cam, said cam being movable manually by means of said actuating handle of said shaft from said fully locked position to said fully released position whereby said projecting portion is positioned below the level of the top surface of said gate operatively engaging the raised portion of said gate during its opening movement to move said projecting portion to the top surface of said gate and said projecting portion being maintained in this position to the fully open position of said gate by said balance weight, said projecting portion operatively engaging said raised top portion of said gate during its closing movement to move said cam to a position whereby the latching surface portion of said cam rests on the top surface of said gate to be movable automatically by said balance weight to said fully locked position when the raised portion of said gate reaches fully closed position, and said seal plate overbalancing the operating handle to supple-

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ment the movement of the locking cam to fully locked position.

6. The combination with a vehicle hopper having a frame surrounding the hopper defining a bottom discharge opening and a horizontally sliding gate mounted in the frame for closing said opening and operable to an open position uncovering said opening, said frame having a rearwardly extending bracket, a pivot trunnion on the inner side of said bracket, a locking cam pivotally mounted on said trunnion, said cam including a portion having a latching surface generally facing said gate at one side of the pivot mounting of said cam, a projecting portion on said cam at the opposite side of said pivot mounting and a balance weight between said portions, said latching surface being engageable with the rear edge of said gate in the closed position thereof, an operating shaft extending axially through said trunnion and operably connected at its inner end to said cam, and an actuating handle outside of said bracket operably connected to the outer end of said shaft, said cam being mounted and arranged normally to assume a plurality of individual operative positions including fully released, fully locked, and at least one intermediate position with said balance weight at one side of the pivot mounting of the cam, and said cam being movable manually by means of said actuating handle of said shaft from said fully locked position to said fully released position whereby said projecting portion is positioned below the level of the top surface of said gate operatively engaging the rear edge of said gate during its opening movement to move said cam to a position whereby the latching surface portion of said cam rests on the top surface of said gate to be movable automatically by said balance weight to fully locked position when the rear edge of said gate reaches the fully closed position.

7. The combination with a vehicle hopper having a frame surrounding the hopper defining a bottom discharge opening and a horizontally sliding gate mounted in the frame adjacent the opening, means for moving the gate between a closed position closing said opening and an open position uncovering said opening, said frame having a rearwardly extending bracket, a pivot trunnion on the inner side of said bracket, a locking cam pivotally mounted on said trunnion, said cam including a portion at one side of the pivot axis having a latching surface generally facing the closed position of said gate, a projecting portion on said cam at the opposite side of said pivot mounting engageable with said gate in the open position thereof and a balance weight mounted between said portions, said latching surface being engageable with the rear edge of said gate in the closed position thereof, an operating shaft extending axially through said trunnion and operably connected at its inner end to said cam, and an actuating handle outside of said bracket operably connected to the outer end of said shaft.

8. The combination with a vehicle hopper having a frame surrounding the hopper defining a bottom discharge opening and a horizontally sliding gate mounted in the frame adjacent the opening, means for moving the gate between a closed position closing said opening and an open position uncovering said opening, said frame having a rearwardly extending bracket, and a locking cam pivotally mounted on said bracket, said cam including a portion at a side of said pivot axis having a latching surface generally facing the closed position of said gate, a projecting portion on said cam at the opposite side of said pivot axis engageable with said gate in the open position thereof and a balance weight mounted between said portions, said latching surface being engageable with the rear edge of said gate in the closed position thereof, said cam being mounted and arranged normally to assume a plurality of individual operative positions including fully released, fully locking, and at least one intermediate position with said balance weight at one side of the pivot mounting of the cam, and said cam being movable automatically to said fully locking position when said pro-

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jecting portion of the cam becomes engaged by the gate in moving past the cam from open position.

9. The combination with a vehicle hopper having a frame surrounding the hopper defining a bottom discharge opening and a horizontally sliding gate mounted in the frame adjacent the opening, means for moving the gate between a closed position closing said opening and an open position uncovering said opening, said frame having a rearwardly extending bracket, and a locking cam pivotally mounted on said bracket, said cam including a portion at a side of said pivot axis having a latching surface generally facing the closed position of said gate, a projecting portion on said cam at the opposite side of said pivot axis engageable with said gate in the open position thereof and a balance weight mounted between said portions, said latching surface being engageable with the rear edge of said gate in the closed position thereof, said cam being mounted and arranged normally to assume a plu-

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5 rality of individual operative positions including fully released, fully locking, and at least one intermediate position with said balance weight at one side of the pivot mounting of the cam and said cam being movable automatically to said fully locking position when said projecting portion of the cam becomes engaged by the gate in moving past the cam from open position, and said balance weight engaging said bracket at respectively opposite sides of said pivot axis in the fully released and fully locking positions of said cam.

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