July 27, 1954 W. R. SHAVER ET AL 2,684,645

HOPPER CAR DOOR LOCK

Filed Jan. 14, 1950 5 Sheets-Sheet 1

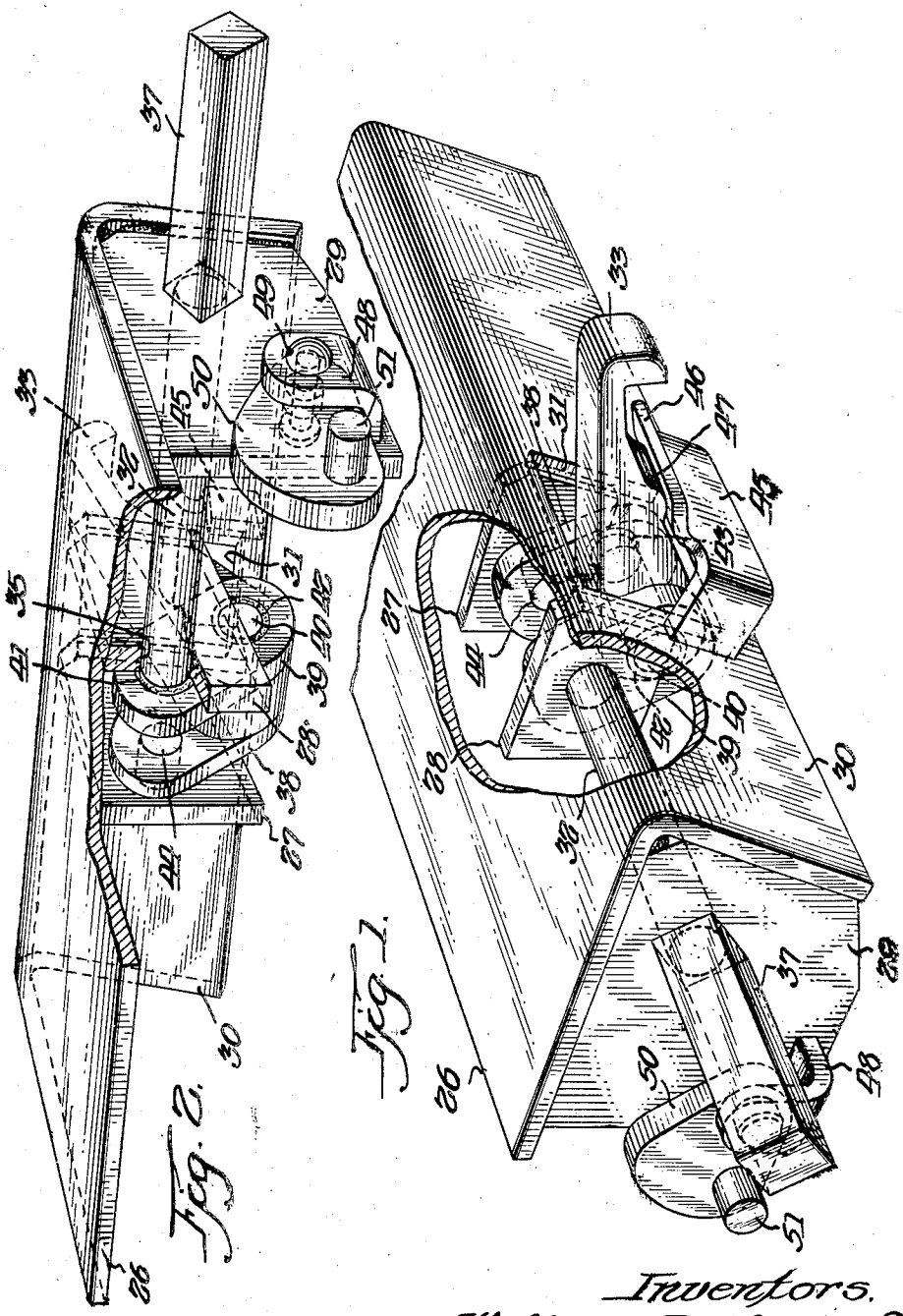


Fig. 1.

Fig. 2.

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Fig. 3.

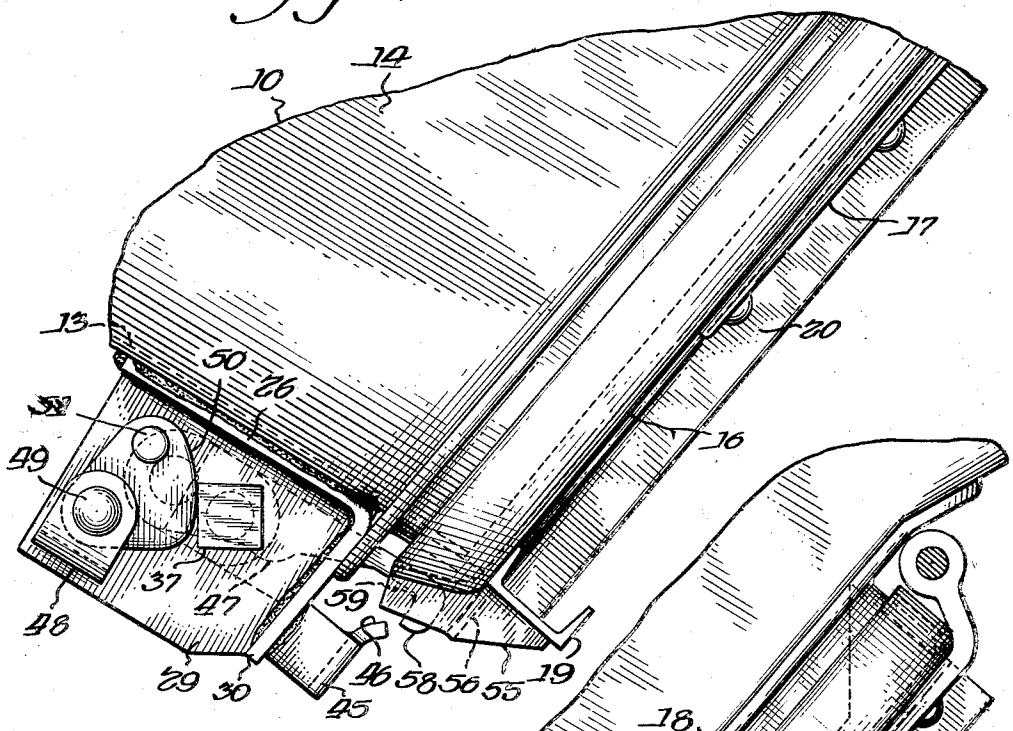
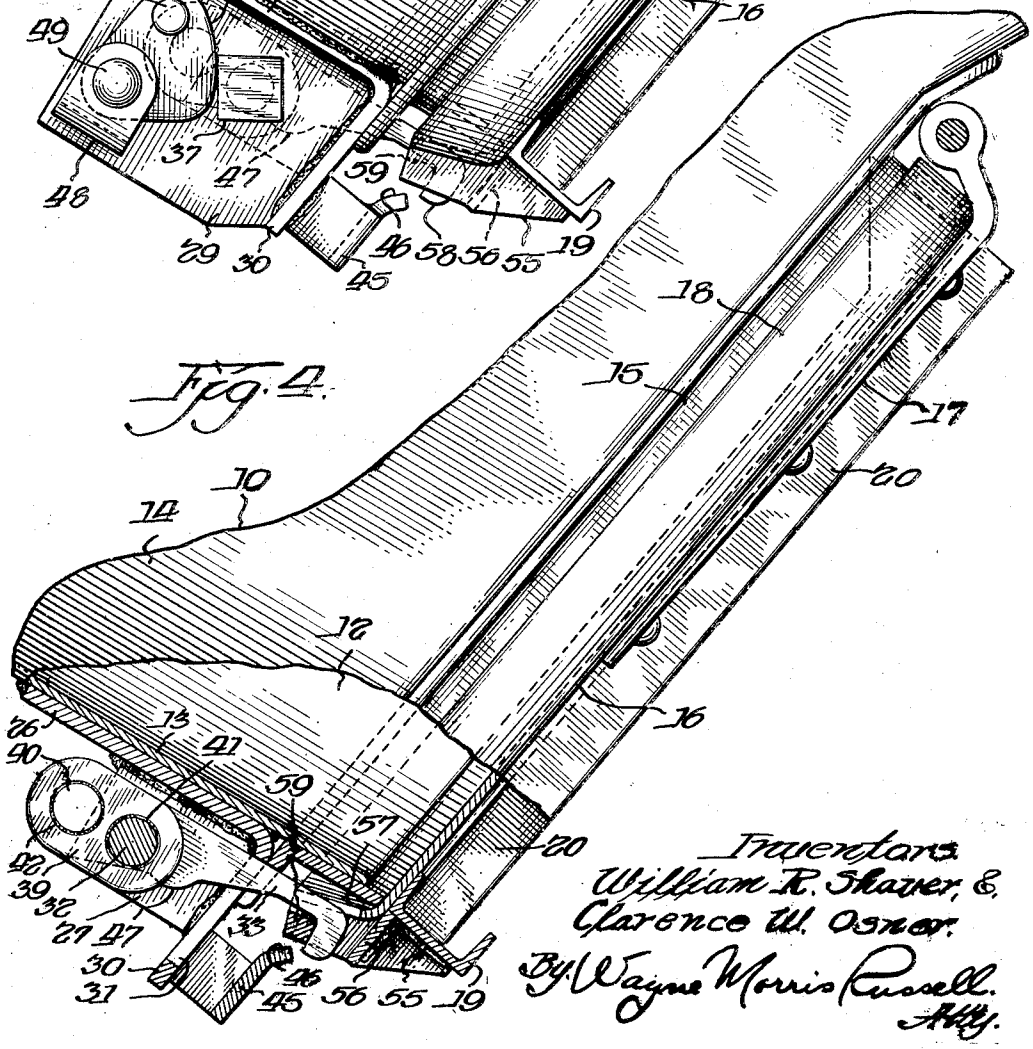


Fig. 4.



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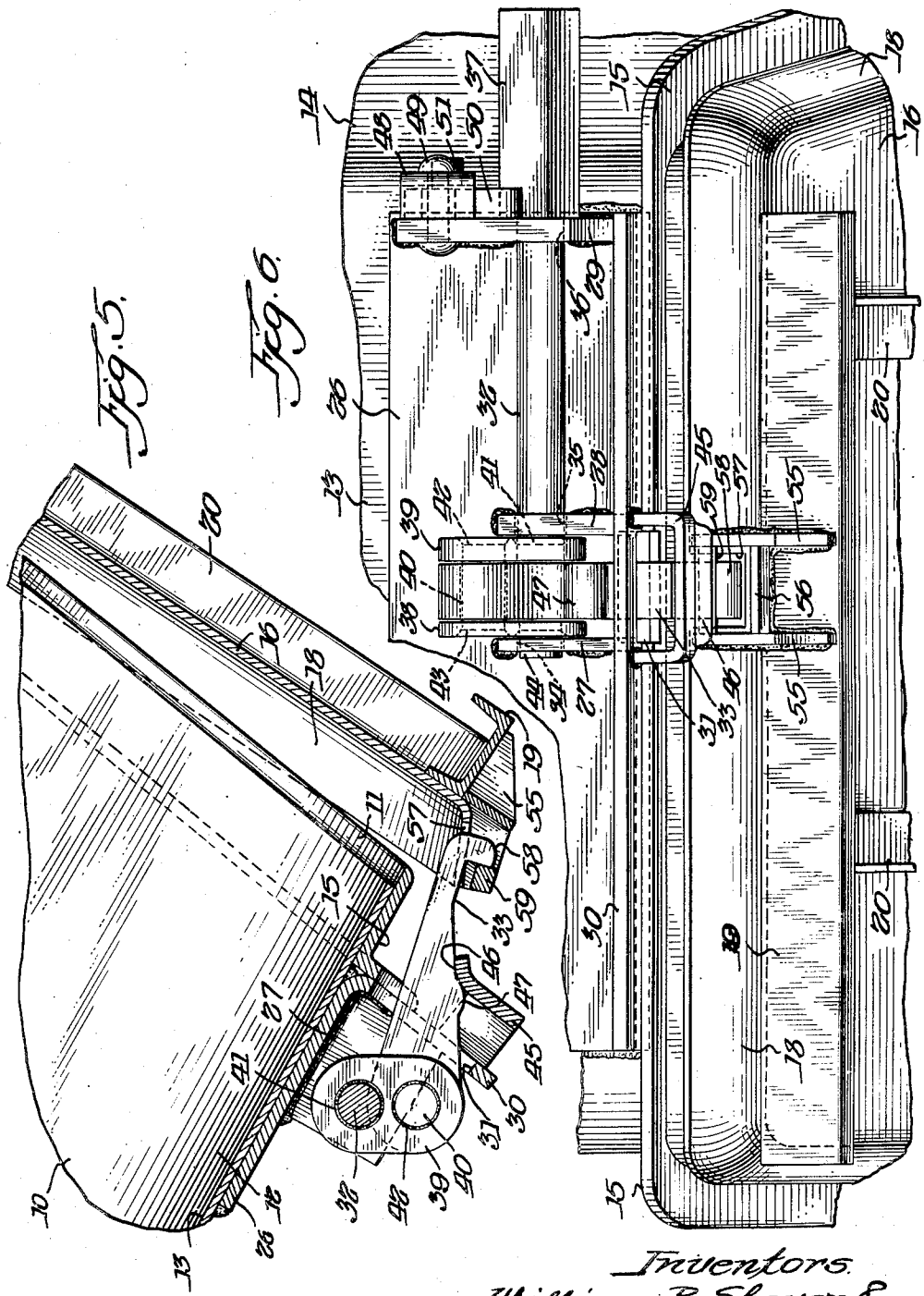


Fig. 5.

Fig. 6.

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HOPPER CAR DOOR LOCK

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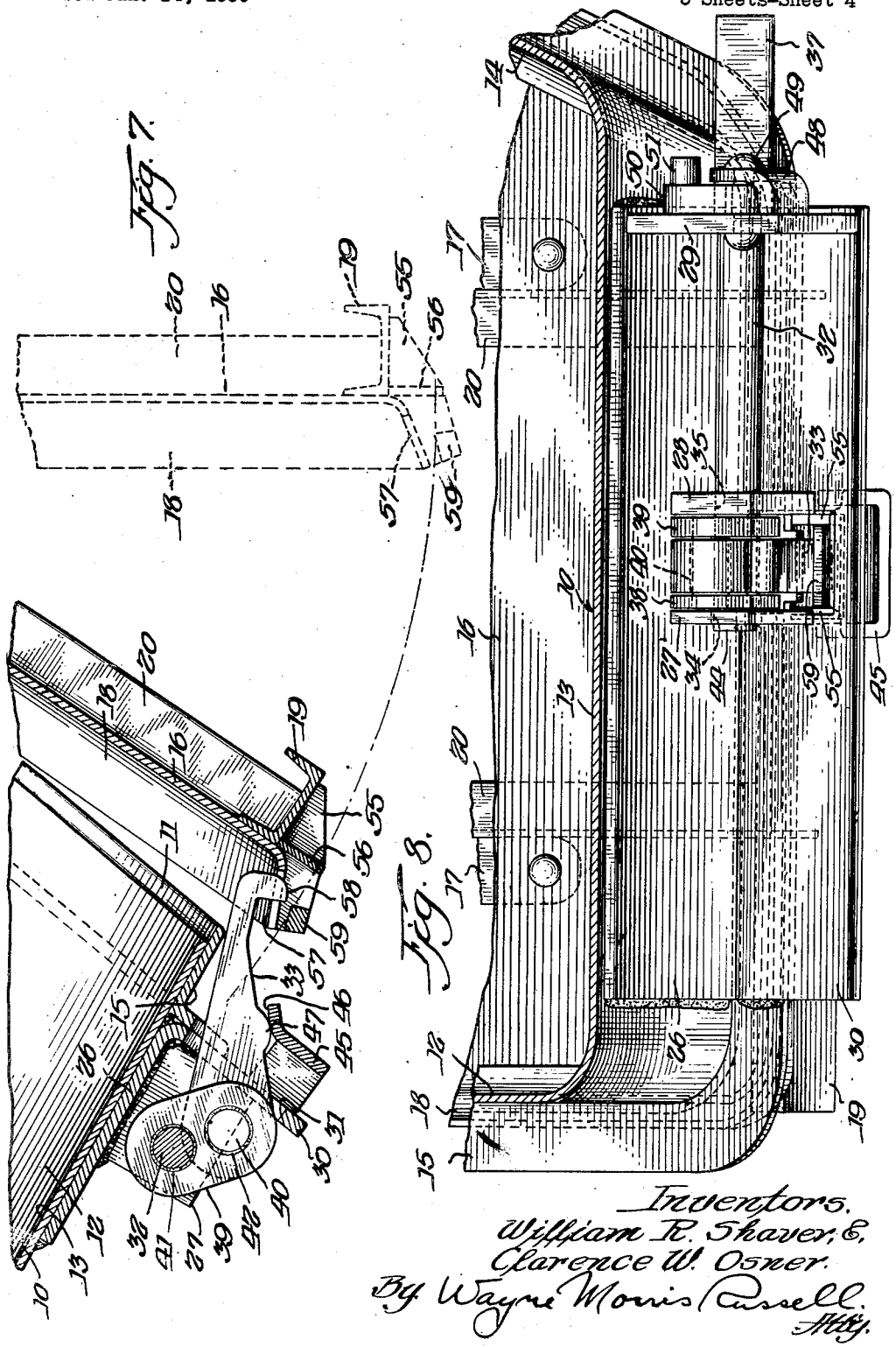


Fig. 7.

Fig. 8.

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HOPPER CAR DOOR LOCK

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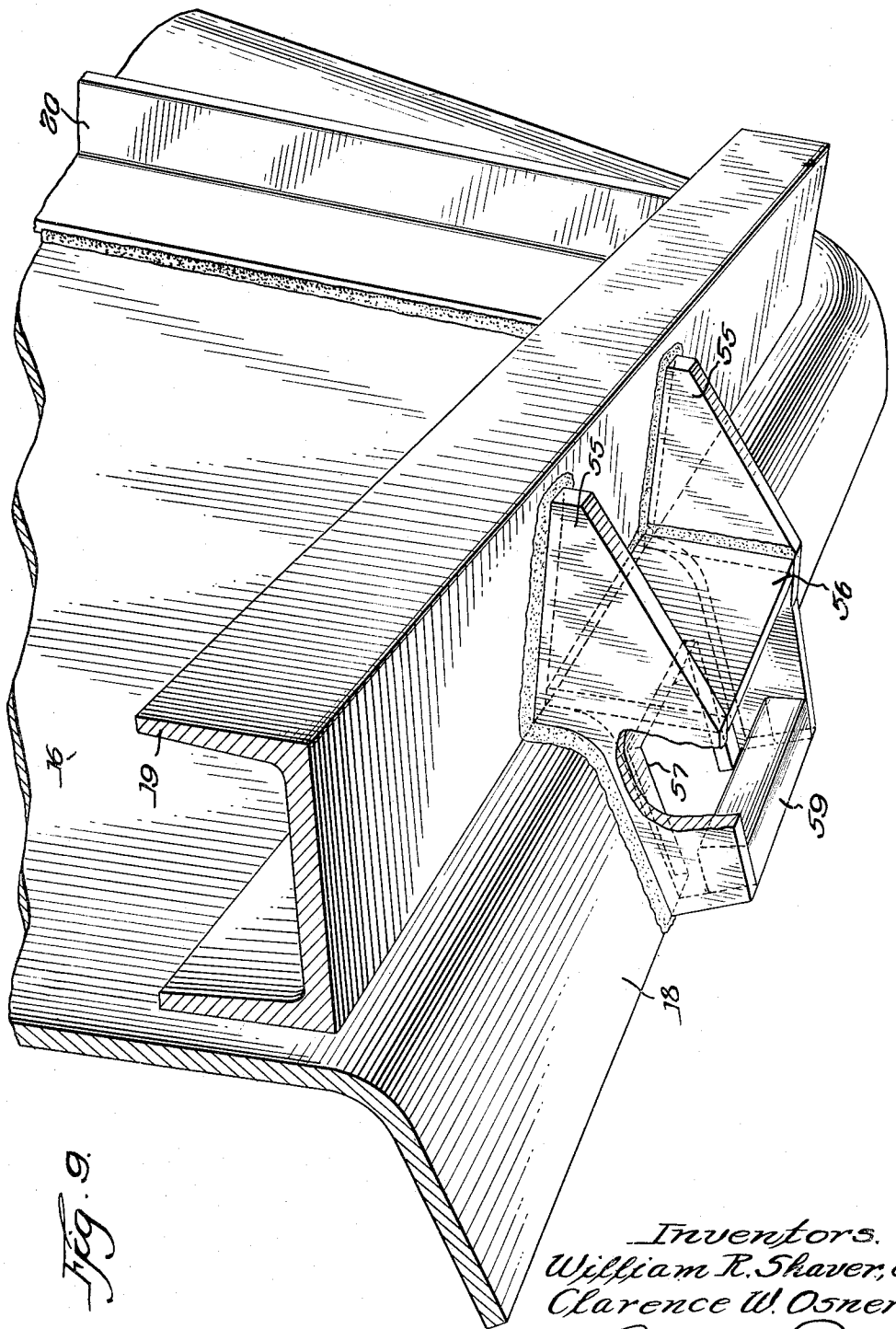


Fig. 9.

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UNITED STATES PATENT OFFICE

2,684,645

HOPPER CAR DOOR LOCK

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Application January 14, 1950, Serial No. 138,532

11 Claims. (Cl. 105—308)

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This invention relates to a door locking arrangement for railway hopper cars and is primarily concerned with the provision of a bottom operating lock adapted to be mounted beneath a hopper for engagement with a door substantially at the center thereof and operable from the side of the car to release or lock the door.

The principal object of the invention resides in the provision of a lock of this type which is easily actuated, of simple but sturdy design and positive in operation both in releasing the door to full open position and in closing the door.

An important object of the invention is realized in the provision of a latching device of this type wherein during the opening operation, after the latch has been initially actuated, it is adapted automatically to release itself fully to permit complete opening of the door without further manipulation.

Another object of the invention is had in the provision of a hopper door lock assembly readily adapted for easy construction as a complete sub-assembly for application to the hopper as a unit and which might be fabricated in the form of a weldment.

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

Figs. 1 and 2 are what might be termed front and rear perspective views of the sub-assembly comprising the door latching mechanism, each having portions broken away more clearly to reveal the eccentric mounting of the latching hook;

Fig. 3 is a fragmentary side elevational view of a railway car hopper having the door locking assembly of this invention mounted therebeneath and showing the door secured in closed position;

Fig. 4 is a similar view, but having portions broken away to show the hopper and latch mounting bracket in section and the latch engaged with the bracket on the door securely to hold the door in closed position;

Fig. 5 is a longitudinal sectional view through the hopper and door illustrating the opening movement of the mechanism and showing the positions of the door and latch just prior to the latch being lifted clear of locking engagement with the door;

Fig. 6 is a bottom plan view of the hopper and door with the locking mechanism engaged to secure the door in fully closed position;

Fig. 7 is a longitudinal sectional view similar to Fig. 5 but illustrating the positions of the door

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and latch just as the latch is raised clear of engagement with the bracket on the door to release the door for swinging movement to full open position to discharge the load;

Fig. 8 is a transverse sectional view through the hopper, taken behind the latch assembly, showing the mounting of the assembly on the underside of the hopper with the door secured in closed position, and

Fig. 9 is a fragmentary perspective view of the lower end of the door particularly showing the keeper assembly.

The hopper door latch of this invention consists of a unitary sub-assembly fabricated in the form of a weldment for application to the hopper complete and ready for operation without need for adjustment or fitting of any kind. In the form herein disclosed, the unit assembly comprises a mounting plate having associated bearing plates supporting an operating shaft rotatably mounted therein and having an eccentric portion or crank with a latch member mounted thereon for drawing the door to fully closed position and securely locking it upon rotation of the crank. The latch member is operatively associated with a cooperating bracket on the door from which it is automatically disengaged during the opening movement by a bracket on the mounting plate which supports the latch while the door is open. In the closed position of the door, the latch member is retained against displacement by a locking cam engageable with the operating shaft. The crank portion of the operating shaft, with the associated latch member, is disposed between spaced bearing plates substantially at the center of the hopper bottom wall, and the locking cam is pivotally mounted on a bearing plate adjacent the side of the hopper supporting the free end of the operating shaft in position to engage the square operating end of the shaft. The latch mechanism is disclosed and described as comprised of weldments, but the arrangement also may be produced in the form of castings if desired.

In the drawings, 10 represents a railway car hopper having a discharge opening 11. The hopper comprises inner side wall 12, a bottom or slope sheet 13 and a sloping outer side wall 14. A hopper door frame 15 of angle section is disposed about the discharge opening with the outwardly directed flange spaced rearwardly from the opening and the other flange forming a seat about the opening for the associated door 16. The door comprises a flanged pan suspended by hinges 17 from the door frame for swinging

movement toward and away from the discharge opening, and the flange 18 on the door is adapted in the closed position to be engaged around the door frame 15 to provide an effective seal. The door is stiffened adjacent the bottom edge by means of a reinforcing channel member 19 which extends substantially across the width of the door and is further reinforced by stiffening angle members 20 extending substantially full height of the door adjacent the hinges.

The door locking mechanism is disposed entirely beneath the hopper bottom slope sheet and does not have any fixed or operating parts extending upwardly on the hopper outer side wall, but is installed as a complete unit entirely on the underside of the hopper. The unit assembly comprises a mounting plate 26 which is adapted to support all of the mechanism parts in bearing plates 27, 28 and 29, secured to the mounting plate by welding to form an integrated portion thereof. The mounting plate 26 is bent to provide an angle section having a depending flange 30, and is disposed flatwise against the underside of the slope sheet 13 with the depending flange seating against the outstanding flange of the door frame 15 and is secured to the bottom surface of the hopper by welding. The bearing plates 27, 28 and 29 are disposed in edgewise relationship to the plate 26 and flange 30 and welded to both to provide spaced depending bearings for the support of the operating mechanism, and acting also as stiffening or reinforcing gussets between the flange and body portion of the mounting plate. The plate 29 is located adjacent one end of the mounting plate, adapted to be disposed at the outer side of the hopper, while the plates 27 and 28 are located approximately at the center of the mounting plate in spaced apart relation at opposite sides of an opening 31 provided in the depending flange 30, for a purpose hereinafter to appear.

The operating parts of the mechanism comprising the shaft assembly 32 and latching member 33, are rotatably mounted in the plates 27, 28 and 29 which are provided with bearing openings 34, 35 and 36 for the purpose (see Fig. 6). The operating shaft is arranged in side by side spaced relation with respect to the axis of pivotal connection of the upper end of the door 16 to the hopper 10. The operating shaft extending through the bearing openings 36 and 35 in plates 29 and 28 is round, but outwardly of end plate 29 is of square section, as at 37, for application of a suitable operating tool commonly used for the purpose. This squared end has been designed of a size to take the standard wrench equipped with a ratchet mechanism or clutch used for operating hopper door locks generally, and ordinarily provided in all places where cars of this type are loaded or unloaded. The shaft is continuous between and extends through the bearing plates 29 and 28, but at the inner side of the latter, between plate 28 and the spaced opposing plate 27, the shaft is provided with a crank or eccentric portion upon which the latch 33 is mounted for actuation. This crank is comprised of a pair of throws, 38 and 39, connected by a bearing 40 in offset relation to the center of the shaft 32 whereby to obtain an eccentric motion of the bearing when the operating shaft is rotated. The shaft 32 extends through the throw 39 flush with the inner surface thereof and is welded around the outer surface as at 41, while the bearing 40 extends through this throw and is welded about the outer surface, as at 42.

The bearing 40 is similarly welded in the throw 38 at 43, as best indicated in Figs. 1 and 6. The throw 38 is rotatably supported in bearing 34 in the plate 27 coaxially with the shaft 32 by means of a trunnion 44 which extends through the throw flush with the inner surface and is secured by welding around the trunnion at the outer surface of the throw. All of the welds securing the shaft 32, bearing 40 and trunnion 44 with respect to the crankthrows 39 and 38 are disposed flush with the outer surface of the respective throws by chamfering the openings in which the welds are made.

The latch member 33 is arranged transversely of the operating shaft and is mounted upon the bearing 40 between the crankthrows 38 and 39 for reciprocating movements through opening 31 in the mounting plate flange 30 upon rotation of the operating shaft, and it will be noted that the latch is designed and mounted to engage the door member in a downward direction so that it operates by gravity to drop into operative latching position automatically. The outstanding flange of the door frame 15 is cut away at the opening 31 to permit passage of the latch member, but it will be noted that the mounting plate 26 secured to the underside of the hopper slope sheet and the door frame serves to reinforce and strengthen these members in the area where the door frame is cut away. To support the latch member when the hopper door 16 is open, a bracket 45 is mounted on the outside of the depending flange 30 of the mounting plate 26 adjacent the lower edge and bridging the opening 31. When the door is open, the latch rests upon this bracket to be positioned for reengagement by the door in the closing operation. The bracket serves the further function of releasing the latch from engagement with the door by lifting the latch clear of the associated catch on the door during opening movement, and for this purpose is provided with an outwardly directed lip 46 which is adapted to be engaged by a bottom projection 47 on the latch member and intermediate the ends of the latch member as the door opens, thus forcing the latch upwardly, out of locking engagement with the door.

The sub-assembly comprising the locking mechanism is completed by a locking cam 50 adapted to engage the square end portion 37 of the operating shaft to lock the mechanism against accidental dislodgment. The locking cam is pivotally mounted on the outer face of the end plate 29 in a bracket 48 which is bent to provide a bottom support for the cam when released, and welded to the face of plate 29. The cam is disposed between the bracket and the end plate and mounted on an axle member 49 extending through the associated parts and riveted over on the inner side of the end plate 29 and the outside of the bracket member, with a collar encircling the axle member between the bracket and end plate. An outstanding lug 51 on the cam affords means for driving the cam home against one of the sides of the squared end 37 of the operating shaft, and for prying it free of such engagement when it is desired to actuate the mechanism to release the hopper door. The complete assembly described is fabricated on the bench and carried to the car as a unit, where it is positioned on the underside of the hopper bottom 13, with the depending flange 30 abutting against the outstanding flange of the door frame 15 and welded to the hopper bottom. The opening 31 is disposed in alignment with the

notched portion of the door frame, with the latch 33 projecting outwardly for engagement with the door 16.

The hopper door is provided with a catch assembly for operative association with the latching member on the hopper, and which also is fabricated in the form of a weldment. This catch assembly is constructed in the form of a staple secured to the lower portion of the door, and is comprised of a pair of plates 55 spaced apart and shaped to fit the flange of the door and the web of the stiffening member 19 in edgewise relation and secured thereto by welding. A reinforcing web plate 56 extends between the side plates 55 intermediate their length and is welded thereto and to the member 19, as best shown in Fig. 6. The flange 18 on the door is cut away between the plates 55, as at 57, to provide for passage of the latch member 33 which is provided with an integral depending hook portion 58 for engagement over a keeper or bar 59 extending between and welded to the plates 55 to complete the staple structure. The bar 59 is disposed closely adjacent to the edge of the door flange 18 for locking engagement by the hook 58, and when thus engaged, the door is securely held against opening movement.

With the locking mechanism assembly mounted in position on the underside of the hopper and the catch assembly secured to the door, the arrangement may be operated as follows: Assuming the car to be loaded and the door 16 fully closed, with the mechanism locked, as shown in Figs. 3 and 4, and it is desired to discharge the load, the first step necessary is to release the locking cam 50 from engagement with the squared end 37 of the operating shaft. This may be accomplished by means of the lug 51, either by prying the cam loose with a suitable lever, utilizing the lug to obtain a purchase, or by striking the lug with a hammer. With the locking cam disengaged from the operating shaft and disposed in an inoperative position where it rests upon the bottom support portion of the mounting bracket 48, as best indicated in Figs. 1 and 2, the next step is to rotate the operating shaft contra-clockwise to actuate the crank portion 40 and thus move the latch member 33 outwardly, through the opening 31. This is accomplished by use of a suitable tool on the squared end 37 of the shaft, and as shown in Figs. 6 and 8, this operating end of the shaft is extended outwardly of the sloping hopper side wall 14 for this purpose, whereby a tool may readily be applied and used to actuate the mechanism without interference. From the fully closed position of the mechanism, illustrated in Fig. 4, the operating shaft rotates through a maximum of less than a hundred and eighty degrees (180°) to release the door, and as shown in Fig. 5, the hook portion 58 on the latch member 33 remains fully engaged with the staple 59 on the door until the bottom projection 47 on the latch strikes the lip 46 on bracket 45, when the latch member is lifted clear of the staple, as shown in Fig. 7, and the door swings entirely free to discharge the load. Thus, when the operating shaft is actuated, the door is fully released automatically without the necessity for actuating the mechanism a second time to effect a complete release. When the load has been completely discharged and it is desired to close the door, the mechanism may be disposed as shown in Fig. 5, with the latch member 33 disposed at an intermediate position for engagement by the door when it is swung to this position and then drawn to fully closed position by operation of the mechanism. In this position, the latch 33 is supported upon the bracket 45 prior to engagement by the door, with the bottom projection 47 disposed inwardly of the lip 46, and the door is then swung to a position where the staple 59 is operatively engaged by the latch hook 58 which normally falls by gravity into this engagement, after which the operating shaft may be rotated clockwise to actuate the mechanism and door to fully closed position and the cam 50 engaged with the squared end 37 to effect a locked relationship, secure against any but an intentional disengagement. In this fully closed position, as best shown in Fig. 4, the crank 40 is disposed beyond dead center with respect to a line drawn through the center of the crank and any point of engagement of the hook 58 with the staple 59, which it will be seen passes beyond the center of the operating shaft in the direction of closing movement, so that the normal tendency of the forces acting on the mechanism is to cause it to be drawn more securely into locking relationship. In this position, the latch member 33 is disposed adjacent the underside of mounting plate 26 and in actual contact with the top side of opening 31 in the flange 30, so that disengagement of the hook 58 from staple 59 is impossible without rotation of the operating shaft, and which can only be effected in the position of the parts illustrated in Fig. 7 since the releasing movement of the latch must be in an upward direction. The invention affords an effective lock for the doors of railway hopper cars, which is disposed entirely below the hopper and is simple of design and positive in operation. It provides a unitary sub-assembly which might be fabricated as a weldment if desired and installed on the car complete, ready for operation. The device releases automatically after initial actuation, and moves by gravity to operative position in the initial closing movement of the door without the use of counterbalancing devices.

What is claimed is:

1. A lock for railway hopper car doors comprising a weldment including a mounting plate bent to form a depending flange, an opening in said depending flange, a pair of depending bearing plates at respective sides of said opening secured edgewise to said mounting plate and flange, an end bearing plate secured edgewise to the mounting plate and flange, an operating shaft rotatively supported in all of said bearing plates having a crank portion disposed between said first-named pair of bearing plates, a latch member pivotally mounted on said crank portion reciprocable through said opening on rotation of the operating shaft, a supporting bracket for the latch member bridging said opening and secured to the mounting plate, a projection on the bottom surface of said latch member adapted to ride over said bracket upon rotation of the shaft to lift the latch member, said operating shaft extending outwardly of said end bearing plate having a squared portion, and a locking cam on the end bearing plate engageable with said squared portion.

2. A lock for railway hopper car doors comprising a weldment including a mounting plate bent to form a depending flange, an opening in said depending flange, a pair of depending bearing plates at respective sides of said opening secured edgewise to said mounting plate and flange, an end bearing plate secured edgewise to said mounting plate and flange, an operating

shaft rotatively supported in all of said bearing plates having a crank portion disposed between said first-named pair of bearing plates, a latch member pivotally mounted on said crank portion reciprocable through said opening on rotation of the operating shaft, a supporting bracket for the latch member bridging said opening and secured to the mounting plate, and a projection on the bottom surface of the latch member adapted to ride over said bracket upon rotation of the shaft to lift the latch member.

3. A lock for a railway car including a hopper having a door hinged to swing from a position closing the hopper to an open position discharging the contents of the car, said lock comprising an operating shaft mounted beneath said hopper and having a crank portion, a latch member pivotally mounted on said crank portion and having a hook at its free end, a staple member on the door adapted to cooperate with said hook, said hook normally dropping into engagement with the staple member by gravity in an intermediate position of the door, supporting means depending from the hopper and engageable under said latch member, and a projection on the latch member adapted to ride over said supporting means upon rotation of the shaft to raise said hook out of engagement with the staple member to release the door.

4. A lock for a railway car including a hopper having a door hinged to swing from a position closing the hopper to an open position discharging the contents of the car, said lock comprising an operating shaft mounted beneath the hopper and having a crank portion, a latch member pivotally mounted on said crank portion and having a hook at its free end, a staple member on the door adapted to cooperate with said hook, said hook normally dropping into engagement with the staple member by gravity in an intermediate position of the door and adapted to draw the door fully closed by actuation of the crank portion to a position beyond dead center upon rotation of the operating shaft, and means to release said door in a single actuation of the operating shaft including lifting means depending from the hopper and a projection on the latch member and the projection being adapted to ride over the lifting means upon rotation of the shaft to disengage said hook from the staple member.

5. A lock for a railway car including a hopper having a door hinged to swing from a position closing the hopper to an open position discharging the contents of the car, said lock comprising a mounting member secured beneath the hopper, an operating shaft rotatively supported in the mounting member and having a crank portion, a latch member pivotally mounted on said crank portion and having a hook at its free end, a staple member on the door adapted to cooperate with said hook, said hook normally dropping into engagement with the staple by gravity in an intermediate position of the door and adapted to draw the door fully closed by actuation of the crank portion to a position beyond dead center upon rotation of the operating shaft, said latch member in closed position bearing on its top side against a portion of the mounting member positively to prevent disengagement of the hook from said staple member, and means to release said door in a single actuation of the operating shaft including means on the mounting member and a projection on the bottom surface of the latch member and the projection being adapted to ride over the means on the mounting member upon rotation of the shaft to lift said hook from the staple member.

6. A lock for a railway car hopper having an opening in one side wall thereof and having a door positioned over said opening and having its upper end pivotally connected to said hopper, said lock comprising a mounting member secured to the bottom of said hopper, a shaft arranged in side by side spaced relation with respect to the axis of pivotal connection of said door to said hopper and rotatably supported in said mounting member and said shaft having an eccentric portion thereon, a latch member arranged transversely of said shaft and pivotally mounted on said eccentric portion, a keeper positioned on the lower end of said door and secured to said door and adapted to be engaged with said latch member, and a projection extending from said latch member, rotation of said shaft in one direction causing said projection to engage said mounting member resulting in the disengagement of said latch member from said keeper when said latch member is in engagement with said keeper resulting in the releasing of said door and rotation of said shaft in the opposite direction after said latch member has been engaged with said keeper resulting in the closing of said door.

7. A lock for a railway car hopper having an opening in one side wall thereof and having a door positioned over said opening and having its upper end pivotally connected to said hopper, said lock comprising a mounting member secured to the bottom of said hopper, a shaft arranged in side by side spaced relation with respect to the axis of pivotal connection of said door to said hopper and rotatably supported in said mounting member and said shaft having an eccentric portion thereon, a latch member arranged transversely of said shaft and having one end pivotally mounted on said eccentric portion and said latch member being provided with a hook on its other end, a keeper positioned on the lower end of said door and secured to said door and adapted to be engaged by said hook, and a projection extending from said latch member, rotation of said shaft in one direction causing said projection to engage said mounting member resulting in the disengagement of said hook from said keeper when said hook is in engagement with said keeper resulting in the releasing of said door and rotation of said shaft in the opposite direction after said hook has been engaged on said keeper resulting in the closing of said door.

8. A lock for a railway car hopper having an opening in one side wall thereof and having a door positioned over said opening and having its upper end pivotally connected to said hopper, said lock comprising a mounting member secured to the bottom of said hopper, a shaft arranged in side by side spaced relation with respect to the axis of pivotal connection of said door to said hopper and rotatably supported in said mounting member and said shaft having an eccentric portion thereon, a latch member arranged transversely of said shaft and having one end pivotally mounted on said eccentric portion and said latch member being provided with a hook on its other end, a keeper positioned on the lower end of said door and secured to said door and adapted to be engaged by said hook, a lip extending from said mounting member, and a projection extending from said latch member intermediate the ends of said latch member, rotation of said shaft

in one direction causing said projection to engage said lip resulting in the disengagement of said hook from said keeper when said hook is in engagement with said keeper resulting in the releasing of said door and rotation of said shaft in the opposite direction after said hook has been engaged on said keeper resulting in the closing of said door.

9. A lock for a railway car hopper having an opening in one side wall thereof and having a door positioned over said opening and having its upper end pivotally connected to said hopper, said lock comprising a mounting member secured to the bottom of said hopper, a shaft rotatably supported in the mounting member and having an eccentric portion thereon, a latch member pivotally mounted on said eccentric portion, a keeper positioned on the lower end of said door and secured thereto and adapted to be engaged with said latch member, and a projection extending from the latch member, rotation of said shaft causing said projection to engage the mounting member to disengage said latch member from said keeper when the latch member is in engagement with the keeper thereby to release said door.

10. A lock for a railway car hopper having an opening in one side wall thereof and having a door positioned over said opening and having its upper end pivotally connected to the hopper, said lock comprising a keeper positioned on the lower end of the door and secured to the door, a mounting plate secured to the bottom of the hopper and having a pair of spaced apart depending bearing plates disposed inwardly of an end thereof, an end bearing plate depending from said end of the mounting plate, an operating shaft rotatively supported in all of said bearing plates having a crank portion disposed between said first named pair of bearing plates, a latch member pivotally mounted on said crank portion and having a hook portion and adapted to be moved under the bottom of the hopper where the hook portion is in engagement with the keeper to hold the door in closed position upon rotation of the shaft in one direction and adapted to be moved from under the bottom of the hopper where the hook portion is disengaged from the keeper to release the door upon rotation of the shaft in the opposite direction, and means on the mounting plate supporting the latch member in an intermediate position when released from engagement with the keeper so that the latch member will engage the keeper by gravity when the door is moved toward the hopper at the beginning of the closing movement of the door.

11. In a railway car having a bottom discharge hopper including a door frame reinforcing the hopper opening and a door positioned over the opening and having its upper end pivotally connected to the hopper and said door frame having a cut away portion for passage of a door latching member, a door lock assembly comprising a keeper positioned on the lower end of the door and secured to the door, a mounting plate secured to the underside of said hopper adapted to reinforce the hopper and said door frame and having a pair of spaced apart depending bearing plates disposed inwardly of an end thereof, an end bearing plate depending from said end of the mounting plate, an operating shaft rotatably supported in all of said bearing plates having a crank portion disposed between said first named pair of bearing plates, a latching member pivotally mounted on said crank portion and having a hook portion and adapted to be reciprocated through said cut away portion of the door frame to a location under the bottom of the hopper where the hook portion is in engagement with the keeper to hold the door in closed position and to a location from under the bottom of the hopper where the hook portion is disengaged from the keeper to release the door upon rotation of the operating shaft, and means on the mounting plate supporting the latch member in an intermediate position when released from engagement with the keeper so that the latch member will engage the keeper by gravity when the door is moved toward the hopper at the beginning of the closing movement of the door.

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