Feb. 18, 1964 J. T. SMITH 3,121,405

HOPPER CAR DOOR LOCK

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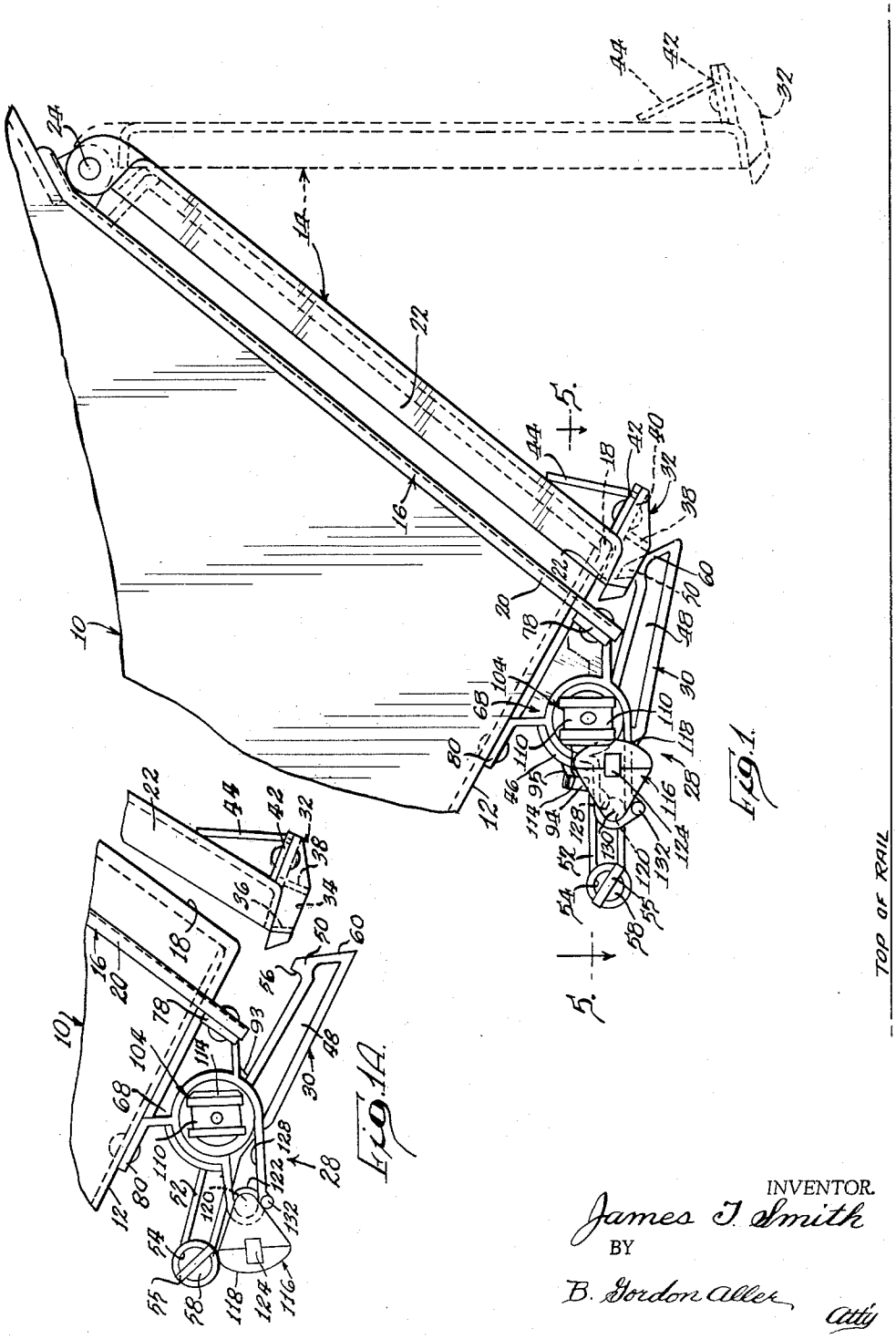


Fig. 1.

Fig. 1A.

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Fig. 2.

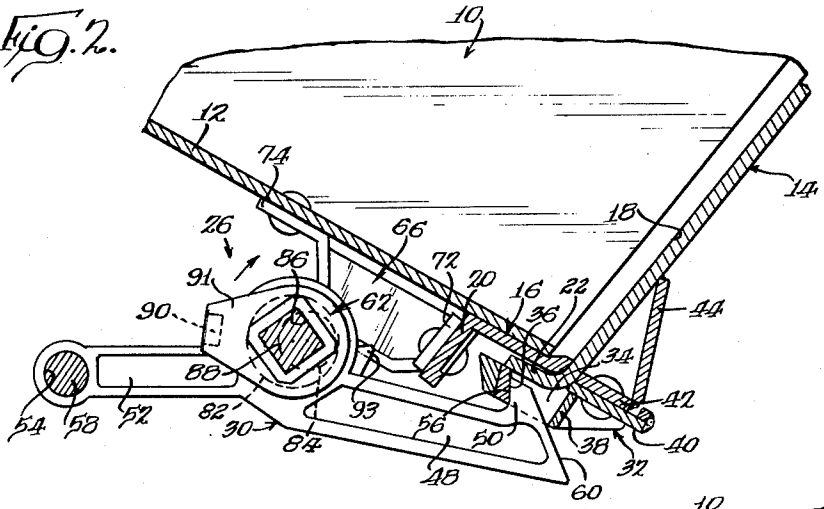


Fig. 3.

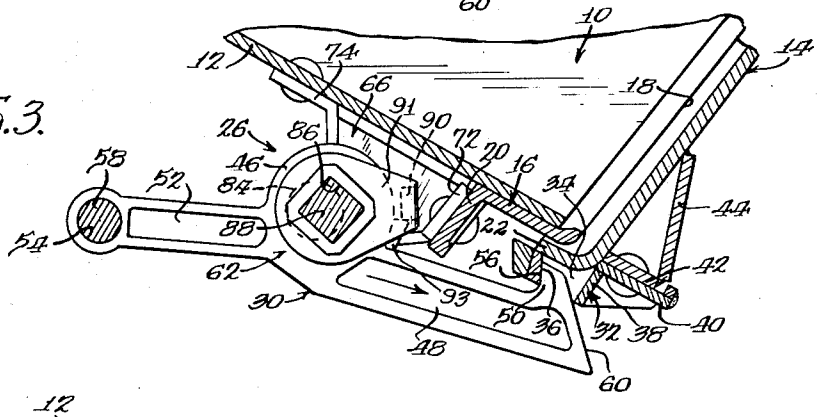
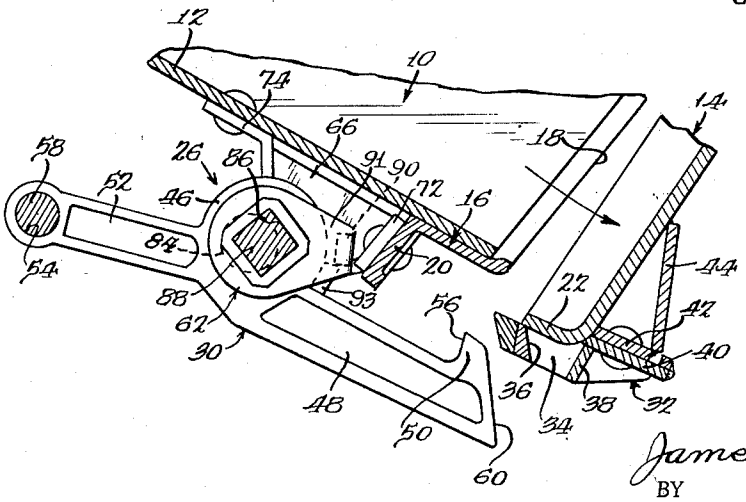


Fig. 4.



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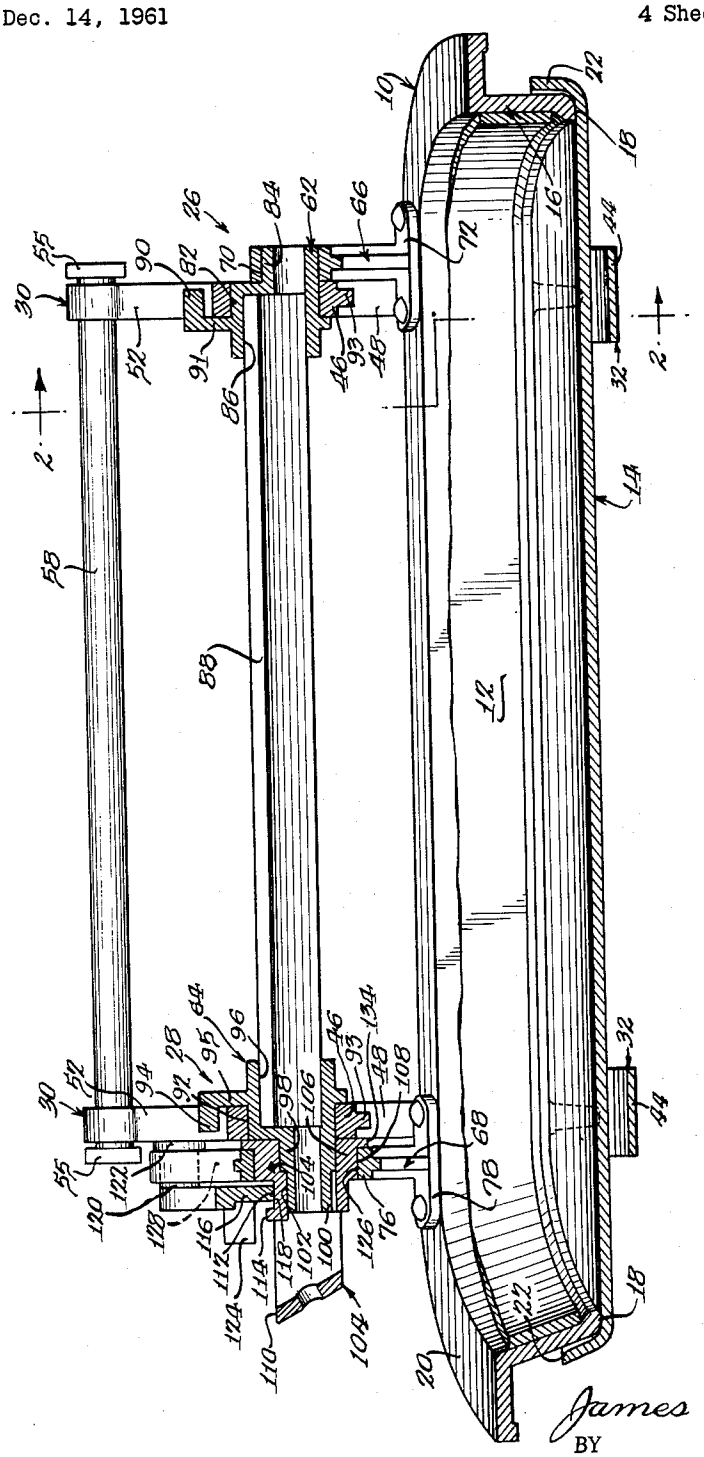


FIG. 5.

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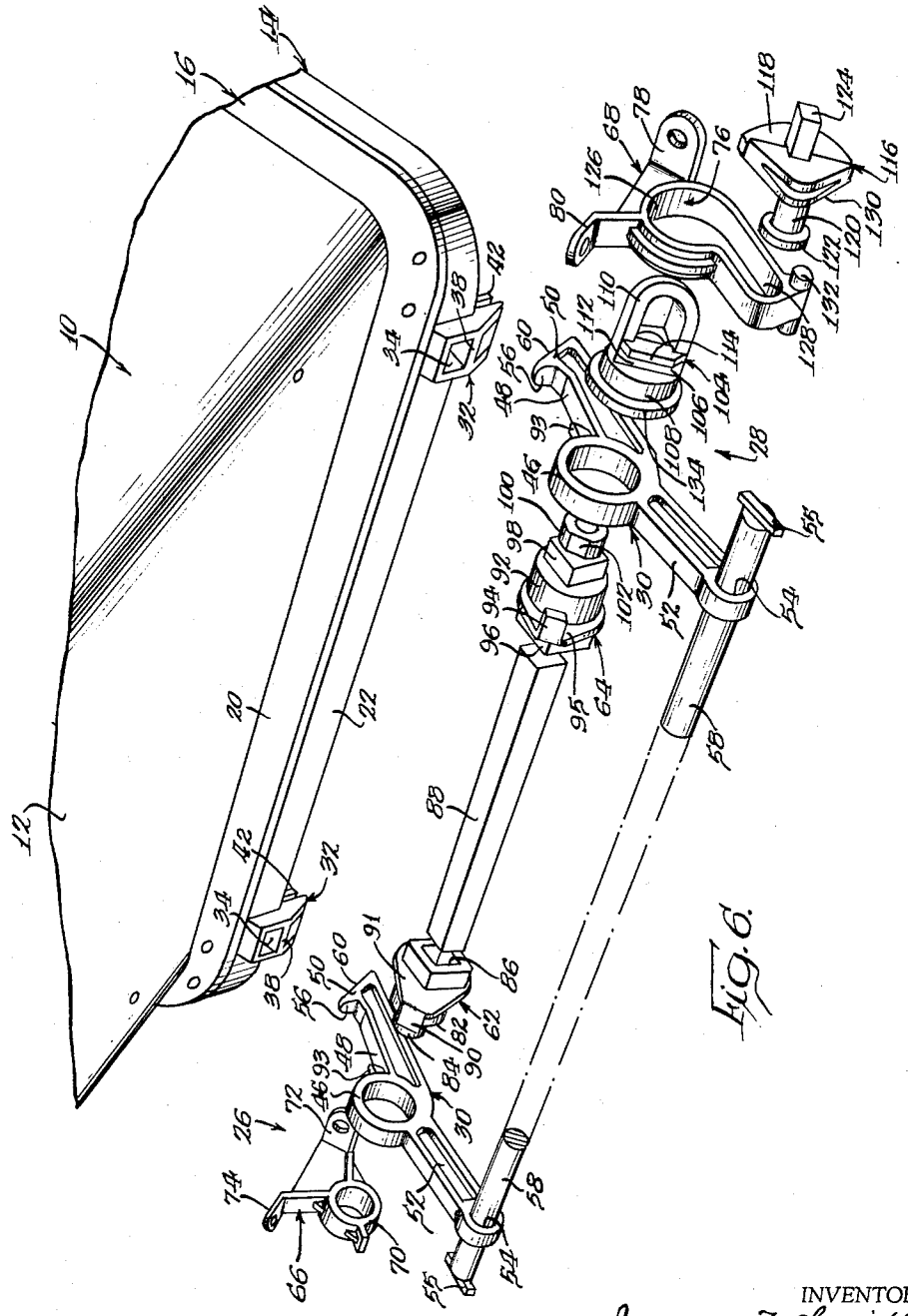


Fig. 6.

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3,121,405

HOPPER CAR DOOR LOCK

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Filed Dec. 14, 1961, Ser. No. 159,393
6 Claims. (Cl. 105—253)

The present invention relates to improvements in hopper or dump car door locks.

The hopper car door lock of this invention represents an improvement from the standpoint of safety, tighter locking action and less costly manufacture over the conventional locks, of which that disclosed in J. R. Sheesley Patent No. 2,482,516 is typical.

In the conventional lock a single latch and keeper structure is located at the center of the hopper and door. Under conditions of wear and heavy usage the door may become somewhat warped and develop leaks at the corners of the hopper chute. With the double locking action of the lock of this invention, this cannot occur.

The single lock of the prior art frequently did not provide adequate rail clearance, particularly when the door was released to open position; the door thus did not fully open and the rate of discharge from the car was slowed. The double lock of this invention straddles the rail, and there can be no interference between the top of the rail and any part of the lock structure.

It is also obvious that the prior door locks all required a very substantial number of right and left hand castings in view of the fact that the number of hoppers employed in each of the hopper cars is ordinarily divisible by four. There are, therefore, left and right hand elements in the various hopper locks. Such right and left hand parts are completely eliminated in the door lock of this invention, and duplicate or similar elements are universal in installation. This means that this new and improved hopper door lock is far less costly to manufacture than that of the prior art.

The double door lock of this invention is of greatly simplified construction, and its components are easily assembled without the use of bolts or similar connectors, except for the rivets securing the lock to the hopper.

The foregoing are some of the objects and advantages of the present invention. Others will become apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a fragmentary side elevational view of a hopper chute illustrating the door lock in locked position and indicating the relationship of the door and the lock to the top of the rail;

FIG. 1A is an elevational view similar to FIG. 1, showing the door lock elements in the position they assume when the door is unlocked;

FIG. 2 is a fragmentary sectional view through the lower portion of the hopper chute and lock structure taken substantially along the irregular line 2—2 of FIG. 5 looking in the direction on the arrows, and illustrating the lock in locked position;

FIG. 3 is a view on the plane of FIG. 2, showing the lock in unlocked position;

FIG. 4 is a view on the plane of FIGS. 2 and 3 showing the lock in released position;

FIG. 5 is a horizontal sectional view taken substantially along the irregular line 5—5 of FIG. 1, looking in the direction of the arrows; and

FIG. 6 is an exploded perspective view illustrating the elements of the lock of the present invention.

Referring particularly to FIGS. 1, 5 and 6 of the drawings, there is shown a hopper 10 having a slope sheet 12 and a swingable door 14. The opening from the hopper 10 is framed by a reinforcing and sealing angle 16 having a lip 18 and an outwardly projecting flange 20. The door

is flanged at 22 to overlap the sealing angle 16 to provide as nearly as possible a leakproof closing seal (FIG. 2). At its upper edge the door 14 is freely pivoted on conventional hinge structures 24 to the body of the hopper 10. The door may be provided with suitable stiffeners and the like with which the present invention is not concerned.

The door 14 is secured in closed and locked position by a pair of locks, an inner lock 26 and an outer lock 28, which are interconnected for simultaneous movement from locked to unlocked and to released positions, and vice versa. Each of the locks 26 and 28 includes a movable latch or bolt member 30 and a latch lug or keeper 32. The latch or bolt member 30 is pivotally and eccentrically mounted on the hopper 10 proper, while the latch lugs 32 are fixedly mounted on the door 14.

Each of the keepers or latch lugs 32 comprises a steel casting, generally rectangular in shape, and formed at its underside with a recess 34 to receive the latch 30, the recess having an undercut surface 36 adapted to be engaged by the latch in locked position, as shown most clearly in FIG. 2. Opposite the surface 36, the recess is bounded by a wall 38, the function of which will become apparent hereinafter. The latch lug 32 is riveted through a top portion 40 thereof to a flange 42 welded and secured by a brace 44 to the outer surface of the door 14 adjacent the lower edge. It will be noted from FIGS. 1 through 4 that the latch lug is also shaped to be supported against the flange 22 of the door 14.

Each of the locks, as previously stated, includes a latch 30 comprising a bearing 46, a forwardly extending or first arm 48, terminating in an upwardly directed hook 50 and a rearwardly extending or second arm 52 terminating in an ear having an aperture 54. Each of the hooks 50 is so arranged that when the latch is in locked position, as shown in FIG. 2, the hook surface 56 engages the undercut surface 36 of the keeper or latch lug 32.

The two latches 30 are interconnected by a bar 58 extending therebetween and through the apertures 54; and the bar is restrained against accidental dislodgment by suitable keepers 55 at its opposite ends.

The latches 30 are eccentrically mounted and when moved between the locked and unlocked position, a camming surface 60 on the hooked end 50 cooperates with the lower edge of the wall 38 to cam the arm 48 downwardly and out of locking position as well as insuring that the door 14 swings clear of the latches. The reverse action takes place on the locking movement of the latches. The inner of the latches 30 is mounted on an eccentric 62 while the outer is mounted on an eccentric 64.

The inner eccentric 62 is journaled in a bearing bracket 66, and the outer eccentric is journaled in a bearing bracket 68. The inner bearing bracket comprises a cylindrical bearing element 70 connected by appropriate webs to a pair of flanges 72 and 74. The flange 72 is riveted to the flange 20 forming a part of the sealing angle 16 secured to the hopper 10, and the flange 74 is riveted to the slope sheet 12. The outer bearing bracket 68 is formed with a substantially scroll shaped bearing structure 76 connected by suitable webs to a pair of flanges 78 and 80, the flange 78 being riveted to the flange 20, and the flange 80 being riveted to the slope sheet 12.

The inner eccentric 62 has a first cylindrical bearing 82 adapted to be rotatable in the latch bearing 46 and an eccentrically positioned bearing 84 adapted to be rotatable in the bearing element 70 of the bracket 66, thereby mounting the latch for eccentric movement rotatably and inwardly and outwardly with respect to the latch lug 32. The eccentric positioning of these two bearings 82, 84 in their most extreme position is most clearly illustrated in FIG. 5. The bearings 82 and 84 are adjacent one another and opposite them is a square socket 86 arranged to receive one end of a torque bar 88. The

inner eccentric 62 is also provided with a stop lug 90 on an integral arm 91 and arranged to engage the arm 52 and to move the inner latch 30 into locking position with the latch lug or keeper 32. This position of the stop lug 90 is best shown in FIG. 2. The lug 90 is also adapted to engage an abutment 93 on the latch 30 (FIGS. 3 and 4) to move the latch in the clockwise direction to unlocked and released positions.

The outer eccentric 64 is formed with a bearing surface 92 adapted to be rotatable within the bearing 46 of the latch 30. It has an eccentrically positioned stop lug 94 performing the same function as the stop lug 90 and integral with arm 95 in the same relative position as the lug 90, as is seen most clearly from FIGS. 1, 5 and 6, so that it engages the arm 52 of the outer latch 30 to move it into locked position and so that it engages the abutment 93 to move the latch to unlocked and released positions. The eccentric 64 is also provided with a square socket 96 on the axis of the bearing 92 to receive the opposite end of the torque bar 88. Thus, when one or the other of the eccentrics 62 and 64 is rotated, the rotation is transmitted through the torque bar 88 to the opposite eccentric.

Adjacent the bearing surface 92 the eccentric is provided with a smaller, substantially square portion 98 having one of the corners cut off and an eccentrically positioned circular portion 100 having a flatted surface 102 arranged to be received in the base of a bar socket and operator 104. The bar socket and operator 104 has a complementally formed recess in the body 106 thereof and is provided with a bearing surface 108 arranged to be received in the outer bearing element 76. Thus, when the elements are assembled, the inner eccentric 62 supports the inner latch 30 on the bearing bracket 66, and the outer eccentric 64 and bar socket and operator 104 support the outer latch 30 on the bracket 68.

The bar socket 104 is formed with a hook 110 which projects outwardly and beyond a locking cam surface 112 bounded on its outer edge by a flange 114.

The locking cam surface 112 is adapted to cooperate with a plate-like, segment-shaped locking lever 116 which has a cylindrical camming surface 118 thereon. A bearing stud 120 integral with the lever 116 and having a retaining flange 122 formed thereon projects inwardly toward the latch 30 from a position opposite the surface 118. A rectangular operating lug 124 projects directly outwardly from the outer surface of the locking lever 116 in a position intermediate the stud 120 and the surface 118 and to be conveniently engaged by a trainman's tool.

As noted previously, the bearing surface 108 of the bar socket and operator 104 is adapted to rotate in a scroll shaped bearing 76 having a principal cylindrical bearing portion 126 and a tangential slot like portion 128, the bearing 108 being rotatable within the principal portion 126. When the parts are assembled, the bearing stud 120 is rockably and slidably positioned within the tangential slot 128, and the cylindrical bearing surface 108 is positioned within the larger cylindrical bearing 126. The camming surface 118 is located with respect to the bar socket 104 so that it is adapted slidably to engage the locking cam surface 112 when the locking lever is in the position shown in FIG. 1. In this position it will be observed that the eccentric extension 130 on the locking lever rests against a stop stud 132 secured to the underside of the outer bearing bracket 68.

The assembly of the double lock of this invention is very simple and with the exception of the bar 58 connecting the outer arms of the latches 30, the elements are held by and between the brackets 66 and 68. The inner bracket supports the inner eccentric on the bearing 84 and the inner latch 30 is held on that side of the bracket 66 toward the center of the hopper 10. The outer eccentric 64 is supported by the bar socket and operator 104 which has its bearing 108 journaled in the outer bracket 68 with the hook 110 extending outwardly therefrom. The bar socket and operator 104 is prevented from sliding outwardly through the bearing bracket by a flange 134 adjacent the bearing surface 108. The outer latch 30 is supported by the eccentric bearing surface 92 on that side of the bracket 68 toward the center of the hopper 10. The square torque bar 88 fits solidly into the sockets 86 and 96 in the eccentrics 62 and 64, respectively, and transmits movement between the eccentrics as well as preventing their axial movement toward each other.

In assembling the components on the outer bracket 68, the stud 120 of the locking lever 116 is inserted into the tangential slot 128 before the bar socket and operator 104 is slid axially into the bearing portion 76. The latter plus the stud flange 122 prevent withdrawal of the stud 120 and removal of the lever 116 from the assembly.

The eccentrics 62 and 64, the latches 30, the bar socket and operator 104, the locking lever 116, and the torque bar 88 are assembled with the inner and outer bearing brackets 66 and 68 before the latter are riveted to the hopper 10. When the brackets are riveted in place, the torque bar 88 holds the inner eccentric 62 in the bracket 66 and holds the subassembly of the outer eccentric 64 and the bar socket and operator 104 in the bracket 68. The assembly of the lock components is simple, and a minimum number of operations is required to complete the assembly and secure it to the hopper. It should also be noted that with the exception of the rivets securing the brackets to the hopper, no bolts or like securing elements are needed.

The bar 58 may be fitted through the apertures 54 in the latch arms 52 either before or after the previously described assembly has been made. However, at least one of the retainers must be welded in place after the bar 58 has been assembled with the latches. It is of course possible to complete the subassembly of the torque bar 88, the inner and outer eccentrics 62 and 64, the two latches 30, and the connecting rod 58 prior to the assembly of this unit with the bar socket and operator 104, the locking lever 116 and the bearing brackets 66 and 68.

When the door is in locked position, it will be observed that the bearing stud 120 is at the outer end of the tangential bearing slot 128, that the camming surface 118 slidably bears against the flat camming surface 112 of the bar socket 104, that the eccentrics 62 and 64 have been rotated to the maximum extent in the counterclockwise direction, as seen in FIGS. 1 and 2, that the hook end of the latch 30 is securely in engagement with the undercut portion 36 of the latch lug 32, and that the door 14 is held tightly against the lip 18 on the sealing flange 16. However, when it is desired to open the door, the locking lever 116 is rotated in the counterclockwise direction (FIG. 1) by applying an appropriate tool to the rectangular lug 124 which moves the camming surface 118 from the locking cam surface 112 on the bar socket 104. The operator then inserts a tool into the hook 110 on the bar socket and operator 104 and rotates the latter in the clockwise direction. This will rotate the eccentrics 64 and 62 in the clockwise direction transmitting the torque through the torque bar 88 and moving the stop lugs 90 and 94 away from the rearwardly extending arms 54 of the latches 30 and engages these lugs with the abutments 93. The latches are then released to the position shown in FIG. 3. The opening of the door may then be accomplished by further clockwise rotation of the lug carrying eccentrics to free the hook surfaces 56 from the undercut surfaces 36 and permitting the door 14 to swing outwardly under its own weight and that of the load to be discharged from the hopper car.

When the hopper car has been emptied, the door may be swung readily to the closed position, the latches 30 rotated in the counterclockwise direction as seen in the drawings so that the hook surfaces 56 engage the undercut surfaces 36 of the latch lugs 32. The bar socket and operator 104 is then rotated in the counterclockwise direc-

tion as far as it will go, and when the stop lugs 90 and 94 have come against the arms 52 and securely position the latches in locked position (FIG. 2), the locking lever 116 is rotated in the clockwise direction against the stop 132 so that the hopper door is again locked to retain the load in the hopper car.

It will be appreciated from the foregoing description that the objectives which were claimed for this invention at the outset of this specification have been fully attained by the structure disclosed.

While a preferred embodiment of the hopper car door lock of this invention has been shown and described, it will be apparent that numerous modifications and variations thereof may be made without departing from the underlying principles of the invention. It is therefore desired, by the following claims, to include within the scope of the invention all such variations and modifications by which substantially the results of this invention may be obtained through the use of substantially the same or equivalent means.

What is claimed as new and desired to be secured by United States Letters Patent is:

1. In a hopper structure for a railway hopper car, the structure having an outlet opening and a door pivoted at its upper edge to the structure and positioned to close the opening; the combination therewith of a door locking mechanism comprising, a bearing bracket secured to the hopper structure, said bracket being formed with an opening therein having a generally cylindrical portion and an elongated slot portion tangential thereto, a bar socket and operator having a bearing portion journaled in said cylindrical portion of said bracket and having a locking surface adjacent said bearing portion, a locking lever having a stud rotatable and slidable in said elongated bearing slot portion and having a camming surface engageable with said locking surface, means for manually rotating said locking lever so that its camming surface is disengaged from said locking surface to permit manual manipulation of said bar socket and operator, an eccentric nonrotatably connected to said bar socket and operator for rotation therewith and having a bearing surface radially offset from its axis of rotation, a latch journaled on said offset bearing surface, said latch having first and second arms extending away from said bearing surface, said first latch arm being shaped to engage the distal edge of the door to hold it in partly and fully closed positions and to release it to fully open position, said second arm mounting a counter weight, and said eccentric having a lever arm rotatable therewith, spaced laterally of said latch and projecting over said latch and engageable with the surfaces of said first and second arms upon rotation of said eccentric so as to rotate said latch about said offset bearing surface, whereby manipulation of said bar socket and operator in unlocked condition will effect actuation of said latch.

2. In a hopper structure for a railway hopper car, the structure having an outlet opening and a door pivoted at its upper edge to the structure and positioned to close the opening; the combination therewith of a door locking mechanism comprising, a bearing bracket secured to the hopper structure, said bracket being formed with an opening therein having a generally cylindrical portion and an elongated slot portion tangential thereto, a bar socket and operator having a bearing portion journaled in said cylindrical portion of said bracket and having a locking surface adjacent said bearing portion, a locking lever having a stud rotatable and slidable in said elongated bearing slot portion and having a camming surface engageable with said locking surface, means for manually rotating said locking lever so that its camming surface is disengaged from said locking surface to permit manual manipulation of said bar socket and operator, said bar socket and operator having a noncircular socket therein, an eccentric having a projecting portion shaped complementally to said socket fitted thereinto for rotation of said eccentric with said bar socket and operator, said eccentric having a bearing surface radially offset from its axis of rotation, a latch journaled on said offset bearing surface, said latch having first and second arms extending away from said bearing surface, said first latch arm being shaped to engage the distal edge of the door to hold it in partly and fully closed positions and to release it to fully open position, said second arm mounting a counterweight, and said eccentric having a lever arm rotatable therewith, spaced laterally of said latch and projecting over said latch and engageable with the surfaces of said first and second arms upon rotation of said eccentric so as to rotate said latch about said offset bearing surface, whereby manipulation of said bar socket and operator in unlocked condition will effect actuation of said latch.

3. In a hopper structure for a railway hopper car, the structure having an outlet opening and a door pivoted at its upper edge to the structure and positioned to close the opening; the combination therewith of a door locking mechanism comprising, a bearing bracket secured to the hopper structure, said bracket being formed with an opening therein having a generally cylindrical portion and an elongated slot portion tangential thereto, an operator having a bearing portion journaled in said cylindrical portion of said bracket and having a locking surface adjacent said bearing portion, a locking lever having a stud rotatable and slidable in said elongated bearing slot portion and having a camming surface engageable with said locking surface, means for manually rotating said locking lever so that its camming surface is disengaged from said locking surface to permit manual manipulation of said operator, said operator having a bar socket formed adjacent said locking surface for reception of an operating bar, said operator having a second and noncircular socket within its said bearing portion and opening away from said bar socket, an eccentric having a projecting portion shaped complementally to said second socket fitted thereinto for rotation of said eccentric with said operator, said eccentric having a bearing surface radially offset from its axis of rotation, a latch journaled on said offset bearing surface, said latch having first and second arms extending away from said bearing surface, said first latch arm being shaped to engage the distal edge of the door to hold it in partly and fully closed positions and to release it to fully open position, said second arm mounting a counterweight, and said eccentric having a lever arm rotatable therewith, spaced laterally of said latch and projecting over said latch and engageable with the surfaces of said first and second arms upon rotation of said eccentric so as to rotate said latch about said offset bearing surface, whereby manipulation of said operator in unlocked condition will effect actuation of said latch.

4. In a hopper structure for a railway hopper car, the structure having an outlet opening and a door pivoted at its upper edge to the structure and positioned to close the opening; the combination therewith of a door locking mechanism comprising, a pair of axially spaced and axially aligned bearing brackets secured to the hopper structure, one of said brackets being formed with an opening therein having a generally cylindrical portion and an elongated slot portion tangential thereto, a bar socket and operator having a bearing portion journaled in said cylindrical portion of said one bracket and having a locking surface adjacent said bearing portion, a locking lever having a stud rotatable and slidable in said elongated bearing slot portion and having a camming surface engageable with said locking surface, means for manually rotating said locking lever so that its camming surface is disengaged from said locking surface to permit manual manipulation of said bar socket and operator, a first eccentric nonrotatably connected to said bar socket and operator for rotation therewith and having a bearing surface radially offset from its axis of rotation, a second eccentric journaled in the other of said brackets and having a bearing surface offset from its axis of rotation, a

bar interconnecting said eccentrics so that they will rotate in unison, a latch journaled on each of said offset bearing surfaces, said latches having first and second arms extending away from said bearing surfaces, said first latch arms being shaped to engage the distal edge of the door to hold it in partly and fully closed positions and to release it to fully open position, a second bar interconnecting said second latch arms, and said eccentrics each having a lever arm rotatable therewith, spaced laterally from the adjacent latch and projecting over the adjacent latch and engageable with the surfaces of said first and second arms upon rotation of said eccentrics so as to rotate said latches about said offset bearing surfaces, whereby manipulation of said bar socket and operator in unlocked condition will effect actuation of said latches.

5. In a hopper structure for a railway hopper car, the structure having an outlet opening and a door pivoted at its upper edge to the structure and positioned to close the opening; the combination therewith of a door locking mechanism comprising, a pair of axially spaced and axially aligned bearing brackets secured to the hopper structure, one of said brackets being formed with an opening therein having a generally cylindrical portion and an elongated slot portion tangential thereto, an operator having a bearing portion journalled in said cylindrical portion of said one bracket and having a locking surface adjacent said bearing portion, a locking lever having a stud rotatable and slidable in said elongated bearing slot portion and having a camming surface engageable with said locking surface, means for manually rotating said locking lever so that its camming surface is disengaged from said locking surface to permit manual manipulation of said operator, said operator having a noncircular socket therein opening toward the other of said brackets, a first eccentric having a projection formed complementally with said operator socket and fitted therein so that said eccentric rotates with said operator, said eccentric having a bearing surface radially offset from its axis of rotation, a second eccentric journalled in the other of said brackets and having a bearing surface offset from its axis of rotation, a bar interconnecting said eccentrics so that they will rotate in unison, a latch journaled on each of said offset bearing surfaces, said latches having first and second arms extending away from said bearing surfaces, said first latch arms being shaped to engage the distal edge of the door to hold it in partly and fully closed positions and to release it to fully open position, a second bar interconnecting said second latch arms, and said eccentrics each having a lever arm rotatable therewith, spaced laterally of the adjacent latch and projecting over the adjacent latch and engageable with the surfaces of said first and second arms upon rotation of said eccentrics so as to rotate said latches about said offset bearing surfaces, whereby manipulation of said operator in unlocked condition will effect actuation of said latches.

6. In a hopper structure for a railway hopper car, the structure having an outlet opening and a door pivoted at its upper edge to the structure and positioned to close the opening; the combination therewith of a door locking mechanism comprising, a pair of axially spaced and axially aligned bearing brackets secured to the hopper structure, one of said brackets being formed with an opening therein having a generally cylindrical portion and an elongated slot portion tangential thereto, an operator having a bearing portion journalled in said cylindrical portion of said one bracket and having a locking surface adjacent said bearing portion, a locking lever having a stud rotatable and slidable in said elongated bearing slot portion and having a camming surface engageable with said locking surface, means for manually rotating said locking lever so that its camming surface is disengaged from said locking surface to permit manual manipulation of said operator, said operator having a bar socket formed adjacent said locking surface for reception of an operating bar, said operator having a second and noncircular socket formed within said bearing portion and opening away from said bar socket, an eccentric having a projecting portion shaped complementally to said second socket fitted thereinto for rotation of said eccentric with said operator, said eccentric having a bearing surface radially offset from its axis of rotation, a second eccentric journaled in the other of said brackets and having a bearing surface offset from its axis of rotation, a bar interconnecting said eccentrics so that they rotate in unison, a latch journaled on each of said offset bearing surfaces, said latches having first and second arms extending away from said bearing surfaces, said first latch arms being shaped to engage the distal edge of the door to hold it in partly and fully closed positions and to release it to fully open position, a second bar interconnecting said second latch arms, and said eccentrics each having a lever arm rotatable therewith, spaced laterally of the adjacent latch and projecting over the adjacent latch and engageable with the surfaces of said first and second arms upon rotation of said eccentrics so as to rotate said latches about said offset bearing surfaces, whereby manipulation of said operator in unlocked condition will effect actuation of said latches.

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