Dec. 6, 1960 O. INGRAM ET AL 2,962,983

RAILWAY HOPPER CAR DOOR LOCKS

Filed Sept. 25, 1956 8 Sheets-Sheet 1

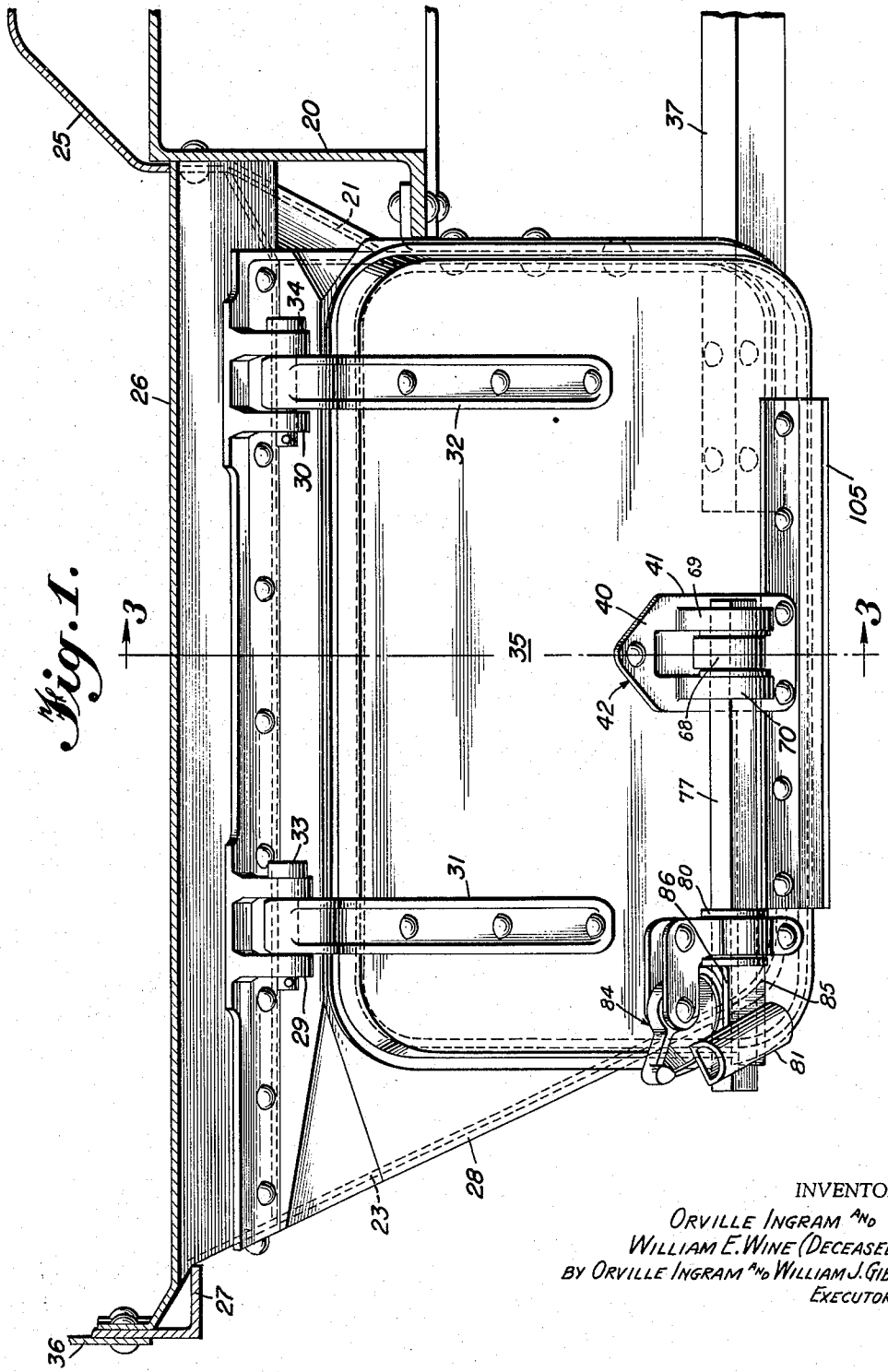


Fig. 1.

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RAILWAY HOPPER CAR DOOR LOCKS

Filed Sept. 25, 1956 8 Sheets-Sheet 2

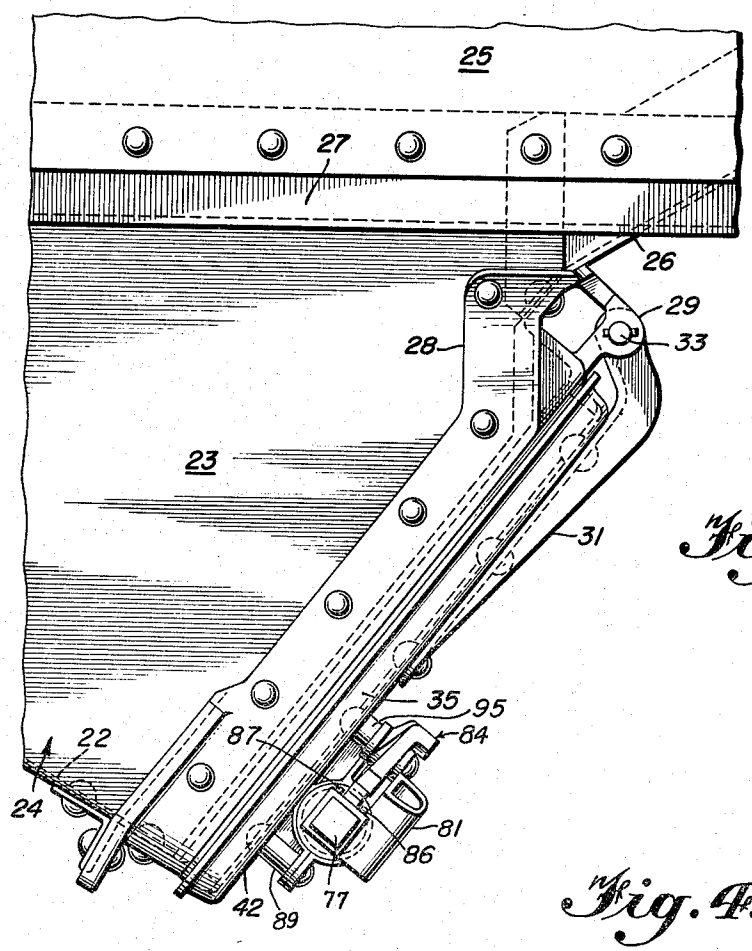
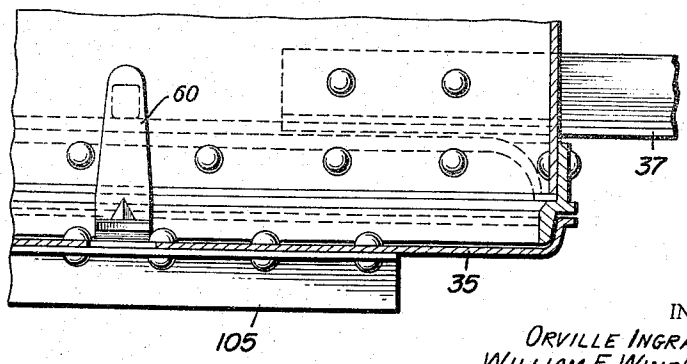


Fig. 2.

Fig. 4.



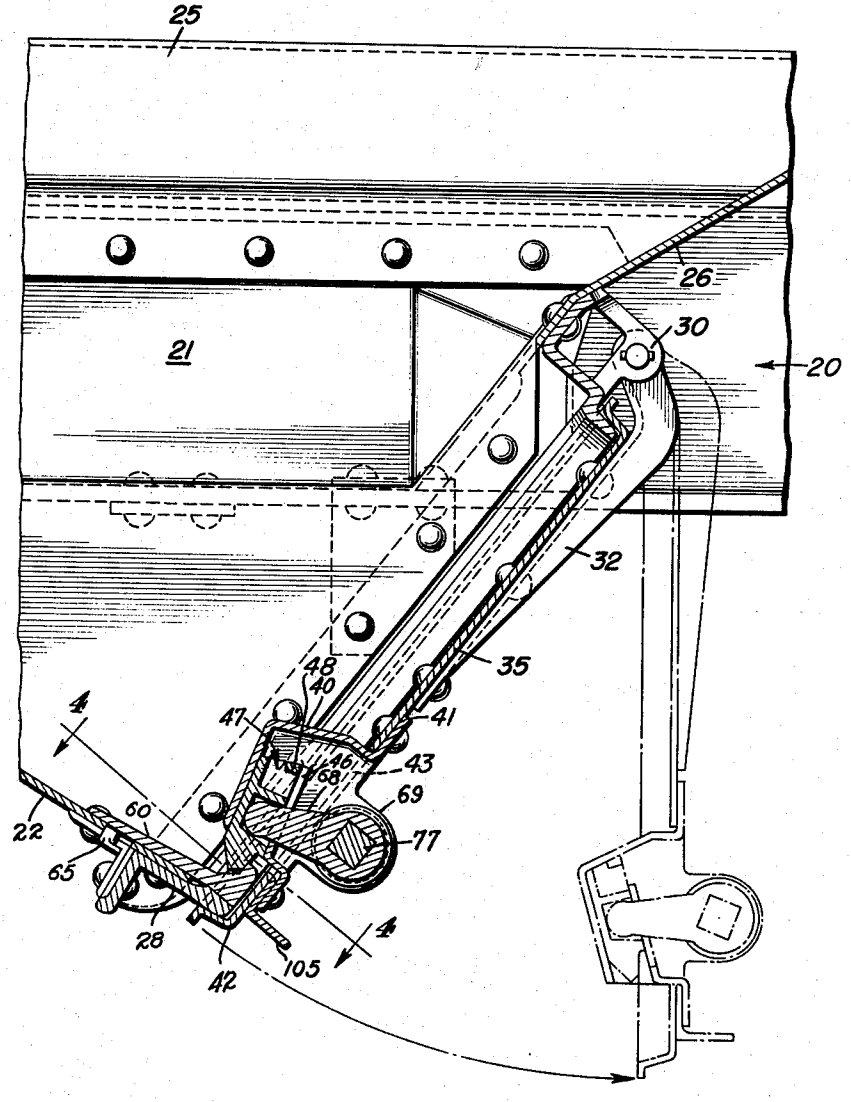
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Dec. 6, 1960 O. INGRAM ET AL 2,962,983

RAILWAY HOPPER CAR DOOR LOCKS

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Fig. 3.



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RAILWAY HOPPER CAR DOOR LOCKS

Filed Sept. 25, 1956

8 Sheets-Sheet 4

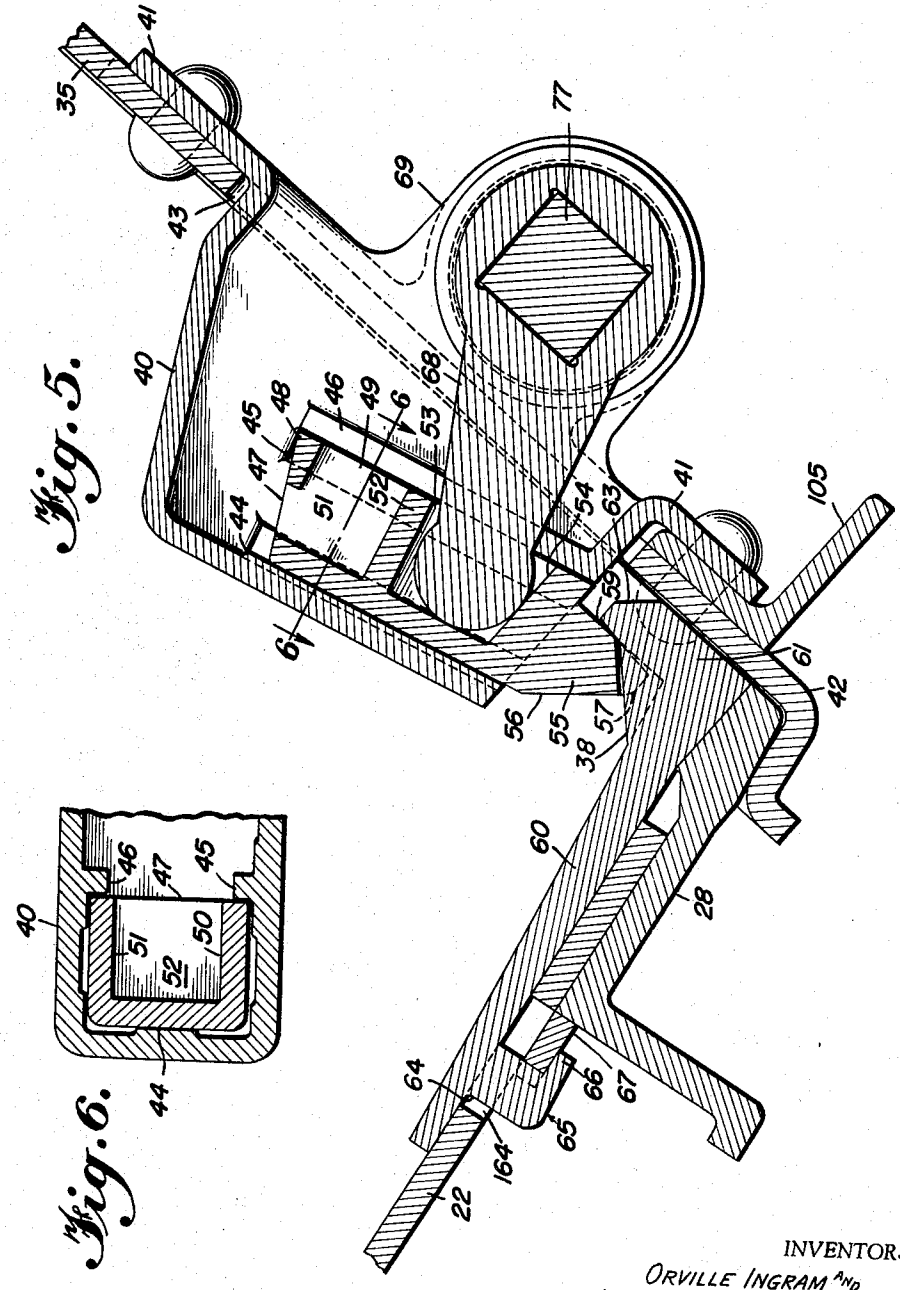


Fig. 5.

Fig. 6.

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RAILWAY HOPPER CAR DOOR LOCKS

Filed Sept. 25, 1956 8 Sheets-Sheet 5

Fig. 7.

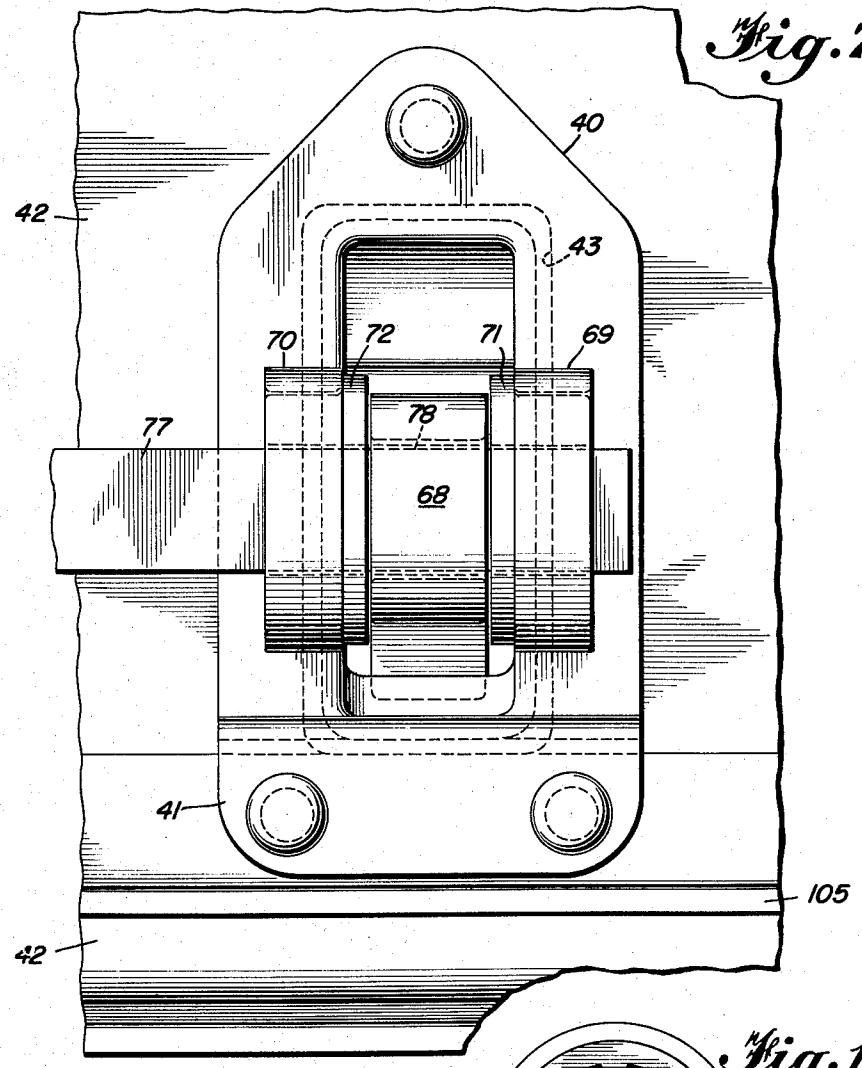


Fig. 13.

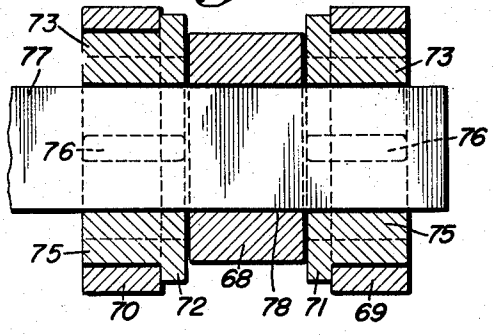
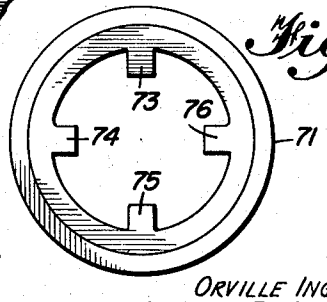


Fig. 14.



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Fig. 8.

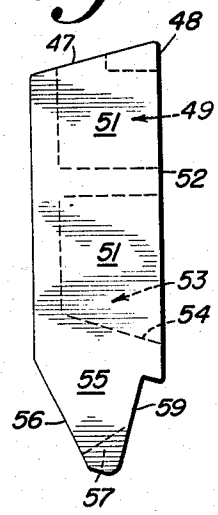


Fig. 9.

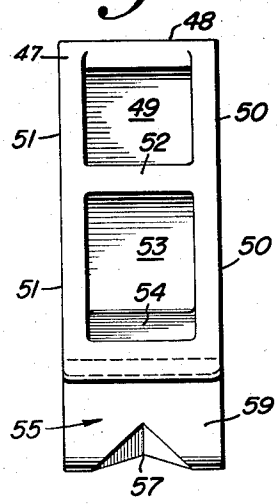


Fig. 10.

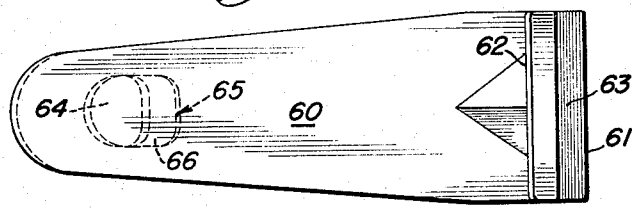


Fig. 11.

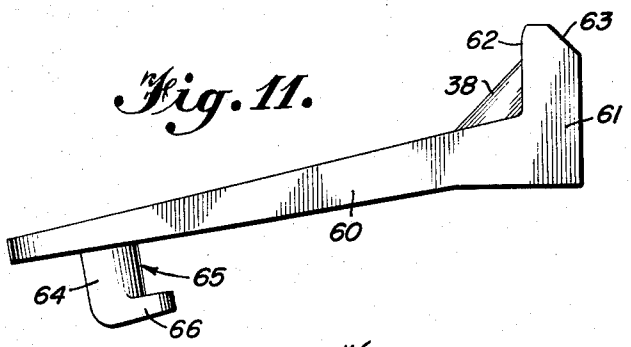
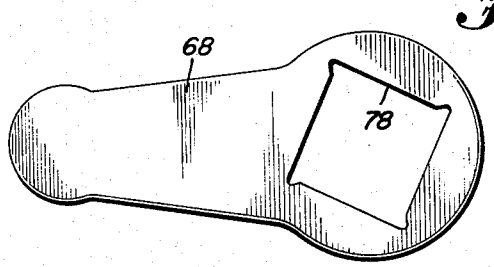


Fig. 12.



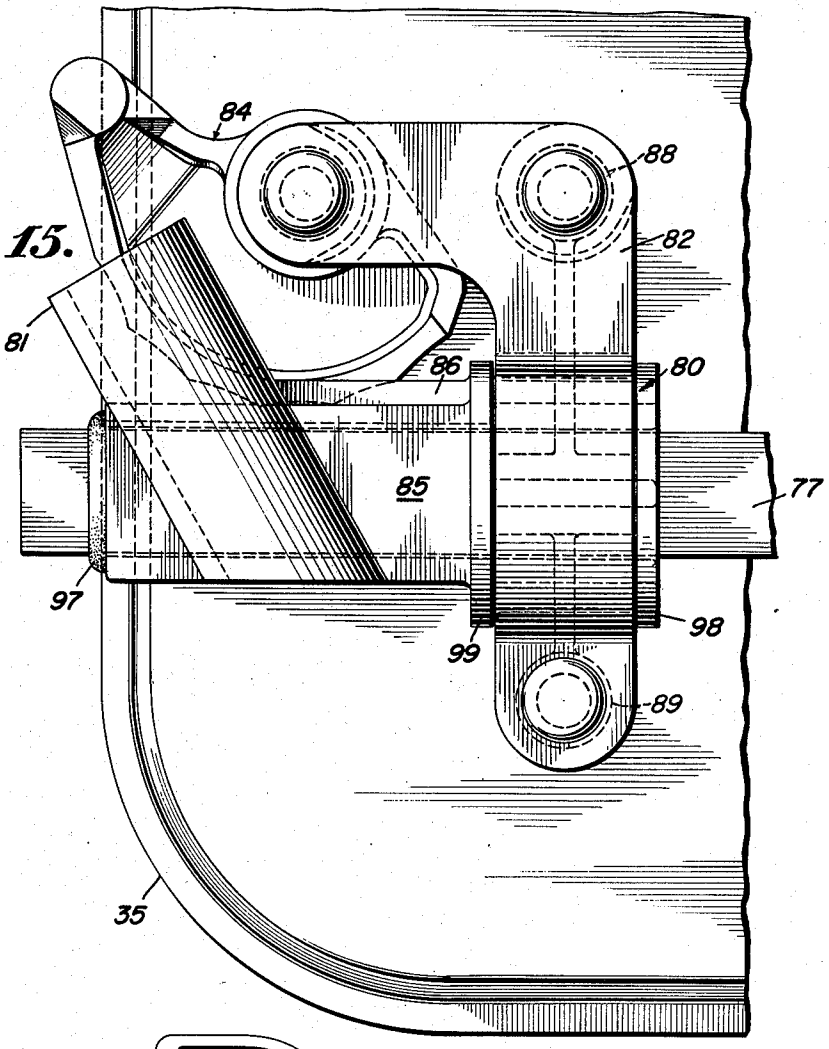
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RAILWAY HOPPER CAR DOOR LOCKS

Filed Sept. 25, 1956 8 Sheets-Sheet 7

Fig. 15.



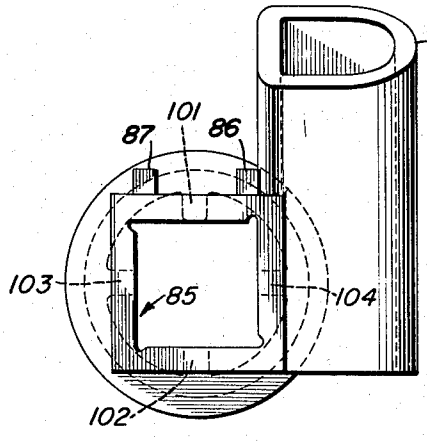


Fig. 18.

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RAILWAY HOPPER CAR DOOR LOCKS

Filed Sept. 25, 1956 8 Sheets-Sheet 8

Fig. 16.

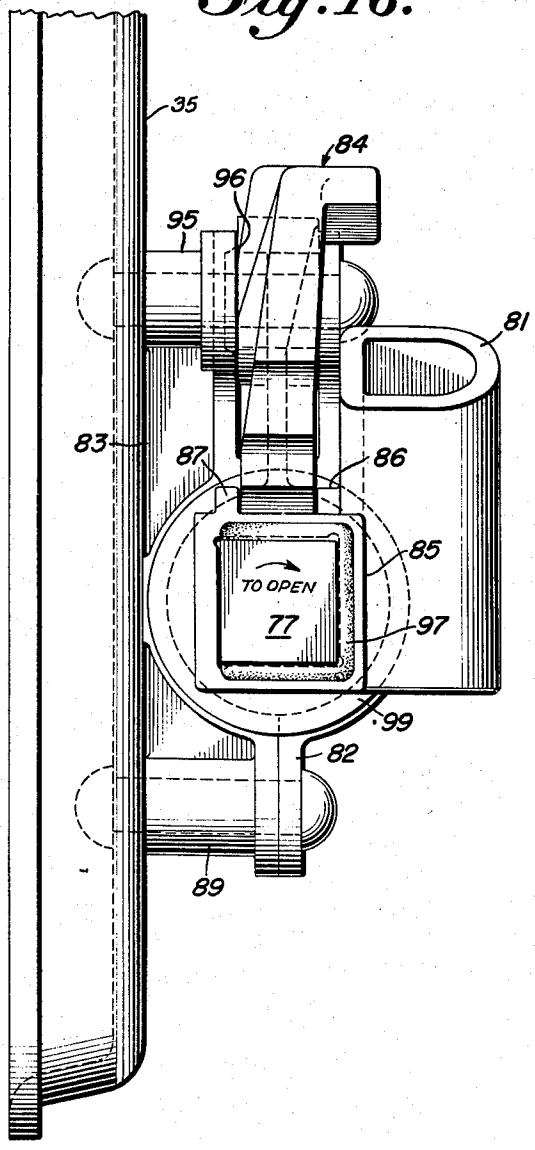
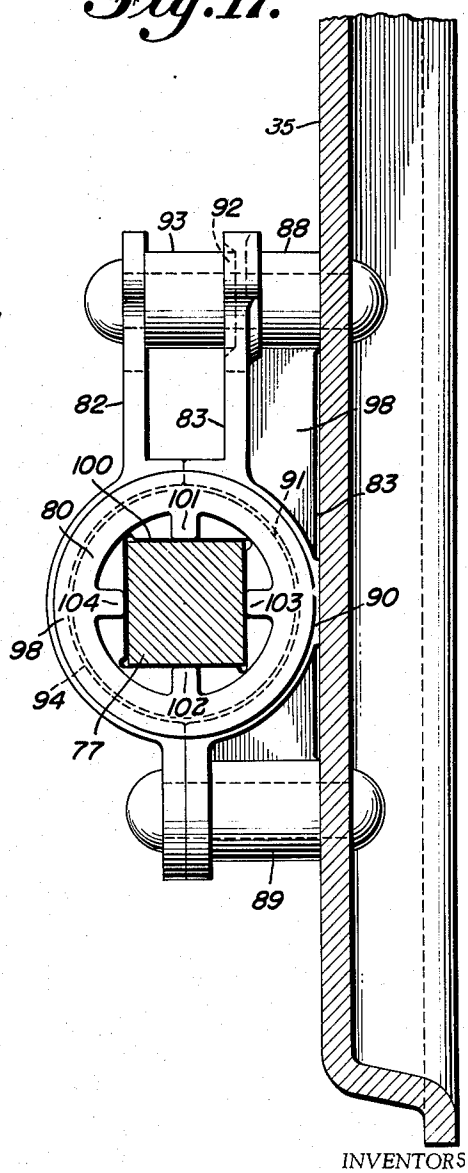


Fig. 17.



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United States Patent Office

2,962,983

Patented Dec. 6, 1960

2,962,983

RAILWAY HOPPER CAR DOOR LOCKS

Orville Ingram, Pinecrest, Va., and William E. Wine, deceased, late of Berryville, Va., by Orville Ingram, Pinecrest, and William J. Gibson, Fredericksburg, Va., coexecutors, assignors to Unitcast Corporation, Toledo, Ohio, a corporation of Ohio

Filed Sept. 25, 1956, Ser. No. 612,030

6 Claims. (Cl. 105—308)

Our invention relates to railway hopper car door mechanisms for retaining in closed position a hinged door adapted to swing to open position under the influence of gravity to permit the lading of the car to be discharged, and is filed concurrently with an application of Orville Ingram and William J. Gibson, executors of the estate of William E. Wine, deceased, Serial No. 612,029.

The principal object of the invention is to provide strong, simple and efficient means for retaining a car door in closed position, which may be manually unlocked, by the use of an individual door operable type locking mechanism.

A primary feature of the invention consists in providing, in combination with a hinged door movable to open position under the influence of gravity, means for supporting the door in closed position involving a plurality of operable members rigidly mounted on and swingable with the door, and having a portion engageable with an initially adjustable member rigidly mounted within the lading retaining zone of the hopper to hold the door in closed position.

A further feature of the invention consists in providing, in combination with a hinged door movable to open position under the influence of gravity, a housing means mounted on and swingable with the door, said housing extending through an opening in the door and having a flange portion engaging the outer face of the door. This flange portion is mounted on the outer face so that the mounting means will not be subject to corrosive elements of coal.

A still further feature of the invention consists in providing, in combination with a hinged door movable to open position under the influence of gravity, a lock controlling mechanism mounted on the face of the hinged door in an easily accessible position consistent with safety requirements, that is, so that the operator's arm will not be in the path of movement of the door, or lading discharge.

A still further feature of the invention consists in providing, in combination with the hinged door movable to an open position under the influence of gravity, housing means mounted on and swingable with the door, said housing extending through an opening in the door and having a flange portion engaging the outer face of the door. This flange portion is mounted on the outer face of the door so that the mounting means will not be subject to corrosive elements of the coal lading, and at the same time reinforce the opening of the door.

In the accompanying drawings our invention consists of the formation, combination and arrangement of parts, as will be herein described and particularly claimed.

Figure 1 is an end elevational view of a hopper showing the door in closed position and the locking mechanism is fixed to secure such closure of the door which retains the lading in the hopper proper.

Figure 2 is a side elevation of a self-clearing hopper showing the door in closed position and the operating mechanism secured in fixed position.

Figure 3 is a section taken on line 3—3 of Fig. 1 and shows in section the relationship of parts of our new and improved individually operated lock.

Figure 4 is a fragmental section taken on line 4—4 of Fig. 3 and shows the relationship of the lading retaining door and a cast frame, which reinforces the hopper and more particularly a plan view of the initially adjustable bolt keeper.

Figure 5 is a section showing the formation, assemblage and relationship of the operating parts of our improved door locking mechanism, including the housing mounted on the face of the door which extends through an opening in the door and into the lading retaining hopper, particularly showing the lock operating arm extending, in a loosely fitted manner, into the bolt; and also an opening in the bolt to receive an insertable bar for initial movement of said bolt in extreme cases. This figure also shows the relationship of the adjustable keeper and a wedge by which it may be initially adjusted prior to fixedly mounting the keeper in position.

Figure 6 is taken on line 6—6 of Fig. 5 and shows in cross section and locking bolt and more particularly the guides for retaining the bolt in operable position during movement.

Figure 7 is an end elevational view showing the flanges of the locking mechanism housing extending and secured to the face of the lading retaining door, as well as showing in detail the bearing housings and relationship of the bearings and operating bar thereto.

Figure 8 shows a side elevational view of the operating bolt.

Figure 9 shows front elevational view of the operating bolt, particularly showing an opening for receiving an insertable bar for initially moving the bolt in extreme conditions, as well as a bifurcated tongue.

Figure 10 is a plan view of the initially adjustable keeper.

Figure 11 is a side elevational view of the initially adjustable keeper, particularly showing the portion which extends through an opening in the floor of the lading retaining hopper which cooperates with a means to initially adjust the keeper with the assemblage of parts.

Figure 12 is a side elevational view of the operating arm.

Figure 13 is a sectional view of the integral bearing housing showing the bearings and the operating bar as well as the operating arm in operable relation.

Figure 14 is an elevational end view of the bearings shown in Fig. 13, particularly pointing out the ribs integral therewith to hold into operable relation the operating bar.

Figure 15 is an end elevational view of the operating mechanism shown mounted on a fragmental section of the lading retaining hopper door. The operating mechanism as shown is in fully locked position.

Figure 16 is an end view of the control mechanism showing the locking pawl in fully locked position.

Figure 17 is an end elevational view of the control mechanism and shows the relationship of the operating shaft and bearings for retaining such shaft, as well as the means for mounting the control mechanism to the face of the door.

Figure 18 is an end elevational view of a part of the control mechanism showing the socket for receiving and inserting a pry bar, cast integral therewith is a bearing, and cooperating ribs to act with a pawl for preventing movement of the control mechanism, which is more clearly shown in Fig. 15.

Referring now in more detail to the drawings, the center sill of the car is indicated as at **20**, and forms the backbone of the hopper car. Riveted to the center sill **20** is the inside hopper sheet **21**. Lower floor sheet **22**, the outside hopper sheet **23** and inside hopper sheet **21** form substantially the lading retaining hopper **24**. The longitudinal hood **25**, cross ridge sheet **26** attached to side sill **27** and center sill **20** together with the reinforcing hopper frame **28** preferentially shown as a one-piece cast steel member and door **35** complete the lading retaining hopper. Cast integral with hopper frame **28** are hinge lugs **29** and **30**. Mounted in operable relation with hinge lugs **29** and **30** are hinges **31** and **32** by the use of hinge pins **33** and **34**. Attached to hinges **31** and **32** is the door **35** and when held in engaging relation with frame **28** by suitably holding or locking mechanism serves to retain lading within the hopper **24**. Side **36** attached to side sill angle **27** functions as a lading retaining wall until unloading operations cause lading to pass by gravity into hopper **24**. Cross tie angle **37** is shown as a standard alternate and is used to connect an adjacent hopper in an effort to subdue spreading of the hoppers when the car body weaves under motion of the car on uneven track conditions.

Locking mechanism details within lading zone

The locking mechanism referred to above consists of the following relationship and details of parts. Cast housing **40** is mounted on door **35** by riveting or welding housing flange **41** to the non-lading retaining face of the door as at **42**. The body portion of housing **40** passes through opening **43** in the door and into the lading retaining space of the hopper structure. Cast integral within the body portion of housing **40** are guides **44**, **45** and **46** which restrict movements of bolt **47** when under the load of locking action. Bolt **47** consists of a first body portion having an insertable pry retaining element **48**, an opening **49** for receiving an insertable pry means surrounded by pry retaining element **48**, wall **50**, wall **51** and spacer wall **52**. A second body portion of bolt **47** consists of a recessed portion **53** surrounded by a spacer wall **52**, a continuation of walls **50** and **51** and an inclined bottom element **54**. A third portion or tongue **55** completes the details of bolt **47**. Tongue **55** has an inclined surface **56** and a bifurcated tip **57**. Tongue **55** has an engaging surface **59** relieved at its tip, which when in contact with keeper **60** holds the door **35** in locked position.

Keeper **60** comprises a first or plate portion **61** having an engaging face **62** substantially parallel to the face of the door **35**. Relieved portion **63** will when door **35** is moved from open to closed position assist in raising contact bolt **47** to clear portion **61** of keeper **60** so that bolt **47** will drop by gravity into engageable, or locking relation with keeper **60**. The second portion of keeper **60** consists of a pyramidal-like integral reinforcing rib **38** positioned so that the bifurcated portion **57** of tongue **55** will overlie said reinforcing rib **38**. When the bifurcated tongue **55** is brought into locking relation with keeper **60** the tapered surface of the bifurcated tongue **57** will move foreign objects in its path of movement, permitting full engagement of the bolt **47** and keeper **60**. A third portion of the keeper **60** consists of a tail-like extension or plate portion connecting first, second, and fourth portions and extending over an opening **164** in floor sheet **22**. A fourth portion of keeper **60** consists of a lug **65** having a shank **64** which extends through opening **164** which opening is larger than lug **65**. Lug **65** has a lateral projecting portion **66** lying substantially parallel to the slope of floor sheet **22** and at substantially right angles to projection **66**. Lateral projecting portion **66** of lug **65** provides a support for an insertable wedge **67**.

Operative relationship of housed bolt and mounted keeper

Housing **40** may conveniently be pre-assembled to door **35**, bolt **47** inserted in the housing and held in position by an operating link **68**. Keeper **60** may then be loosely mounted on the hopper floor sheet **22** and held in preliminary position by lug **65** contacting an edge of the material surrounding the opening. When the door is swung to closed position the preliminary relationship of bolt **47** and keeper **60** will be established. Insertable wedge **67** is then placed in position between shank **64** of lug **65** and frame **28**. The wedge is held in place by projection **66** of lug **65**. Wedge **67** may be then forceably moved. The wedge acting on the lug during this movement will move keeper **60** within opening **164** until bolt surface **59** and keeper surface **62** are in proper relation to hold door **35** in a practicable fitted relation to frame **28**. The keeper **60** is then welded in a fixed position to the lower floor sheet **22** and the hopper frame **28**.

Details of locking mechanism (outside lading zone)

Integral with housing flange **41** of housing **40** are bearing retaining housings **69** and **70**. Inserted in bearing retaining housings **69** and **70** are bearings **71** and **72**. These bearings are provided with inner ribs **73**, **74**, **75** and **76** which contact and hold operating shaft **77** in position which shaft is to be rotated during locking or unlocking operations. Rotatable operating shaft **77** passes through bearing **72** then through a substantially square opening of link **68**, then through bearing **71**. It can easily be seen that when operating shaft **77** is rotated link **68** will move up or down accordingly as the shaft is rotated. Link **68** being operatively connected to bolt **47** will raise or lower, thus either engaging or disengaging bolt **47** from keeper **61** thereby either locking or unlocking the mechanism. When the locking mechanism is disengaged the door **35** will swing open by gravity.

Operating shaft **77** extends substantially parallel to the face of the door to the control elements of the locking mechanism.

Details of control mechanism

The control mechanism is mounted near the outer marginal edge of the door **35** and consists in part of an integral bearing **80** and a socket **81** for receiving an insertable bar. Split bearing housings **82** and **83** are provided to receive and hold bearing **80** in rotatable position. A dog or pawl **84** is provided so that when holding face is in engagement with the shaft housing **85** the shaft **77** will not rotate.

The operating elements consist of a substantially cylindrical portion or socket **81**, an integral shaft housing **85**, for receiving an insertable bar which when moved in an arcuate path will rotate shaft housing **85** and shaft **77** which is confined in shaft housing **85** and operate the cooperating locking mechanism elements. Shaft housing **85** is provided with projections **86** and **87** placed in parallel relationship to receive pawl **84**.

When pawl **84** is in engaging relation with shaft housing **85** and the shaft has a tendency to rotate either projection **86** or **87** will contact pawl **84** and hold the shaft **77** in a non-rotatable status.

Split bearing housing **83** is mounted on the outside face of door **35** and stools **88** and **89**, as well as the flat portion **90** will hold bearing surface **91** in aligned relation with bearing housing **69** and **70** so that bearing **80** will be in aligned relationship with bearings **71** and **72**. Stool **88** is provided with a recessed portion **92** for receiving stool

93 of split housing 82. This assembly of parts will position the contact surface 94 bearing housing 82 in workable relationship with surface 91 of bearing 80. Stool 95 has a recessed portion for receiving stool 96 on which is mounted rotatable pawl 84 and hold housings 83 and 82 in spaced relation so that pawl 84 may rotate freely.

Operating shaft 77 is conveniently welded to housing 85 as at 97 to hold the shaft in place.

The bearing portion 80 of the control operating mechanism is provided with collars 98 and 99 which further limit the longitudinal movement of operating bar 77 when said bar is welded to housing 85 as at 97. Bearing portion 80 is further provided with a substantially square opening 100 and ribs 101, 102, 103 and 104 for receiving and holding operating bar 77 in position.

When critical weather conditions cause moisture to freeze about the tongue 55 of bolt 47 an insertable bar may be placed in opening 49 pivot about link 68 affording a direct pry to initially disengage bolt 47 from its keeper 60 within the limits of clearance between link 68 and the recessed portion 53 of bolt 47.

Reinforcement angle 105 is placed at the lower edge of the door 35 as a stiffening means for the door at this point.

We claim:

1. A door locking mechanism for a hinged door swingable to close a discharge opening of a hopper of a railway hopper car, comprising a housing fixedly mounted on an outside face of and extending through an opening in said door, said housing in a closed position of said door extending into said hopper for protecting parts of said mechanism from lading, a keeper mounted in said hopper within said discharge opening thereof and initially adjustable in spacing relative to said opening from without said hopper, means movably mounted in said housing and engageable with said keeper in said closed position for locking said door in said position, and means including a shaft mounted on said outside face of said door and connected to said movably mounted means for controlling operation of said mechanism.

2. A door locking mechanism for a hinged door swingable to close a discharge opening of a hopper of a railway hopper car, comprising a housing fixedly mounted on an outside face of and extending through an opening in said door, said housing in a closed position of said door extending into said hopper for protecting parts of said mechanism from lading, a keeper mounted on a floor of said hopper within said discharge opening, said keeper including a catch portion, a pyramidal portion inwardly of and integral with said catch portion, a plate portion integral with said first named portions and extending inwardly therefrom along said floor of said hopper, and a lug depending from said plate portion and projecting through an opening in said floor, adjusting means below said floor and engageable with said lug for initially adjusting the spacing of said keeper relative to said discharge opening, bolt means movably mounted in said housing and engageable with said catch and pyramidal portions of said keeper in said closed position for locking said door in said position, and means including a shaft mounted on said outside face of said door and connected to said bolt means for controlling operation of said mechanism.

3. A door locking mechanism for a hinged door swingable to close a discharge opening of a hopper of a railway hopper car, comprising a housing fixedly mounted on an outside face of and extending through an opening in said door, said housing in a closed position of said door extending into said hopper for protecting parts of said mechanism from lading, a keeper mounted on a floor of said hopper within said discharge opening, said keeper including a catch portion, a pyramidal portion inwardly of and integral with said catch portion, a plate portion integral with said first named portions and extending inwardly therefrom along said floor of said hopper, and a lug depending from said plate portion and extending through an opening in said floor and therebelow having a lateral projection, wedge means below said floor and engageable with and supportable on said lateral projection of said lug for adjusting the initial spacing of said keeper relative to said discharge opening, bolt means movably mounted in said housing and engageable with said catch and pyramidal portions of said keeper in said closed position for locking said door in said position, and means including a shaft mounted on said outside face of said door and connected to said bolt means for controlling operation of said mechanism.

4. A door locking mechanism for a hinged door swingable to close a discharge opening of a hopper of a railway hopper car, comprising a housing fixedly mounted on an outside face of and extending through an opening in said door, said housing in a closed position of said door extending into said hopper for protecting parts of said mechanism from lading, a keeper mounted in said hopper within said discharge opening thereof and initially adjustable in spacing relative to said opening from without said hopper, a member movably mounted in said housing and engageable with said keeper in said closed position for locking said door in said position, means on said member and engageable by a bar inserted through said door opening for prying said member out of engagement with said keeper and thereby releasing said door for swinging to open position, and means including a shaft mounted on said outside face of said door and connected to said member for controlling operation of said mechanism.

5. A door locking mechanism for a hinged door swingable to close a discharge opening of a hopper of a railway hopper car, comprising a housing fixedly mounted on an outside face of and extending through an opening in said door, said housing in a closed position of said door extending into said hopper for protecting parts of said mechanism from lading, a keeper mounted in said hopper within said discharge opening thereof and initially adjustable in spacing relative to said opening from without said hopper, a bolt member movably mounted in said housing and having a bifurcated tongue engageable with and overlying a pyramidal portion of said keeper in said closed position for locking said door in said position, means on said bolt member for receiving a pry bar inserted through said door opening for prying said tongue out of engagement with said keeper, an operating arm member projecting from said outside face into a portion of said bolt member for shifting said bolt member into and out of engagement with said keeper, and means including a shaft mounted on said outside face and mounting said operating arm member for controlling operation of said mechanism.

6. A door locking mechanism for a hinged door swingable to close a discharge opening of a hopper of a railway hopper car, comprising a housing fixedly mounted on an outside face of and extending through an opening in said door, said housing in a closed position of said door extending into said hopper for protecting parts of said mechanism from lading, a keeper mounted in said hopper within said discharge opening thereof and initially adjustable in spacing relative to said opening from without said hopper, a bolt member movably mounted in said housing and engageable with said keeper in said closed position for locking said door in said position, a connecting bar rotatably mounted on said outside face of said door, an operating arm member mounted on an inner end portion of and rotatable with said connecting bar and operatively connected to said bolt member for shifting said bolt member into and out of position to engage said keeper on rotation of said bar, a bearing housing mounted on said outside face of said door and journalling an outer end portion of said bar, a detent member pivotally connected to said bearing housing, and spaced parallel ribs integral with said bar and disposed

to receive said detent for locking said bar against rotation.

References Cited in the file of this patent

UNITED STATES PATENTS

443,804	Stamm	Dec. 30, 1890
506,978	Clark	Oct. 17, 1893
1,699,860	Suckfield	Jan. 22, 1928
1,719,282	Wilson	July 2, 1929
1,798,578	Anderson	Mar. 31, 1931
1,979,234	Tatum	Oct. 30, 1934
2,058,018	Holmes	Oct. 20, 1936
2,630,770	Zimmer	Mar. 10, 1953
2,630,771	Dorey	Mar. 10, 1953
2,638,061	Ingram	May 12, 1953
2,638,062	Zimmer	May 12, 1953
2,644,554	Katz	July 7, 1953
2,730,966	Dorey	Jan. 17, 1956

FOREIGN PATENTS

803,774	Germany	Apr. 19, 1951