Aug. 16, 1949. W. F. BATHO 2,479,292

DOOR OPERATING MECHANISM FOR DUMP CARS

Filed March 14, 1946 6 Sheets-Sheet 1

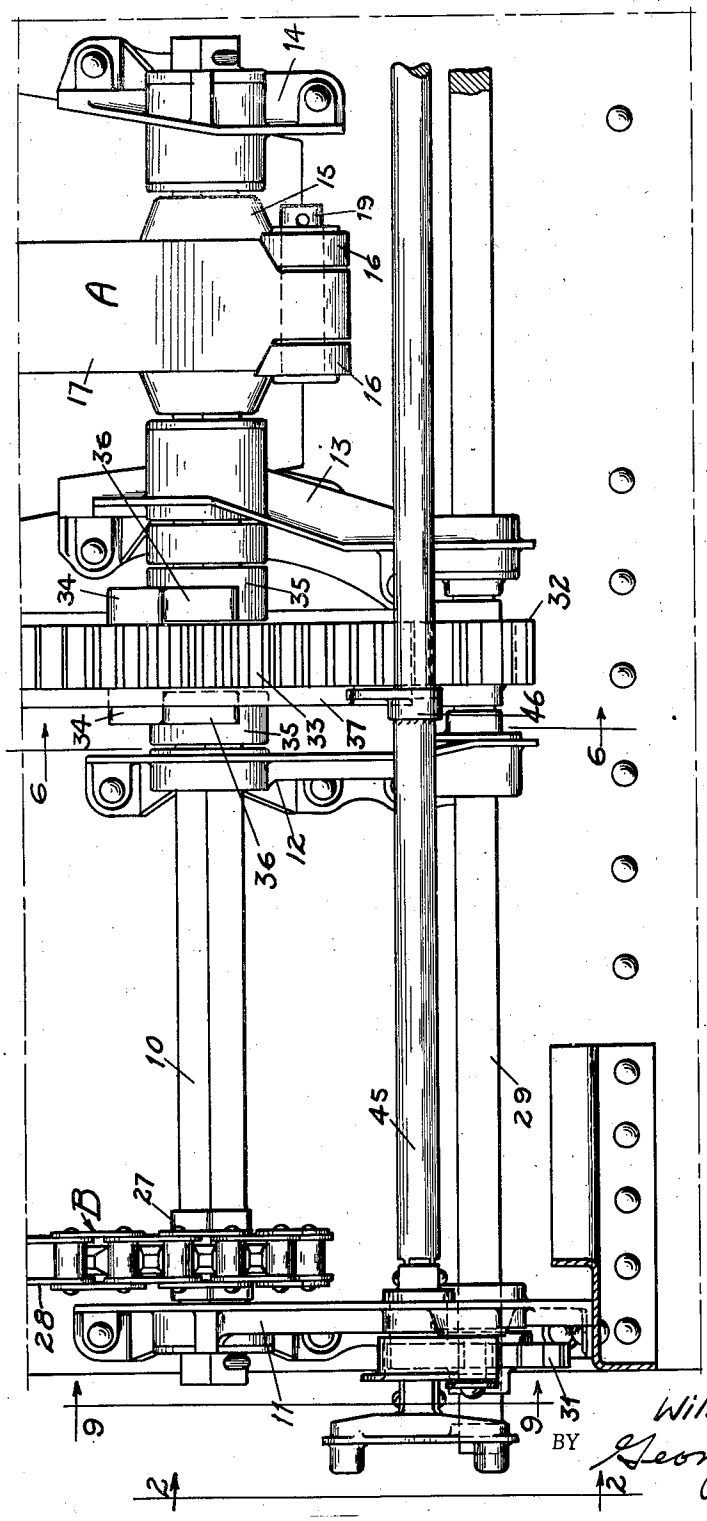


Fig-1.

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DOOR OPERATING MECHANISM FOR DUMP CARS

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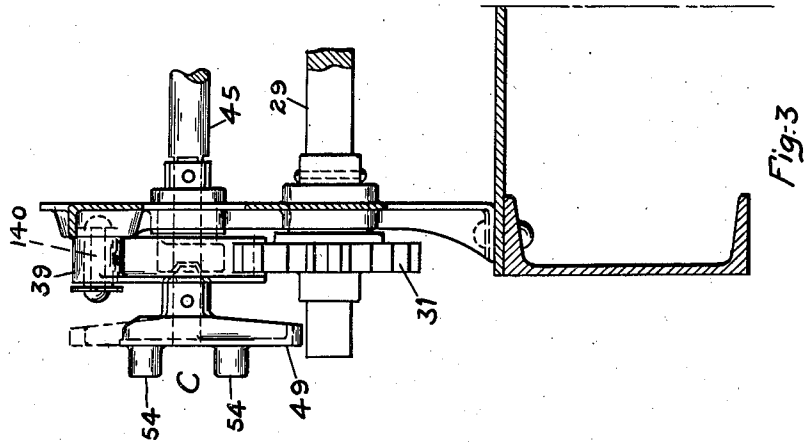


Fig-3

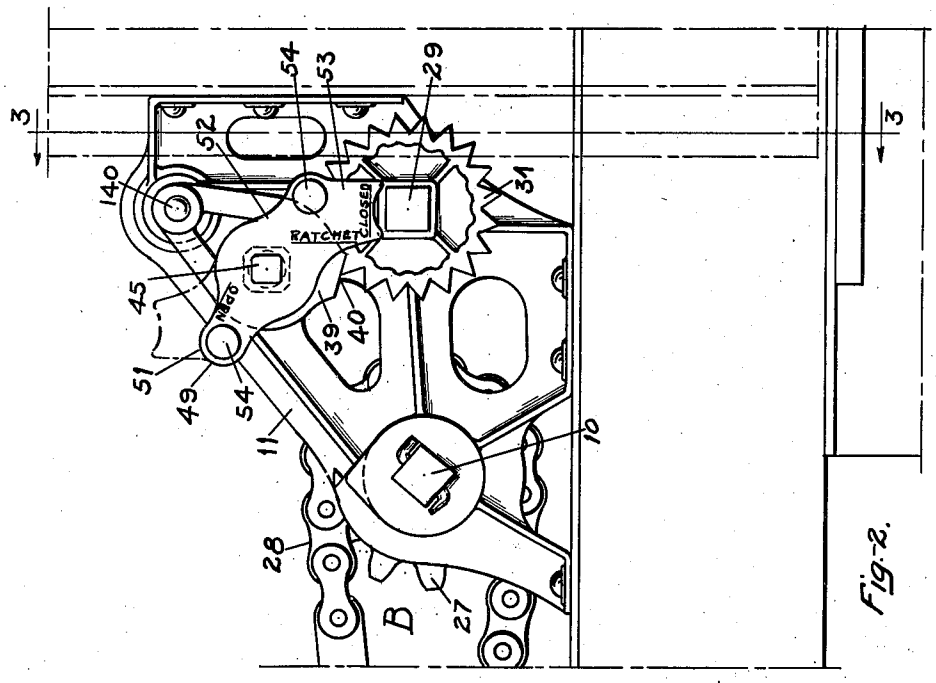


Fig-2.

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DOOR OPERATING MECHANISM FOR DUMP CARS

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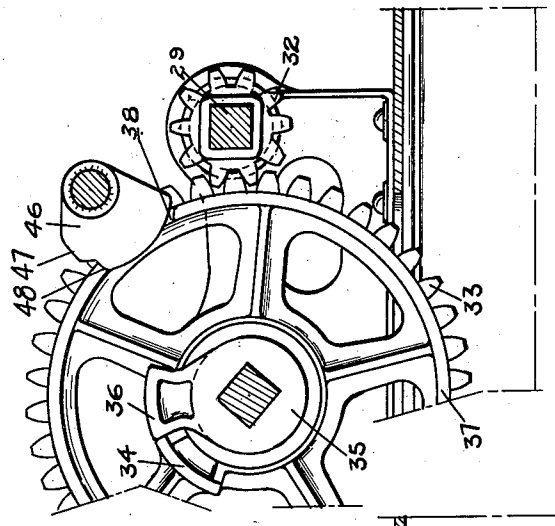


Fig.-6.

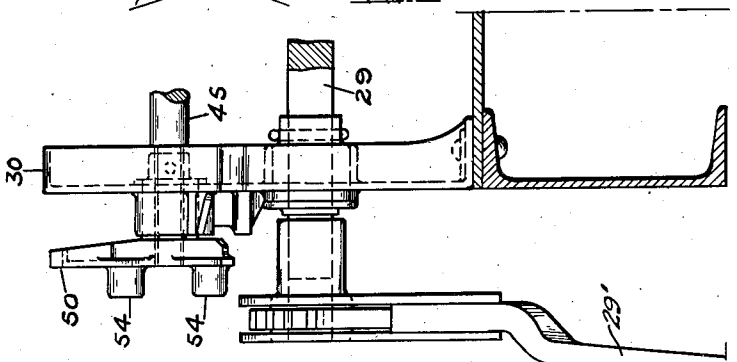


Fig.-5.

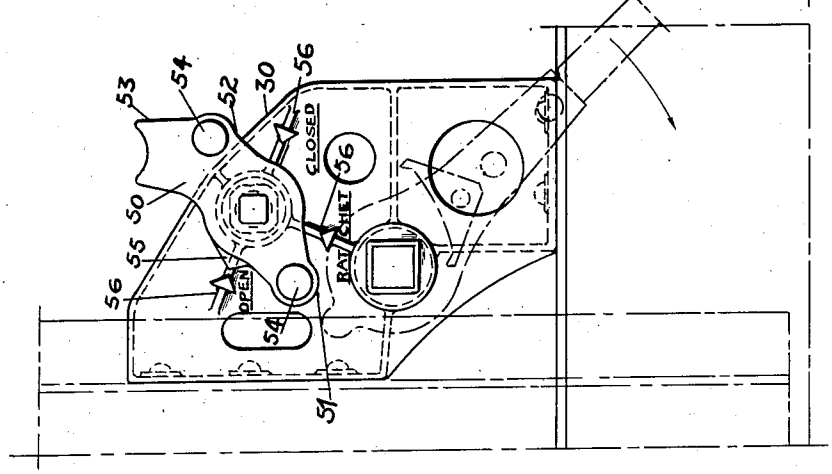


Fig.-4.

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DOOR OPERATING MECHANISM FOR DUMP CARS

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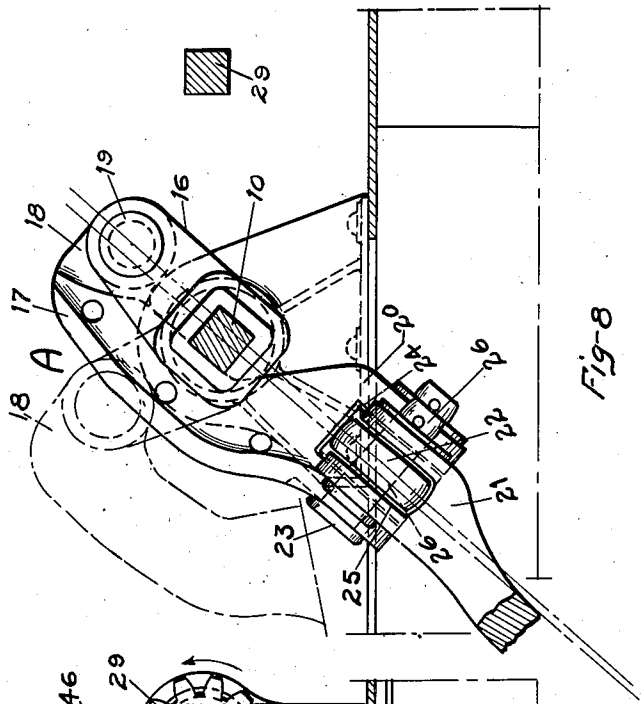


Fig-8

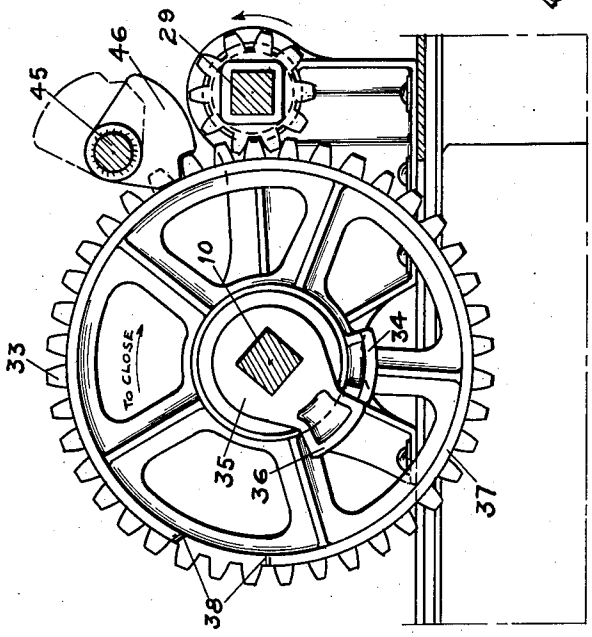


Fig.-7

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DOOR OPERATING MECHANISM FOR DUMP CARS

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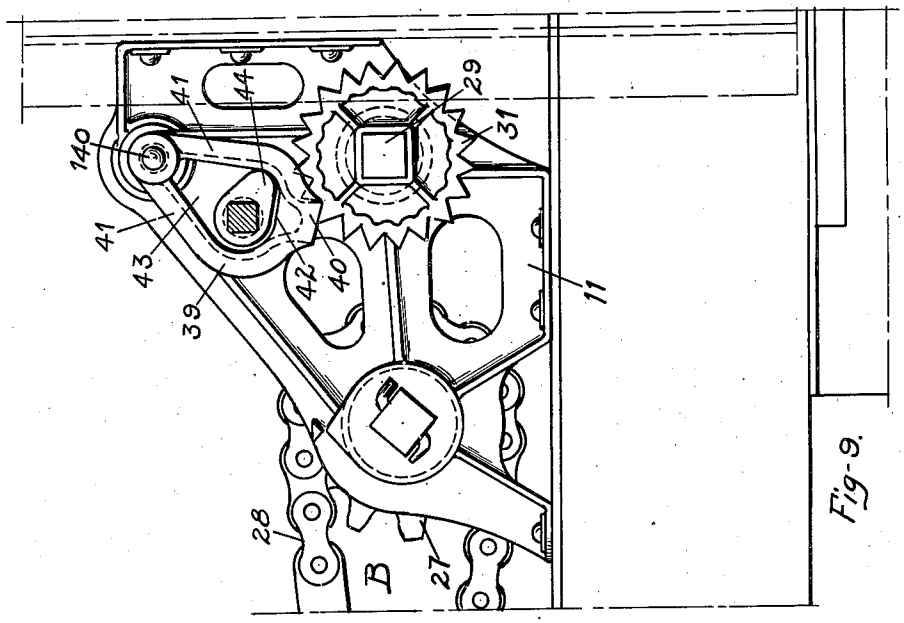


Fig-9.

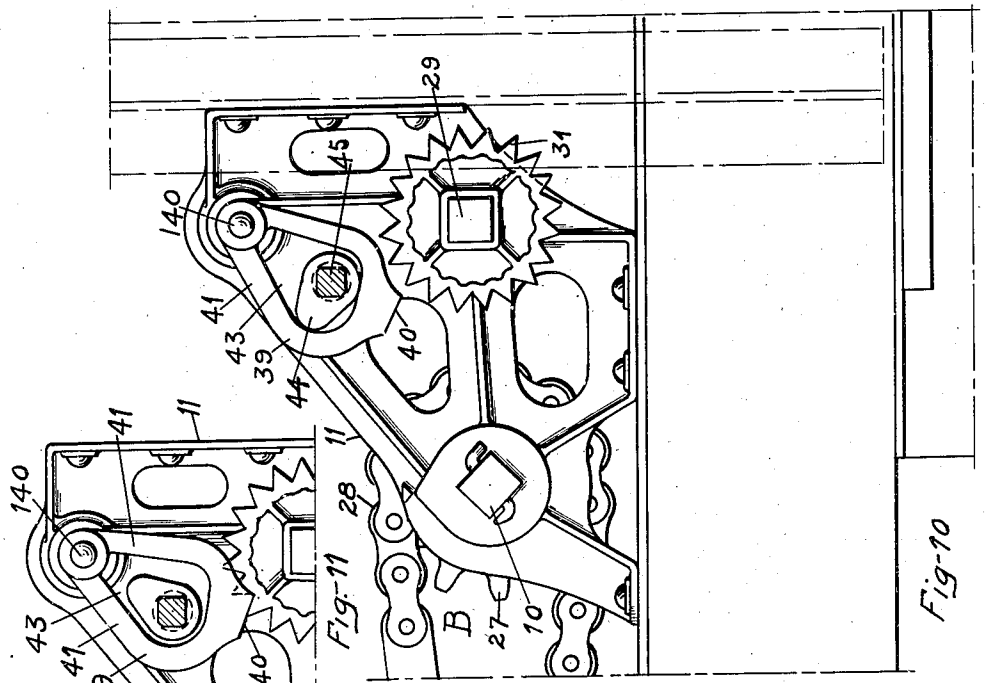


Fig-11

Fig-10

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DOOR OPERATING MECHANISM FOR DUMP CARS

Filed March 14, 1946 6 Sheets-Sheet 6

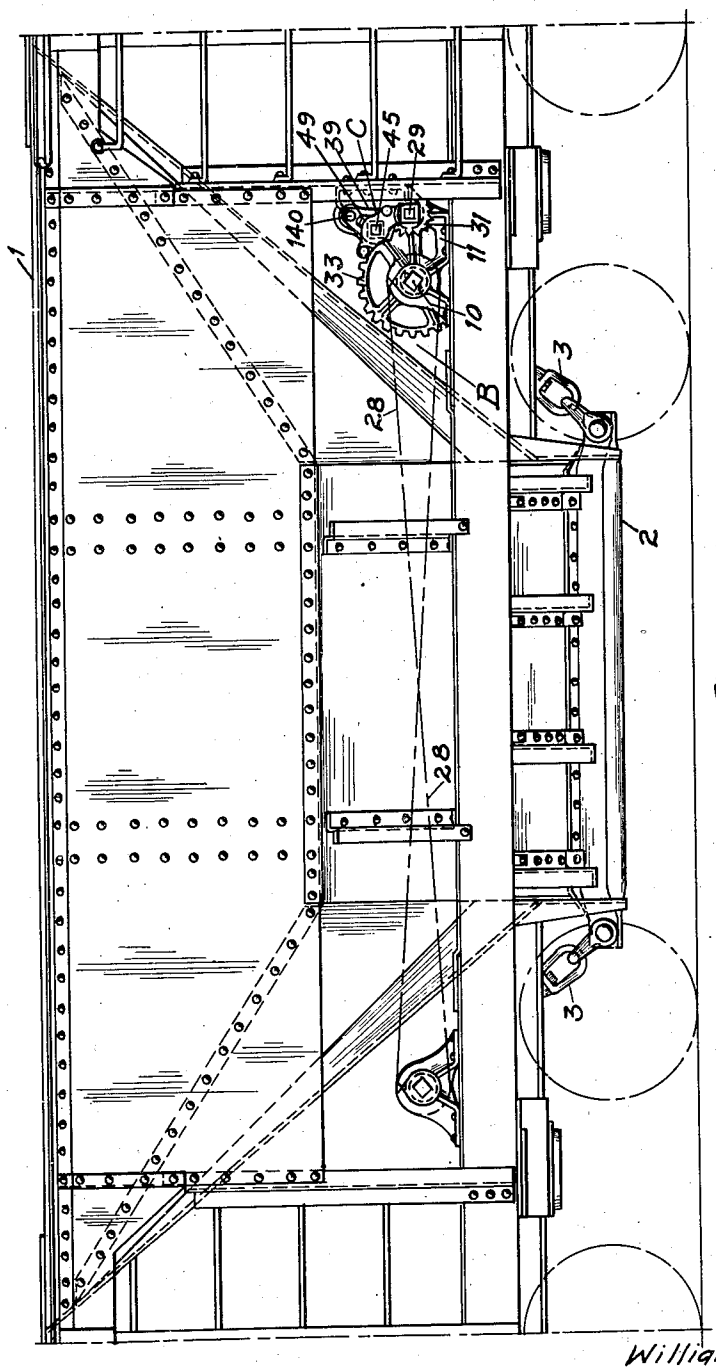


Fig-12

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Patented Aug. 16, 1949 2,479,292

UNITED STATES PATENT OFFICE

2,479,292

DOOR OPERATING MECHANISM FOR DUMP CARS

William F. Batho, Chicago, Ill., assignor to Enterprise Railway Equipment Company, Chicago, Ill., a corporation of Illinois

Application March 14, 1946, Serial No. 654,232

14 Claims. (Cl. 105—250)

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This invention relates to improvements in door operating mechanism for dump cars.

One object of the invention is to provide a mechanism for operating doors of dump cars of the type having a plurality of hinged bottom doors arranged lengthwise of and swingingly supported along their outer edges at opposite sides of the car, including ratchet means adapted to be latched to lock the parts of the operating mechanism against movement, wherein the means for latching is automatically restrained from being moved to locking position unless the doors have been fully closed, thus protecting the operator against injury which might otherwise occur with the usual latching means which is at all times free to be moved to locking position.

A further object of the invention is to provide an operating mechanism of the character set forth in the preceding paragraph, which is of the rotary type and includes a rotary ratchet member and a cooperating locking pawl engageable with the ratchet member to positively lock the parts of the operating mechanism against rotation, wherein manually actuated means is provided for positively moving the pawl to various positions of adjustment with respect to the rotary ratchet member to engage the ratchet wheel for ratcheting action, or positively lock the ratchet wheel against rotation, or to completely disengage the pawl from the ratchet wheel to permit free rotation of the latter.

Another object of the invention is to provide an operating mechanism for hinged doors of dump cars, including a rotary actuating means having a ratchet wheel rotatable therewith and a cooperating latch member or pawl for locking the actuating means against rotation when the doors are fully closed, and manually operated rotary cam means for moving the pawl to locking position, wherein automatic means is provided for blocking rotation of the cam means to prevent locking engagement of the pawl with the ratchet wheel unless the doors have been fully closed by the operating mechanism.

A still further object of the invention is to provide an operating means of the character set forth, including a rotary actuating member designed to be rotated by a wrench or similar tool adapted to be engaged therewith, a ratchet wheel rotatable with the actuating member, a pawl for positively locking the ratchet wheel and actuating member against rotation, and manually operated means for moving the pawl to engaged locking position with respect to the ratchet wheel, wherein the engagement of the wrench or similar

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tool with the actuating member is effectively blocked by means thrown into position by said manually operated means in moving the pawl to its engaged locking position with the ratchet wheel, thus preventing application of the wrench as long as the operating means is locked by the pawl, and making it necessary to release the pawl from its locking engagement with the ratchet wheel before the wrench may be applied to actuate the mechanism, thereby protecting the attendant against injury which might result by possible rotation of the actuating member and of the wrench therewith if such a safety device were not provided, which would occur if the pawl were unlocked from the ratchet wheel after the wrench has been operatively engaged with the actuating member.

A further object of the invention is to provide a rotary operating means for hinged doors of dump cars, including a ratchet wheel and a locking pawl cooperating therewith, means for visually showing the position of the pawl with reference to the ratchet wheel to indicate whether it is in position entirely disengaged therefrom, or in ratcheting position, or in position to positively lock the ratchet wheel against rotation.

Other objects of the invention will more clearly appear from the description and claims hereinafter following.

In the drawings, forming a part of this specification,

Fig. 1 is a plan view, partly broken away, of the improved door operating mechanism at one end of the dump car, portions of the car structure being shown in section, the end of the car illustrated being that usually designated as the operating end;

Fig. 2 is a side elevational view, looking in the direction of the arrows of line 2—2, Fig. 1;

Fig. 3 is a vertical sectional view corresponding substantially to the line 3—3 of Fig. 2;

Fig. 4 is an elevational view looking at the side of the car opposite to that shown in Fig. 2;

Fig. 5 is a vertical sectional view, partly broken away, through the end of the car looking from right to left in Fig. 4, showing a safety wrench applied for operating the mechanism;

Fig. 6 is a transverse, vertical sectional view corresponding substantially to the line 6—6 of Fig. 1;

Fig. 7 is a view similar to Fig. 6, showing the parts of the operating mechanism in a different position;

Fig. 8 is a vertical sectional view longitudinally of the car at the location of the drop door con-

necting mechanism of the door operating means, showing the connecting mechanism in locked position and indicating, in dotted lines, the position of the parts assumed when the door is partly open;

Fig. 9 is a vertical sectional view, corresponding substantially to the line 9—9 of Fig. 1, showing the ratchet means and other parts of the operating mechanism in elevation, the ratchet wheel being locked by the cooperating pawl;

Fig. 10 is a view similar to Fig, 9, showing the pawl completely disengaged from the ratchet wheel;

Fig. 11 is a view similar to Fig. 9, with certain parts broken away, illustrating the ratcheting position of the pawl; and

Fig. 12 is a view, in side elevation, of an ore car in which the present invention is embodied.

My improved operating mechanism is preferably employed in connection with a dump car 1, Fig. 12, having a pair of bottom doors 2 arranged lengthwise of the car at opposite sides thereof and hinged along their outer edges, which are well-known in this art. As illustrated in the drawings, my improved operating mechanism is particularly adapted to cars of this character and is of the type illustrated in Patent No. 1,547,640, granted July 28, 1925, to Argyle Campbell, which discloses a complete operating mechanism of this kind and the arrangement thereof on the car. Reference may be had to said Patent No. 1,547,640 for an understanding of the general arrangement and structure of a door operating mechanism of the type in which my improvements are embodied.

As shown in the drawings, my improved operating mechanism comprises, broadly, a lifting and winding mechanism A at each end of the car (the winding mechanism at one end of the car only being shown), driving means B connecting the lifting and winding means at opposite ends of the car for simultaneous operation, and an actuating mechanism C at one end of the car for operating the lifting and winding mechanism.

The lifting and winding mechanism A, which is duplicated at opposite ends of the car, includes a shaft 10 journaled in suitable bearing brackets 11, 12, 13, and 14, carried by the underframe of the car and arranged below the usual sloping floor as shown in Figure 12. The shaft 10 is preferably of square cross section and is fitted with the usual cylindrical thimbles which form journals for the shaft rotatable in suitable bearing openings provided in the brackets 11, 12, 13, and 14. As shown most clearly in Fig. 1, intermediate the bearing brackets 12 and 13, which are mounted on the center sills of the car, the shaft 10 carries a hub 15 which is fixed thereto for rotation therewith. The hub 15 is provided with a pair of laterally spaced, radially extended arms 16—16. A locking hanger 17 is pivotally connected to the outer ends of the arm 16—16, as shown in Figs. 1 and 8, the hanger having a hook-shaped upper end portion 18 which is embraced between the arms 16—16 and supported for swinging movement between said arms by a pivot pin 19 extending through the extremity of said hook-shaped portion and the arms 16—16. The hanger 17 has a depending shank portion which extends below the shaft 10 and is laterally offset at its lower end in the direction of said shaft, forming a head 20 from which are supported the usual set of two links 21, only one of which is shown in the drawings. These links are designed to connect the hanger to the respective doors at opposite sides of the corresponding end of the car. These links may be of any well-known design and are supported from the head 20 of the hanger to swing about axes at right angles to the axis of swinging movement of the hanger. As is the usual practice, the links 21, one of which is shown in Fig. 8, are disposed at opposite sides of the hanger 17 and are connected to the latter by a transversely extending bar 22 pivotally supported on the hanger by a pin 23 extending through the lower end of the head of the hanger which is forked as indicated at 24 to accommodate the bar. Each link 21 is forked at its upper end, as indicated at 25, to receive the corresponding outer end of the bar 22 and is pivotally connected to the latter by a pin 26 extending through the bar and the arms of the forked portion of the link. The lower end of each link 21 is anchored to the inner edge of the corresponding door to lift the latter as the link is lifted and moved downwardly with the door as the latter is lowered to open position.

As hereinbefore stated, the winding and lifting mechanism A is duplicated at the other end of the car and is arranged in a manner similar to that disclosed in Patent No. 1,547,640, hereinbefore referred to, being reversely arranged and reversely operable with respect to the mechanism A hereinbefore described to lift and lower the doors 2 at their corresponding ends in unison with the other ends thereof by means of link connections 3. The lifting and winding mechanism is designed so that the hanger is moved to off-center position, in other words, beyond dead center, with respect to its connection with the shaft 10 and the connection with the doors, thus being effectively locked against being pulled open by the doors.

The winding shafts of the two lifting and winding mechanisms at opposite ends of the car are connected for rotation in unison in reverse directions in a manner similar to the connection employed in Patent No. 1,547,640, the driving means B serving this purpose.

The driving means B comprises a sprocket wheel 27 fixed to the outer end of the shaft 10 which is extended beyond the bearing bracket 11 for this purpose, a similar sprocket wheel fixed to the corresponding shaft of the lifting and winding mechanism at the other end of the car, and flexible connections 28 having links meshing with the two sprocket wheels and adapted to transmit reverse rotary movement from one shaft to the other.

The actuating mechanism C is preferably employed at one end of the car only, which end is usually termed the operating end of said car. This actuating mechanism comprises a rotary shaft 29, preferably of square transverse cross section, extending from one side to the other of the car in spaced relation with and parallel to the shaft 10. The shaft 29 is journaled for rotation in the central bearing brackets 12 and 13, the outer bearing bracket 11 at one side of the car, and an outer bearing bracket 30 at the opposite side of the car. The bearing bracket 30 is mounted on the car underframe, as shown in Fig. 4, in a manner similar to the bracket 11 shown in Fig. 2. The opposite ends of the square shaft 29 project beyond the outer bearing brackets 11 and 30 respectively to receive a wrench 29', Fig. 5, or similar tool by which the shaft may be rotated. As will be evident, the shaft 29 may thus be operated from either side of the car. This

shaft 29 also carries a ratchet wheel 31 at the end thereof which projects outwardly of the bearing bracket 11, said wheel being fixed to the shaft for rotation in unison therewith. As will be evident, the square portion of the shaft 29 projecting beyond the bearing bracket 11 is of sufficient length to accommodate the ratchet wheel thereon and also provide a portion outwardly of said wheel to accommodate the wrench or other tool. Between the bearing brackets 12 and 13, the shaft 29 carries a pinion 32 fixed to said shaft for rotation therewith and meshing with a large gear wheel 33 mounted on the shaft 10 between said bearing brackets 12 and 13. The gear wheel 33 is freely rotatable on the shaft 10 and is provided with a pair of clutch projections or lugs 34—34 at opposite sides thereof for a purpose hereinafter pointed out. At opposite sides of the gear wheel 33, the shaft 10 carries a pair of collars 35—35 which are fixed to the shaft for rotation in unison therewith. As clearly shown in Fig. 1, the collars occupy the spaces at opposite sides of the gear wheel between the bearing brackets 12 and 13 and the outer sides of the hub of the wheel, thus holding the gear wheel against movement lengthwise on the shaft while permitting free rotation thereof with respect to the shaft. Each collar 35 is provided with a radially projecting lug or arm 36 which is in the path of movement of the lug 34 at the corresponding side of the gear wheel 33 and is engageable by the lug last named to effect rotation of the shaft 10 in unison with the gear wheel to rotate the parts in door lifting direction. Inwardly of the teeth thereof, the gear wheel 33 is provided with a relatively wide, laterally projecting circumferential flange or rim 37 which is at the forward side thereof, as viewed in Figs. 6 and 7, and which is interrupted at one point to provide a slot or seat 38 for a purpose hereinafter pointed out. To provide a circular bearing on the square shaft 10 for smooth rotation of the gear wheel 33, a cylindrical collar may be mounted on the shaft between the collars 35—35.

A locking pawl 39 is supported for swinging movement on the bearing bracket 11 above the ratchet wheel 31 by a pivot pin 140 fixed in said bracket and extending through the upper end of the pawl. At the lower end, the pawl 39 has a depending tooth 40 which is engageable with the teeth of the ratchet wheel. As shown, the pawl 39 is of yoke-shaped form having upwardly converging side arms 41—41, which merge at the upper ends, and a connecting bottom section 42, thus presenting an elongated upwardly tapered opening 43. The pawl 39 is swung to its various positions of adjustment by a cam finger 44 disposed within the opening 43 of the pawl and mounted on the projecting outer end of an operating shaft 45 extending from one side to the other of the car and rotatably supported in suitable bearings in the brackets 11 and 30 which are located at opposite sides of the car. The cam finger 44 is fixed to the shaft 45 for rotation therewith and, when in the position shown in Fig. 10 holds the pawl completely disengaged from the ratchet wheel by engagement with the left-hand arm 41 of said pawl to permit free rotation of the ratchet wheel and the shaft 29. By rotation of the operating shaft 45 in clockwise direction through an angle of 90 degrees, the cam finger is brought to the vertical position shown in Fig. 11, releasing the dog to ratchet over the teeth of the wheel 31. Rotation of this shaft in clockwise direction through an additional angle of 90 degrees brings the cam finger 44 to the position shown in Fig. 9, that is, in engagement with the right-hand arm 41 of the pawl forcing the latter into locking engagement with the ratchet wheel and holding it in that position to positively prevent rotation of said wheel and the shaft 29, thereby locking the entire operating mechanism against rotation. As will be evident, disengagement of the pawl from the locking position shown in Fig. 9 and positioning the same for ratcheting action and full release, as shown respectively in Figs. 10 and 11, is effected by the action of the cam finger 44 through reverse rotation of the shaft 45. The shaft 45 carries a sector-shaped dog 46 which is located at the forward side of the gear wheel 33 in a vertical plane coincident with the flange 37 of said wheel. This dog is fixed to the shaft 45 and is rotatable therewith. In the position shown in full lines in Fig. 7, the dog 46 is adapted to ride on the flange or rim 37 of the gear wheel 33, being provided with a flat cam face 47 on its upper side, as viewed in Fig. 6, designed to engage and rest on the flange 37. Outwardly of the face 47, the upper side edge of the dog, as seen in Fig. 6, is notched to provide a shoulder 48. When the gear wheel 33 is turned to register the slot or seat 38 of the flange 37 with the dog 46, the latter is free to enter the seat when the shaft 45 is rotated. The parts of the operating mechanism are proportioned and designed so that, when the doors have been fully closed by the lifting and winding mechanism, the hanger 17 is in the full-line locked position shown in Fig. 8, and the gear wheel 33 is in the position shown in Fig. 6 with the seat 38 registering with the dog 46 so that the dog may be entered within the seat and the ratchet mechanism locked, as shown in Fig. 9, with the cam finger 44 positioned to hold the pawl 39 in locked engagement with the ratchet wheel 31. As will be evident, the pawl 39 cannot be moved to this locked position unless the seat 38 of the gear wheel 33 registers with the dog 46, as in all other positions of the mechanism the pawl 39 will be prevented from being moved to the position shown in Fig. 9 due to the dog 46 riding on the flange 37 of the gear wheel.

The shaft 45, which carries the cam finger 44 and the dog 46, is provided with operating head members 49 and 50 at opposite ends thereof by which the shaft may be manually rotated to adjust the pawl 39 to its locked, ratcheting, and completely released positions. The head members 49 and 50, which are fixedly secured to the extremities of the shaft 45, are of similar design, each member comprising diametrically oppositely extending arms 51 and 52, the arm 52 having an angular extension 53 adapted to engage over and rest on top of the corresponding wrench-receiving end of the shaft 29 when the pawl 39 is in locking or closed position with respect to the ratchet wheel 31. This position of the head 49 is shown in Fig. 2. To facilitate manual rotation of each head member, the same is preferably provided with spaced diametrically opposite lugs 54—54.

The different positions of adjustment of the locking pawl 39 are indicated to the operator by visual means provided in connection with the ratchet mechanism at each side of the car, the head 49 at one side of the car, as shown in Fig. 2, being provided with the legends "Open," "Ratchet," and "Closed" to indicate respectively the fully released, ratcheting, and locking positions of the pawl. These legends are arranged at different angles so that each legend reads in hori-

zontal direction when the pawl is in position indicated by that particular legend, in other words, when the head has been rotated to bring the pawl to its locked position the legend "Closed" reads horizontally; when the head has been rotated to bring the pawl to ratcheting position the legend "Ratchet" reads horizontally; and when the head has been rotated to bring the pawl to fully released position, the legend "Open" reads horizontally. The head 50 at the opposite side of the car, as shown in Fig. 4, has a toothlike pointer 55 at one side thereof, arranged to register with indicating ribs 56—56—56 on the outer face of the bearing bracket 30, these ribs being disposed radially to the shaft 45 at angles of 90 degrees with respect to each other and provided with arrow heads pointing toward the axis of rotation of said shaft. Adjacent to each rib is placed the proper legend which corresponds to the position of the pawl 39 when the pointer registers with that particular rib, the legends "Open," "Ratchet," and "Closed" being used to designate respectively the completely released, ratcheting, and locking positions of the pawl.

The operation of my improved mechanism is as follows: Assuming that the doors are fully closed with the various parts of the operating means positioned as shown in Figs. 1, 2, 3, 6, 8, and 9, and the locking hangers seated on the respective hubs to eliminate pull or torsion on the shafts which carry the locking hangers, the attendant rotates the shaft 45 in contraclockwise direction by means of the head 49, as shown in Fig. 2, or in clockwise direction by the head 50, as shown in Fig. 4, to full open position as shown in Fig. 10, thereby lifting the arms 53—53 of both heads 49 and 50 out of engagement with the wrench-receiving ends of the shaft 29 to clear the latter to accommodate the wrench. This rotation of the shaft 45 also rotates the cam finger 44 to position as shown in Fig. 10, and the dog 46 to the dotted position as shown in Fig. 7. The pawl 39 is thus unlocked from the ratchet wheel and brought to full open position and the dog 46 lifted entirely clear of the seat 38 in the rim or flange of the gear wheel 33. The operating wrench or similar tool is then engaged with the wrench-receiving end at either end of the shaft 29 and rotated in clockwise direction as shown in dotted position in Fig. 2, thereby imparting rotation of the gear wheel 33 in contraclockwise direction. Although any suitable type of wrench may be used to actuate the operating mechanism, it is preferable to employ a ratchet wrench of the safety type, as shown in Fig. 5 and indicated in dotted lines in Fig. 4. During this action, the gear wheel 33 rotates freely on the shaft 13 from the approximate position shown in Fig. 6 to a position in which the lugs 34—34 of the gear wheel come into engagement with the rear or right-hand side edges of the arms 36—36 of the shaft 10. Further rotation of the gear wheel 33 causes the shaft 10 to rotate therewith, and through the connecting means 28 also effects rotation of the corresponding shaft at the other end of the car, but in reverse direction. As will be evident upon reference to Fig. 8, slight rotation of the shaft 10 swings the hanger 17 toward the dotted line position shown in said figure, unlocking the same and permitting the doors to swing open due to the action of gravity and the additional pressure exerted by the load thereon. Rotation of the shaft 10 during this action is independent of the gear wheel 33, the shaft 10 moving in contraclockwise direction, turning freely in the gear wheel as the lugs 34—34 move in contraclockwise direction away from the lugs 36—36. The gear wheel 33 and the inter-connected parts of the operating means thus remain stationary, thereby protecting the operator against injury.

In closing the doors, the operation is a reversal of the operation just described, the lugs 34—34 of the gear wheel 33 being brought into engagement with the arms 36—36 of the shaft 10 by clockwise rotation of the gear wheel, as shown in Fig. 7, and effecting rotation of the shaft 10 in unison with the gear wheel until the parts reach the positions shown in Figs. 6 and 8 with the door fully closed and the hanger 17 locked in off-center position. During this closing action of the doors, the dog 46 rides on the rim of the gear wheel 33 and can only enter the seat 38 when the gear wheel is in the position shown in Fig. 6. While the dog 46 is riding on the flange of the gear wheel, the pawl 39 is in ratcheting position with respect to the ratchet wheel, as shown in Fig. 11, but cannot be locked to the latter by the cam finger 44 as rotation of the shaft 45 in direction to lock the pawl is blocked by the flange 37 of the gear 33 with which the dog 46 is engaged. It will thus be evident that unless the door has been fully closed and locked, it is impossible to lock the pawl to the ratchet wheel and any attempt to rotate the actuating heads 49 and 50 in a direction to lock the pawl is effectively blocked, thereby giving the operator warning that the doors are not fully closed and the mechanism is in dangerous condition for operation.

I claim:

1. In an operating mechanism for hinged doors of dump cars, the combination with rotary means mounted on the car for closing said doors; of manually actuated means for effecting rotation of said first-named means; a ratchet wheel rotatable with said second-named means; a locking element movable toward and away from said ratchet wheel and engageable therewith to lock the same against rotation; a manually actuated member for moving said locking element into locking engagement with the ratchet wheel; a detachable operating tool for effecting the operation of said manually actuated means; and means controlled by movement of said manually actuated member for blocking access of said detachable operating tool; to said manually actuated means when said locking element is in locked engagement with the ratchet wheel.

2. In an operating mechanism for hinged doors of dump cars, the combination with rotary means mounted on the car for closing said doors; of manually actuated means for effecting rotation of said first-named means; ratchet means for holding said rotary means against rotation in door opening direction; a second manually operated means for locking said ratchet means; a detachable operating tool for effecting the operation of said first mentioned manually actuated means; and means controlled by operation of said second manually operated means for blocking access of said detachable operating tool to said manually actuated means when said ratchet means is in locked condition.

3. In an operating mechanism for hinged doors of dump cars, the combination with rotary means mounted on the car for moving the doors to closed position, said means including a rotary element having a circular rim provided with an opening therethrough; of a ratchet wheel rotatable with

said means; a locking pawl engageable with said ratchet wheel; rotary cam means for moving the pawl toward and away from, and controlling the position thereof with respect to the ratchet wheel, said cam means being rotatable to a position to hold the pawl locked to the ratchet wheel; and a dog rotatable with said cam means, said rim of said rotary element being in the path of movement of said dog to limit rotation thereof and prevent rotation of said cam means to an extent to lock said pawl to the ratchet wheel, said dog being movable into the opening of said rim when said rotary element has been rotated to an extent to fully close said doors and release said cam means to rotate to a position to hold the pawl locked to the ratchet wheel.

4. In an operating mechanism for hinged doors of dump cars, the combination with rotary means mounted on the car for moving the doors to closed position, said means including a rotary element having a circular rim, said rim being interrupted by an opening; of a ratchet wheel rotatable with said means; a locking pawl engageable with said ratchet wheel; rotary cam means for moving said pawl to completely disengaged position, ratcheting position, and locking position with respect to the ratchet wheel; and a controlling element rotatable with said cam means, said rim of said rotary element being in the path of movement of said controlling element and adapted to be engaged thereby and prevent rotation of said cam means to a position to lock said pawl to the ratchet wheel, said opening of said rim registering with said controlling element when the doors are fully closed to provide clearance for rotary movement of said controlling element and permit rotation of the cam means to an extent to lock said pawl to the ratchet wheel.

5. In an operating mechanism for hinged doors of dump cars, the combination with rotary means for actuating the doors including a rotary gear wheel having a rim, a portion of which is interrupted; of a rotary pinion meshing with said gear wheel; a ratchet wheel rotatable with said pinion; a locking pawl movable toward and away from said ratchet wheel and engageable therewith to lock the same against rotation; a rotatable member for moving said pawl into locking engagement with said ratchet wheel; and a stop element rotatable with said member, said rim of the gear wheel being in the path of movement of said stop element to be engaged thereby and prevent rotation of said member to a position to lock the pawl to said ratchet wheel, said interrupted portion of the rim of said gear wheel registering with said stop element when the doors have been fully closed, thereby permitting free rotation of said stop element and of said rotatable member to an extent to lock said pawl to the ratchet wheel.

6. In an operating mechanism for hinged doors of dump cars, the combination with rotary means mounted on the car for closing said doors; of a ratchet wheel rotatable with said rotary means; a locking pawl engageable with said ratchet wheel; a wrench-receiving member rotatable with said rotary means and ratchet wheel; adjusting means for moving said pawl into locked engagement with the ratchet wheel; and an operating head for actuating said last-named means, said operating head having an arm swingable therewith toward said member and into blocking relation with respect thereto to prevent application of the wrench when said pawl has been locked to said ratchet wheel by said adjusting means.

7. In an operating mechanism for hinged doors of dump cars, the combination with rotary operating means mounted on the car for closing said doors; of a ratchet wheel rotatable with said operating means; a locking pawl pivoted for swinging movement toward and away from said ratchet wheel; a rotary cam member for moving said pawl into engagement with said ratchet wheel and locking the same in engaged position; a shaft member rotatable with said ratchet wheel and operating means, said shaft member having a wrench-receiving portion; and a manually actuated element rotatable with said cam member, said element having a fixed arm swingable over and engageable with the wrench-receiving portion of said shaft member to block a wrench from application to the wrench receiving portion of said shaft member.

8. In an operating mechanism for hinged doors of dump cars, the combination with rotary operating means including a rotary actuating shaft mounted on said car; of a ratchet wheel fixed to said shaft, said shaft having a projecting portion shaped to receive a wrench to rotate the same; a pivoted pawl swingable toward and away from said ratchet wheel to engage the teeth thereof; a rotary cam member engaging said pawl to move the same toward and away from said ratchet wheel, said cam member being rotatable to a position to lock said pawl in engaged relation with the ratchet wheel; a second rotary actuating shaft to which said cam member is fixed; and an arm on said second-named shaft, said arm being moved to a position over the projecting portion of said first-named shaft to block a wrench from application to the wrench receiving portion of said shaft member when said member has been rotated to said position to lock the pawl.

9. In an operating mechanism for hinged doors of dump cars, the combination with rotary means for closing said doors including a rotary actuating shaft having a ratchet wheel fixed thereto, said shaft having a projecting portion adapted to receive a wrench by which said shaft is rotated; of a pivoted pawl engageable with said ratchet wheel; a rotatably adjustable cam member engaging said pawl for moving the same toward and away from the ratchet wheel, said cam member being rotatably adjustable to positions to hold the pawl completely disengaged from the ratchet wheel, hold it in ratcheting relation with respect to said wheel, and hold it locked to the same; and an arm rotatable with said cam member and engaged over said projecting portion of the shaft when said cam member has been rotated to its adjusted position last named and operable to block application of the wrench to said projecting portion of the shaft.

10. In an operating mechanism for hinged doors of dump cars, the combination with winding means for lifting the doors to closed position; of a rotary gear member having a lost motion connection with said winding means, said gear member having a rim interrupted by an opening; manually actuated rotary means for rotating said gear member including a pinion meshing with said gear member; a ratchet wheel rotatable with said manually actuated means; a locking element movable toward and away from said ratchet wheel and engageable therewith to lock the same against rotation; a manually actuated rotary member for moving said locking element into locking engagement with the ratchet wheel; a dog rotatable with said rotary member and riding on said rim to prevent said rotary member from moving the locking element to locked position,

said gear member being rotated to a position with the opening in the rim thereof in registration with said dog when the doors are fully closed to permit said dog to enter said opening and the rotary member to move said locking element to locked position; and means controlled by the movement of said manually actuated member for blocking access of an operating tool to said manually actuated means when the locking element is in locked position.

11. In an operating mechanism for hinged doors of dump cars, the combination with winding means for lifting the doors to closed position; of manually actuated rotary means for transmitting rotary movement to said winding means, said rotary means including a gear member having a rim interrupted by an opening therethrough; a ratchet wheel rotatable with said manually actuated rotary means; a locking pawl movable into and out of engagement with said ratchet wheel; a manually operated rotary shaft having a cam member thereon for moving said pawl into locking engagement with the ratchet wheel; and a dog fixed to said shaft and riding on the rim of said gear member to prevent said cam member from being rotated to a position to lock the pawl to the ratchet wheel, said dog being movable into the opening of the rim of said gear member when the latter has been rotated to an extent to fully close said doors, thereby releasing said cam member to be rotated to lock the pawl to the ratchet wheel.

12. In an operating mechanism for hinged doors of dump cars, the combination with a rotary winding member for lifting the doors to closed position; of a rotary driving shaft for actuating said winding member; a ratchet wheel fixed to said shaft; a locking pawl engageable with said ratchet wheel; means for moving said pawl toward and away from said ratchet wheel including a cam rotatable to a position to lock the pawl to the ratchet wheel and thereby lock said shaft against rotation, said shaft having a projecting end adapted to receive a wrench for rotating the same; and a movable blocking member for said end of the shaft actuated by rotation of said cam, said blocking member being movable over the end of said shaft by movement of said cam to said pawl-locking position, thereby preventing application of the wrench when the operating mechanism is locked.

13. In an operating mechanism for hinged doors of dump cars, the combination with a rotary winding element for lifting the doors to closed position; of a rotary driving shaft for said winding element, said shaft having an end thereof shaped to receive a wrench; a ratchet wheel fixed to said shaft; a pivoted locking dog swingable into and out of engagement with the ratchet wheel; a manually operated rotary cam

for moving said pawl into engagement with the ratchet wheel, said cam being rotatable to a position to hold the pawl locked to said wheel, thereby holding said shaft against rotation; means for preventing said cam from moving to said pawl-locking position as long as the doors are not fully closed, comprising a member rotatable with said winding element and a dog riding on said member, said dog being rotatable with said cam, said member having a recess therein adapted to register with the dog when the doors have been fully closed to allow clearance for further rotary displacement of the dog and movement of the cam to a position to lock the pawl to the ratchet wheel; and an arm rotatable with said cam for blocking said wrench-receiving end of the shaft when the cam is in locking position with respect to the pawl, thereby preventing application of the wrench.

14. In an operating mechanism for hinged doors of dump cars, the combination with a rotary winding element for lifting the doors to closed position; of a rotary driving shaft for said winding element; a ratchet wheel fixed to said shaft; a pivoted locking pawl swingable into and out of engagement with the ratchet wheel; a manually operated rotary cam for moving said pawl into engagement with the ratchet wheel, said cam being rotatable to a position to lock said pawl against movement away from said ratchet wheel and thereby lock said shaft against rotation; and means for preventing said cam from moving to said locking position as long as the doors are not fully closed, comprising a member rotatable with said winding element and having a rim provided with a recess, and a dog riding on said rim and movable into said recess when said member has been rotated to a position to register said recess with the dog, said member being brought to the last-named position when the doors are fully closed, said dog being rotatable with said cam and swingable into said recess to allow rotary movement of the cam to a position to lock the ratchet wheel.

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