Dec. 31, 1968 K. HADITSCH 3,419,165

APPARATUS AND SYSTEM FOR OPERATING RAILROAD CAR DUMPER DOORS

Filed June 1, 1966 Sheet 1 of 4

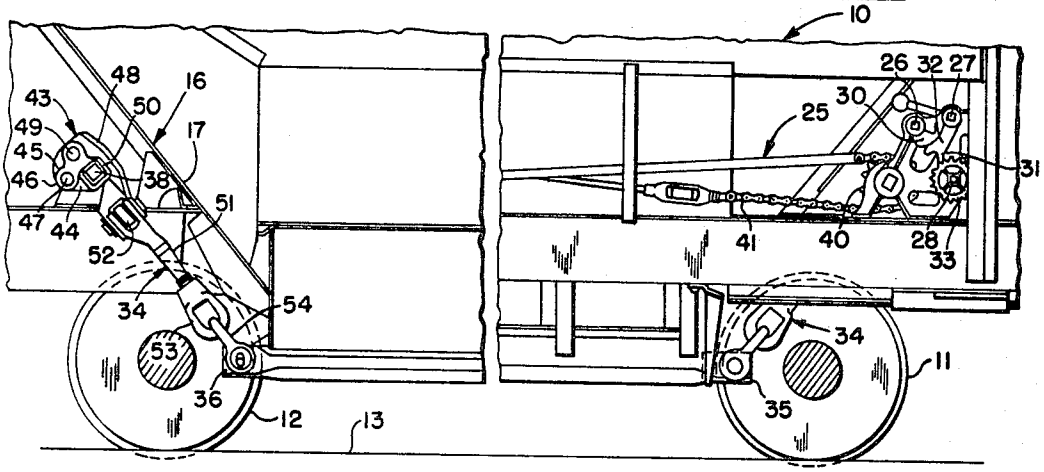

Fig. 1

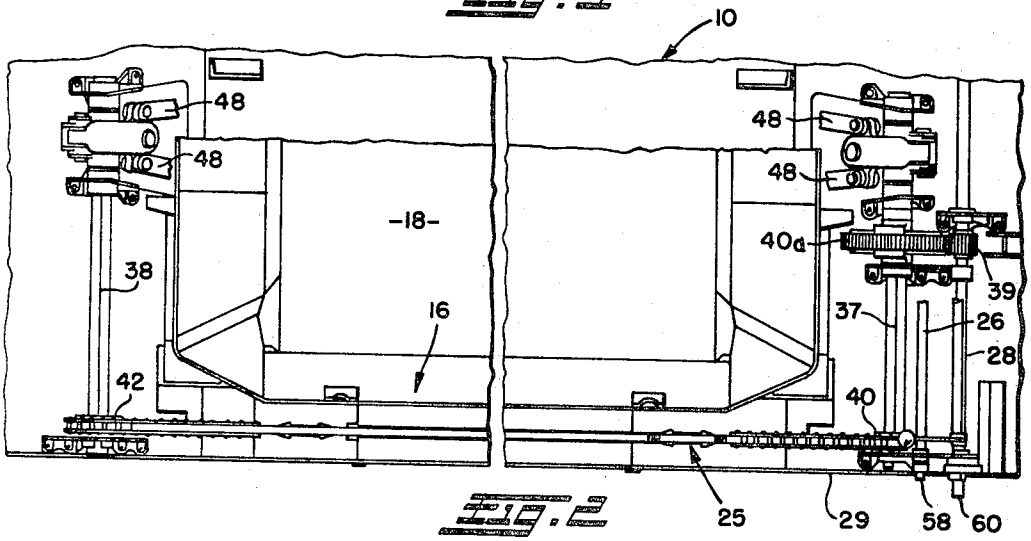

Fig. 2

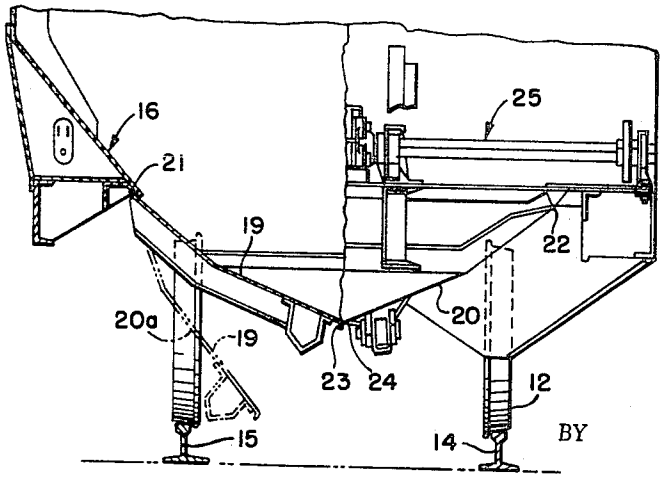

Fig. 3

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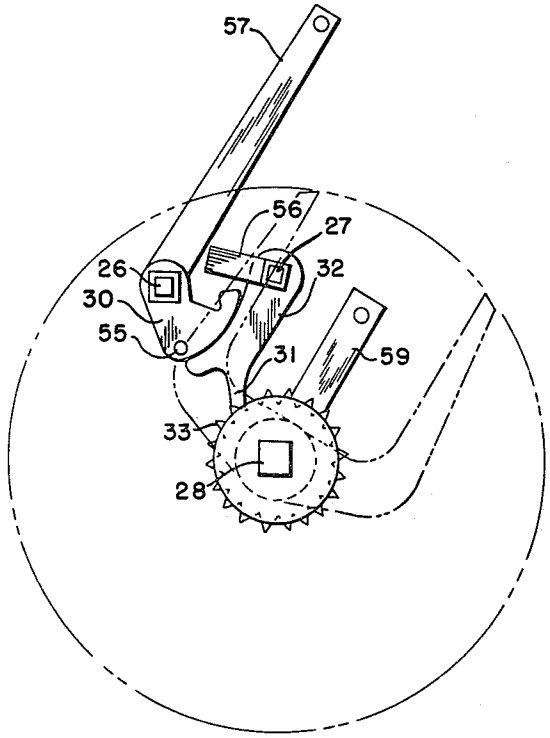

Fig. 4

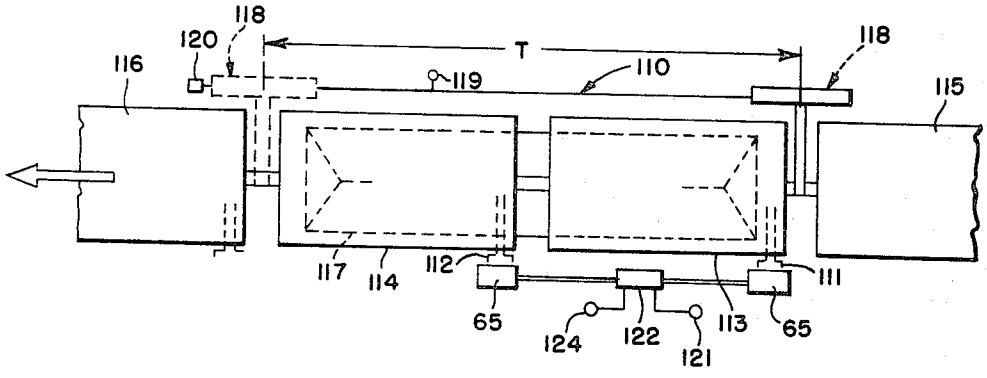

Fig. 5

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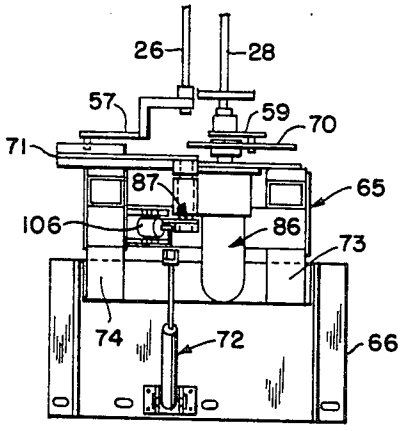

FIG. 6

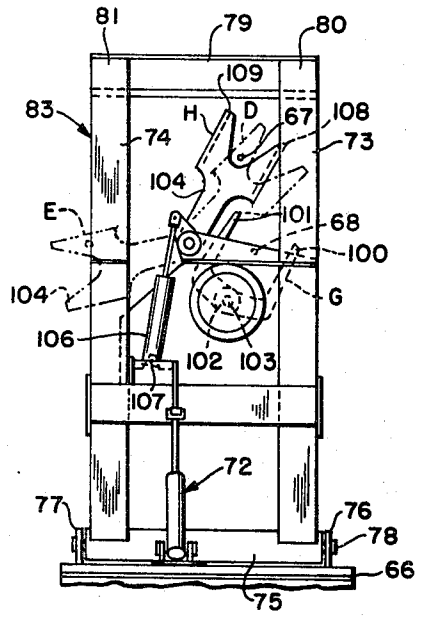

FIG. 7

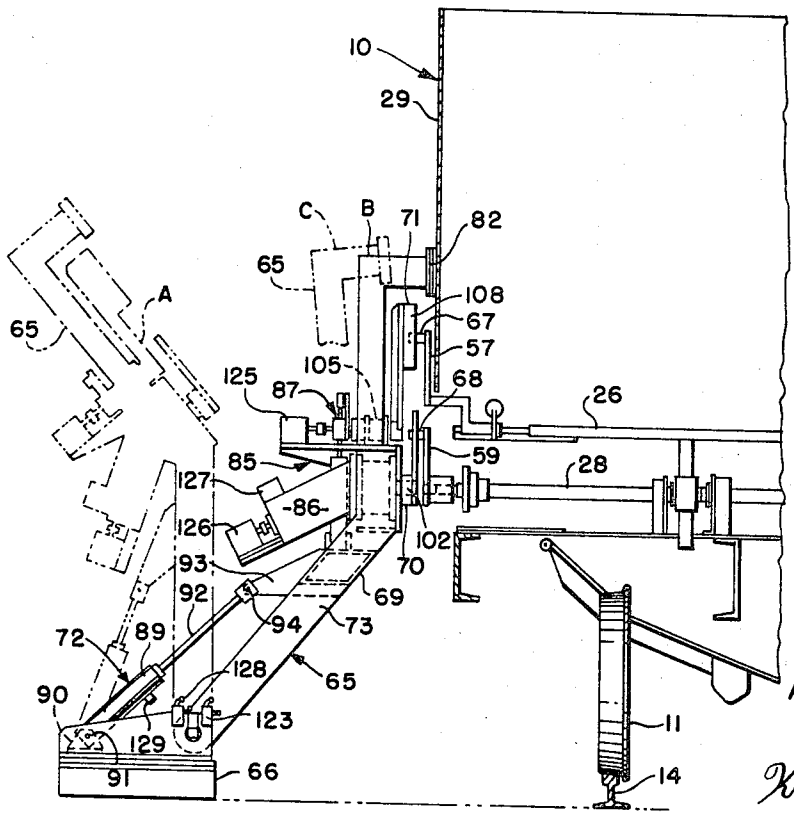

FIG. 5

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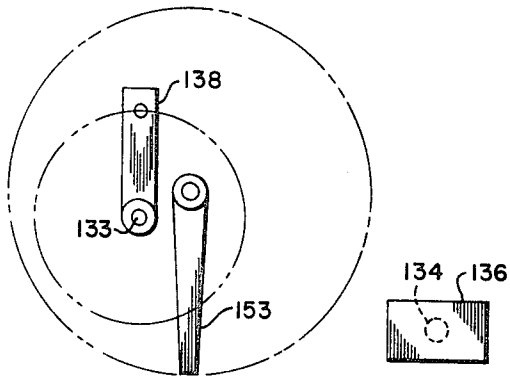

FIG. 9

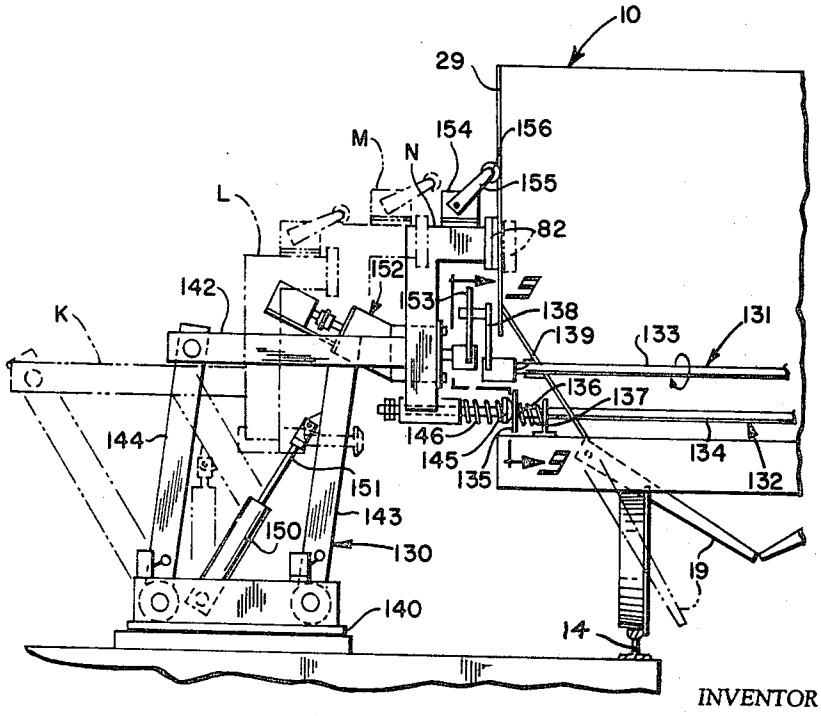

FIG. 10

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3,419,165

APPARATUS AND SYSTEM FOR OPERATING RAILROAD CAR DUMPER DOORS

Karl Haditsch, Seven Hills, Ohio, assignor to McDowell-Wellman Engineering Company, a corporation of Ohio

Filed June 1, 1966, Ser. No. 554,380
18 Claims. (Cl. 214—44)

ABSTRACT OF THE DISCLOSURE

There is provided an apparatus, and a system employing such apparatus, for opening and closing material discharge doors on wheeled, material laden cars, said apparatus including door operating means carried by the car, means for actuating said door operating means separate from the car, and means for positioning the actuating means into operating engagement with the door operating means, and illustrated by its embodiment in a railway dumper car.

This invention relates generally to vehicle unloading, and more particularly to an apparatus and system for operating the dumper doors of a car or vehicle used for hauling material.

The description of the invention is related in reference to a car such as a railroad car, which is movable along a fixed trackway, and utilized for carrying or hauling material such as coal or taconite pellets. These cars further employ car unloading or dumper doors adjacent the trackway, which when open allows the material in the car to move by gravity from the car, through the trackway and into, for example, a hopper disposed below the trackway. The hopper is used to charge material onto a mechanism such as an endless conveyor belt for moving the material away from the dumping site.

The car dumper doors have, in the past, been manually operated, e.g. a shaft extending from the side of the car is manually rotated to operate other mechanisms controlling the opening and closing of the dumper doors. In the past these shafts were rotated manually with wrenches. However, with the advent of powerized equipment, power wrenches are presently employed for rotating these shafts to operate the car dumper doors. In either case, a number of operators are required for operating the mechanisms to open and close the doors. This invention is directed to providing an apparatus for opening and closing car dumper doors, which can be used in a system for automatically unloading railroad cars.

Briefly stated, the invention is in an apparatus for opening and closing dumper doors of a car movable along a fixed trackway and utilized for hauling material. In accordance herewith, there is provided at least one means such as a crank extending from a sidewall of the car, for operating the dumper doors, said crank being moved, or rotated in a predetermined manner to open and close the doors. Also provided is an arm mounted adjacent the trackway for movement towards and away from the car dumper door operating means, or crank when the car is properly positioned on the trackway adjacent the arm. The arm is moved towards the crank to engage it and move, or rotate it in said predetermined manner to open and close the dumper doors.

The following description of the invention will be better understood by having reference to the annexed drawing, wherein:

FIG. 1 is a fragmentary side view and partial section of a railroad car for hauling material showing in particular, a mechanism used for operating railroad car dumper doors;

FIG. 2 is a fragmentary top view of the railroad car of FIG. 1;

FIG. 3 is a fragmentary transverse sectional view of the railroad car of FIG. 1;

FIG. 4 is a fragmentary side view of the dumper door-operating mechanism used in the railroad car illustrated in FIG. 1, adapted for use with an embodiment of the invention shown in FIG. 5;

FIG. 5 is a side view of an embodiment of the invention, and a fragmentary transverse sectional view of the railroad car of FIG. 1;

FIG. 6 is a top view of the embodiment of the invention shown in FIG. 5;

FIG. 7 is a side view of the embodiment of the invention shown in FIG. 5;

FIG. 8 is a diagrammatic illustration of a system for unloading railroad cars;

FIG. 9 is a fragmentary view taken in the plane indicated by the line 9—9 of FIG. 10; and

FIG. 10 is another embodiment of the invention.

Environment of the invention

Referring generally to FIGS. 1–5, and more particularly to FIGS. 1–3, there is shown a conventionally-designed railroad car generally indicated at **10**, for hauling material. The car **10** is mounted on trucks or wheels, e.g. wheels **11** and **12**, which are movable along a fixed trackway **13** composed of parallel rails **14** and **15**.

The interior sides of the car **10**, are sloped to form a hopper **16** in which the material is contained while being hauled in the car **10**. The sides, e.g. side **17**, of the hopper **16** converge toward the hopper bottom **18** which is open.

A pair of hopper doors **19** and **20** are provided to close the open hopper bottom **18**. The hopper doors **19** and **20** are, preferably, hinged along their opposing marginal edges **21** and **22**, respectively, their adjacent marginal edges **23** and **24**, respectively, being in abutting relation when the doors **19** and **20** are closed and covering the open hopper bottom **18**.

The dumper doors **19** and **20** are rotated towards the trackway **13** and away from each other such that the open hopper bottom **18** is free and clear from any obstruction impending the flow of material from the railroad car **10**. The dumper doors **19** and **20** are further positioned, when open (note dotted position indicated at **20***a* of dumper door **19** in FIG. 3), to direct the flow of material, preferably, between the rails **14** and **15** of the trackway **13**. The material in the car hopper **16**, thus moves by gravity through the open dumper doors **19** and **20**, through the trackway **13**, and into a hopper (not shown) disposed below the trackway **13**. As indicated, any suitable mechanism such as an endless conveyor belt is utilized to carry the dumped material from the hopper and dumper site.

This invention is readily adapted for use with any suitable mechanism employing a shaft or shafts extending from the side of the railroad car, and used to operate mechanisms for opening and closing the car dumper doors. One of such mechanisms most commonly used, is generally indicated at **25**.

This door-operating mechanism **25** employs at least three shafts **26**, **27** and **28** extending from the sidewall **29** of the railroad car **10**. The shafts **26**, **27** and **28** are sequentially rotated to operate mechanisms for opening the dumper doors **19** and **20**. For example, the shaft **26** controls the operation of a key, or keeper **30** for holding the tooth **31** of a pawl **32**, in engaging relation with a sprocket **33** for keeping the shaft **28** from rotating.

The keeper **30** is disengaged from the pawl **32** by rotating the shaft **26** in a counterclockwise direction. The tooth **31** of the pawl **32** is disengaged from the sprocket **33** by rotating the shaft **27** in a clockwise direction. The pawl **32** and key or keeper **30** acts as a safety device,

or mechanism for keeping the shaft **28** from rotating, the shaft **28** directly controlling the opening and closing of the dumper doors **19** and **20**.

When the pawl **32** is disengaged from the sprocket **33**, the shaft **28** is rotated in a counterclockwise direction to operate dumper door opening and closing mechanisms **34** coupled to opposing ends of each dumper door **19** and **20**, e.g. ends **35** and **36** of dumper door **19**. The dumper door opening and closing mechanisms **34** are coupled to drive shafts **37** and **38**, which are mounted for rotation adjacent the dumper door ends **35** and **36**.

The shafts **37** and **38** coupled to the door-operating mechanisms **34**, are rotated by any suitable means. For example, a spur gear **39** mounted on the shaft **28**, engages and drives an enlarged spur gear **40***a* mounted on the drive shaft **37**.

A sprocket **40** is mounted on the drive shaft **37** adjacent the car sidewall **29**. A link chain **41**, or any other suitable driving belt, is reeved around the sprocket **40** and a sprocket **42** mounted on the other drive shaft **38**. The link chain **41** is reeved on, and between the sprockets **40** and **42**, such that when the shaft **37** rotates in one direction, the shaft **38** rotates in the opposite direction. In this manner, the dumper doors **19** and **20** are simultaneously opened and closed.

The means for coupling the door opening and closing mechanisms **34** to the shafts **37** and **38** are similar; therefore, their description will be in relation to the coupling means generally indicated at **43**, for coupling mechanism **34** to shaft **38**. The coupling mechanism **43** comprises, a bracket **44** secured to, and extending from the drive shaft **38**. A link arm **45** is pivotally mounted on the bracket end **46** farthest from the shaft **38**, by any suitable means, e.g. pivot pin **47**. The dumper arm **48** is pivotally mounted on the free end of the link arm **45** by any suitable means, e.g. pivot pin **49**. The dumper arm **48** has a recessed portion **50** for matingly engaging and interlocking coaction with the drive shaft **38**. In other words, when the car dumper doors **19** and **20** are closed, the shaft **38** is interlocked in the dumper arm recess **50**. The dumper arm **48** through a series of conventional arms and pivotal connectors **51–54**, is coupled to the dumper door end **36**.

Thus, when the shaft **38** is rotated in a clockwise direction, the link arm **45** forces the dumper arm **48** out of interlocking engagement with the drive shaft **38**. As the shaft **38** is further rotated, the dumper **48** and arm connecting mechanisms **51–54**, through the link arm **45**, moves, or is extended in a direction towards the trackway **13**. In this manner, the car dumper doors **19** and **20** are rotated to their open position.

The dumper arm **48** is re-engaged with the shaft **38** by reversely rotating the shaft **38**, or rotating it in a counterclockwise direction. This causes the dumper arm **48** to move away from the trackway **13**. The drive shaft **38** is rotated until the dumper arm **48** moves over the shaft **38**, and the drive shaft **38** is secured in the dumper arm recess **50**. In this manner, the dumper doors **19** and **20** are closed, or retracted from their open position.

Modification of existing equipment for use with the invention

This conventionally-designed door-operating mechanism **25** presently employed in many railroad cars today, is readily adapted for use with this invention, without impeding its normal use by other mechanisms employed today. The necessary modifications are illustrated in FIG. 4. A pin or bar **55** is secured to, and extends from the keeper **30**. An arm **56** is secured to, and extends from the pawl **32**. A crank **57** is mounted on the shaft end **58**, and extends beyond the car sidewall **29**. Similarly, a crank **59** is mounted on the shaft end **60**, and, similarly, extends beyond the car sidewall **29**. The keeper pin **55** engages and rotates the pawl arm **56** as the keeper **30** is rotated by the shaft **26** and crank **57**. The pawl arm **56** rotates the pawl **32** in a clockwise direction in order to disengage the pawl tooth **31** from the sprocket **33**. The keeper pin **55** and pawl arm **56** are conveniently provided to eliminate a third crank extending from the car sidewall **29**, for operating the shaft **27** to rotate the pawl **32**. In other door-operating mechanisms not described, the mechanism may be so adapted for use with this invention, that only one crank can be utilized for controlling the door opening and closing mechanisms **34**, as well as the safety mechanism such as the pawl **32** and keeper **55**, which are provided to lock the shaft **28** and keep it from rotating.

The invention

The inventive concept is providing an apparatus which will automatically engage and operate the mechanism controlling the operation of the dumper doors. Such an apparatus for operating the dumper door mechanism just described, is generally indicated at **65**. The apparatus **65** is designed to engage and rotate the cranks **57** and **59**, mounted on the shaft ends extending from the car sidewall **29** and used for operating the mechanism for opening and closing the car dumper doors **19** and **20**.

Referring to FIGS. 5–7, the crank-rotating apparatus **65** comprises, a base **66** mounted adjacent the trackway **13** in fixed spaced relation from the adjacent track rail **14**, and within predetermined limits from the car sidewall **29**, and crank arm ends **67** and **68**.

A support or arm **69** is pivotally mounted on the base **66** for movement towards and away from the cranks **57** and **59** protruding from the car sidewall **29**. The support **69** carries means **70** and **71** for engaging and rotating the cranks **59** and **57**, respectively, affixed to shafts **28** and **26**. The support **69** is moved towards and away from the cranks **57** and **59**, and further held in position adjacent thereto such that the crank-operating means **70** and **71** are positioned for rotating the cranks **59** and **57**, respectively, by any suitable means, e.g. hydraulic means **72**.

The support **65** is, preferably, a pair of parallel arms **73** and **74** which are secured to, and extend from a roller **75**. The roller **75** is pivotally mounted between a pair of spaced brackets **76** and **77** secured to, and extending from the base **66**, by any suitable means, e.g. pivot pin **78**. A bar **79** secured on the free arm ends **80** and **81**, holds the rams **73** and **74** in parallel relation.

The bar and arms **73** and **74** form an L-shaped pivot arm generally indicated at **83**, for holding the crank-operating mechanisms **70** and **71** in crank-turning relation to cranks **59** and **57**, respectively. A pad **82** is mounted on the bar **79** for engaging the car sidewall **29**. The pad **82** is conveniently provided to prevent any damage to the car **10** when the pivot arm **83** engages the car sidewall **29**.

A platform generally indicated at **85**, is secured on the support **65** between the support arms **73** and **74**. The crank-rotating means **70** and **71** are each mounted on the platform **85** for rotating the cranks **59** and **57**, respectively. Rotating mechanisms **86** and **87** are provided for rotating the crank rotating means **70** and **71**, respectively. It has been found more suitable to provide individual rotating mechanisms **86** and **87** as the crank rotating means **70** and **71** are sequentially operated to rotate the shafts **26** and **28**. The mechanisms **86** and **87** include electrically or hydraulically-operated motors.

The hydraulic means **72** for moving the support **65** to and from the car **10** on the trackway **13**, comprises a hydraulic cylinder **89**, which is pivotally mounted on a bracket **90** secured to the base **66**, by any suitable means, e.g. pivot pin **91**. A piston **92** extending from the cylinder **89** is pivotally mounted on a bracket **93** secured to the support **65**, by any suitable means, e.g. pivot pin **94**. Thus, the support **65**, or pivot arm **83** are moved to and from the railroad car **10** such that the crank-rotating means **70** and **71** are positioned for engaging the crank handles **59** and **57**, respectively, for rotating the shafts **28** and **26**.

The crank-rotating means **70**, preferably, comprises, a pair of forked or spaced arms **100** and **101** extending from a hub **102** which is mounted on a shaft **103**. The shaft

103 is rotated by the mechanism 86. The arms 100 and 101 are in predetermined spaced relation on either side of the crank arm 68. Thus, when the crank-operating means 70 is rotated in a clockwise direction, the arm 101 engages the crank arm 68 and rotates the crank 59 in one direction. When the crank-operating means 70 is rotated in the opposite direction or counterclockwise, the arm 100 engages the crank arm 68 and rotates the crank 59 in the opposite direction. The arms 100 and 101 are spaced to compensate for misalignments which occur in positioning the crank arm 68 relative to the crank-operating means 70. These misalignments can be caused, for example, by slight differences in the design of the railroad cars 10, worn rails, worn wheels on the railroad cars, improperly positioning the cars, and spring deflection.

The crank-operating means 71, similarly, compensates for discrepancies in positioning the crank arm 67 relative to the crank-operating mechanism 71. The crank-operating mechanism 71 comprises, a crank arm 104 extending from a hub 105, which is rotated by the rotating mechanism 87. The rotating mechanism, preferably, comprises a hydraulic cylinder 106 pivotally mounted on the platform 85 by any suitable means, e.g. pin 107. A pair of plates 108 and 109 are secured to the crank arm 104 in, preferably, parallel relation. The plates 108 and 109 extend from the plane of the crank arm 104, for engaging the crank arm 67 and rotating the crank 57 in a manner similar to the forked arms 100 and 101 of crank-rotating means 70.

System for unloading railroad cars embodying this invention

Referring more particularly to FIG. 8, there is shown a system generally indicated at 110, which utilizes the apparatus 65 of this invention. The system 110 is designed for simultaneously unloading pairs of adjacently disposed railroad cars, e.g. cars 113 and 114, and utilizes a pair of door-operating mechanisms 65. A train of cars, e.g. cars 113–116, are brought to the dumping site by any suitable means, e.g. a diesel locomotive (not shown). The train of coupled care are automatically moved along the trackway 13 towards and away from the dumper, e.g. a hopper 117 disposed below the track way, by any suitable means, e.g. a railroad car pusher generally indicated at 118. The car pusher 118 is designed to move pairs of adjacently disposed cars over the hopper 117. That is, the car pusher 118 travels a distance T equal to two car lengths. When, for example, the cars 113 and 114 are positioned over the hopper 117, their respective shafts 111 and 112 for operating their dumper door mechanisms are positioned adjacent the crank-operating mechanisms 65 of this invention.

Operation of the system

The train of cars are brought to the dumping site such that the first of the chain of cars is positioned adjacent the car pusher 118. A single operator starts the mechanism 119 for controlling the operation of the car pusher 118. The car pusher 118 engages the car and moves it and the next preceding car, e.g. cars 113 and 114, in dumping position over the hopper 117. When the car pusher 118 is at the end of its travel T, it activates a mechanism 120.

The mechanism 120 activates the switch 119 to stop the car pusher 118. The mechanism 120 also activates a mechanism 121 for controlling the pumping of hydraulic fluid from a source of fluid supply 122, to hydraulic means 72 of the crank-operating mechanism 65 adjacent cars 113 and 114. The hydraulic means 72 moves the pivot arm 83 from its disengaged position A (FIG. 5) to its car-engaging position at B (FIG. 5). The hydraulic means 72 moves the pivot arm 83 at a comparatively high rate of speed from its position A to an intermediate position C (FIG. 5) adjacent the car. The hydraulic means 72 continues to move the arm 83 from its position C to its car-engaging position B at a comparatively slower rate of speed to protect the dumper door-operating mechanism 65. The different rates of speed at which the pivot arm 83 moves from position A to B, is controlled by any suitable mechanism, e.g. limit switch 123, which is activated by the arm 83 as it moves from position A to B. The following description is in relation to one of the arms 83 as both arms 83 and apparatus work simultaneously and in unison.

The pusher pad 82, preferably, engages the car sidewall 29. The engagement between the pad 82 and the car sidewall 29, activates a sensing device, e.g. a pressure switch 129. The pressure switch 129 terminates operation of the hydraulic means 72. The arm 83 rests against the car 10 and holds the crank-operating mechanisms 70 and 71 in position for rotating the cranks 59 and 57, respectively.

The pressure switch 129 also activates a mechanism 124 (FIG. 8), for controlling the operation of hydraulic cylinder 106. Hydraulic fluid from the hydraulic fluid source 121 is pumped into the hydraulic cylinder 106 to rotate the arm 104 in a counterclockwise direction. The arm plate 108 engages the crank arm 67 and rotates the crank 57 in a counterclockwise direction from the crank arm position D to crank arm position E (FIG. 7). The shaft 26 is similarly rotated, and the safety mechanism composed of keeper 30 and pawl 32 are disengaged to permit rotating the operating shaft 28. The rotating arm 104 is stopped by any suitable mechanism, e.g. a limit switch 125 (FIG. 5).

The switch 125 deactivates the mechanism 124 to shut off the mechanism 71 for rotating crank 57. The limit switch 125 also activates the mechanism 86 for rotating the crank 59 and shaft 28. The fork arm 100 engages the crank arm 68 and rotates the crank 59 in a counterclockwise direction. The shaft 28 controlling the operation of the dumper doors is similarly rotated, and the dumper doors 19 and 20 opened. The arms 100 and 101 when rotated to open the car dumper doors, activate a mechanism, e.g. limit switch 126 (FIG. 5).

The limit switch 126 shuts off the mechanism 86 for rotating the crank 59 and shaft 28. The limit switch 126 also activates a timer 127 which allows the material within the car hoppers 16 to move by gravity into the hopper 117 disposed below the trackway 13. After the predetermined time period has lapsed, the timer 127 reactivates the mechanism 86 for rotating the crank 59 and shaft 28.

The fork arm 101 engages the crank arm 68 and rotates the crank 59 in a clockwise direction. The shaft 28 is similarly rotated and the car dumper doors 19 and 20 closed. When the dumper doors 19 and 20 are closed, the mechanism is reversed and the fork arm 101 returned to its normal crank arm engaging position G. The hydraulic cylinder 106 is reactivated to rotate the arm 104. The arm plate 109 engages the crank handle 67 and rotates the crank 57 in a clockwise direction from crank arm position E to crank arm position D, thus, similarly rotating the shaft 26 to re-engage the safety mechanism, i.e. keeper 30 and pawl 32. When the safety mechanism is re-engaged, the hydraulic cylinder 106 is reversed and the arm 104 returned to its normal crank arm engaging position H.

The movement of the arm 104 into the position H, activates the limit switch 125 to shut off the mechanism 87 for rotating the crank 57. The mechanism 125 also activates the mechanism 121 for controlling the hydraulic means 72 for rotating the pivot arm 83 into and out of engagement with the car sidewall 29. The direction in which the piston 92 moves, is reversed and the crank-operating means 70 and 71 are rotated out of engagement with the cranks 59 and 57, respectively.

The pivot arm 83 is rotated to position A. The pivot arm 83 as it moves to position A, activates a mechanism, e.g. limit switch 128, mounted on the base 66. The pivot

arm 83 also reactivates the limit switch 123 which, in turn, activates the switch 119 for controlling the operation of the car pusher 118.

The car pusher 118 is returned to its initial position for engaging the train of cars and moving the cars 113 and 114 from the hopper 117. In doing this, the next preceding pair of undumped cars are moved over the hopper 117. The method is repeated until all of the cars of the train of cars are dumped. Thus, the dumping operation is completely automatic except for initially starting the car pusher 118.

Referring more particularly to FIGS. 9 and 10, there is shown another embodiment of the invention generally indicated at 130, designed to engage and operate another type dumper door-operating mechanism generally indicated at 131. In the previously described embodiment or apparatus 65, the crank 57 and shaft 26 were initially rotated to disengage the pawl tooth 31 from the toothed sprocket 33, in order to rotate the shaft 28 and operate the dumper doors 19 and 20. This safety mechanism for locking the dumper door-operating shaft 28 is provided to keep the dumper doors from being inadvertently opened. The present embodiment or apparatus 130 is designed for use with a different safety mechanism generally indicated at 132 (not a part of this invention), which engages the shaft 133 for operating the car dumper doors, e.g. door 19. A shaft 134 for operating the safety mechanism 132, similarly extends from the car sidewall 29. The shaft 134 is moved axially rather than rotated, to engage and disengage the safety mechanism 132 from the dumper door operating shaft 133.

An enlarged pushing plate 135 is secured on the free end 136 of the shaft 134. The plate 135 also acts to compensate for misalignment of operating parts caused, for example, by variations in positioning the cars over the hopper. A coil spring 137 surrounding the shaft 134 and engaging the plate 135, is provided to bias the pushing plate 135 in a direction which keeps the safety mechanism 132 engaged with the main dumper door-operating shaft 133.

A crank 138 similar to crank 57, is provided on the shaft end 139 for rotating the dumper door-operating shaft 133.

The apparatus 130 essentially comprises a base 140 which is similarly mounted adjacent the trackway and in predetermined spaced relation from the adjacent track rail 14. An arm 142, or a pair of similar parallel arms are provided for carrying mechanisms to oeprate the shafts 133 and 134. The arm or arms 142 are, preferably, mounted for parallelogrammatic movement in relation to the base 140. This is accomplished by pivotally mounting the arm or arms 142 on a pair or pairs of parallel, equal length support members 143 and 144 which in turn, are pivotally mounted on the base 140.

The arm 142 similarly carries a pad 82 for engaging the railroad car sidewall 29. The arm 142 carries a ram 145 for engaging the pushing plate 135 and axially moving the shaft 134. The ram 145 is, preferably, biased towards the plate 135 by a coil spring 146. The ram 145 engages the pushing plate 135 as the arm 142 is moved towards the railroad car sidewall 29 by any suitable means, e.g. a hydraulic cylinder 150 pivotally mounted on the base 140. A shaft 151 extending from a piston (not shown) reciprocable in the hydraulic cylinder 150 is pivotally mounted on the support member 143. Thus, the support member 143 is rotated about the base 140. The support member 143, in turn, moves the arm 142 towards the railroad car sidewall 29.

The arm 142 carries a mechnism generally indicated at 152, for rotating the crank 138 secured to the main dumper door-operating shaft 133. The mechanism 152 differs from the previously described mechanism for engaging and rotating the crank 57, in that a single arm 153 (FIG. 9) is used for engaging and rotating the crank 138 rather than the bifurcated arm type crank rotating mechanism 104 (FIG. 7). The single arm 153 is similarly rotated, for example, counterclockwise to engage the crank 138 and rotate the shaft 133 to open the dumper doors. However, in this case the single arm 153 must be rotated approximately 360° in a clockwise direction before it is in a position to engage the crank 138 and rotate the shaft 133 to close the dumper doors. This is essentially, the main operational difference between using the two types of arms for operating the dumper door operating shaft, e.g. shaft 133. This is simply a matter of timing and not difficult to achieve.

The car dumping operation using the apparatus 130 is esentially the same as the previously described system with the exception that as the arm 142 moves towards the railroad car sidewall 29, the ram 145 engages the pushing plate 135 to disengage the safety mechanism 132 from the main operating shaft 133. Thus, the operation for positioning the mechanism 152 relative to the crank 138, and disengaging the safety mechanism 132 controlling the operation of the dumper door-operating shaft 133, have been combined to save valuable operating time.

The dumper door-operating apparatus 130 is similarly moved from its restive position K through positions L and M to its railroad car engaging position N. Whereas the previously described embodiment utilized a limit switch of the pressure type when the pad 82 engaged the railroad car sidewall 29, this embodiment uses a limit switch 154 having an arm 155 with an attached roller 156, extending from, and pivotally mounted on the switch 154.

The roller 156 engages the railroad car sidewall 29 and rotates the limit switch arm 155 to a predetermined position where, for example, electrical circuitry operating the movement of the arm 142 towards the railroad car sidewall 29 is broken when the arm 153 is properly positioned to engage and rotate the crank 138, and electrical circuitry for operating the dumper door crank operating mechanism 152 is closed to begin operation of the arm 153 to rotate the crank 138 in order to open the dumper doors. Otherwise the operation of the car unloading system is generally the same as in the previously described system.

Thus, there has been provided a new and novel apparatus for automatically controlling the operation of car dumper doors used to unload material from a car mounted on a fixed trackway. This apparatus is particularly well suited for use in the above-described system for automatically unloading one or a plurality of cars of a chain of cars.

What is claimed is:

1. An apparatus for opening and closing dumper doors of a car movable along a fixed trackway for hauling material, comprising in combination:
   (a) at least one shaft extending from a car on the trackway, for operating the dumper doors, the shaft rotated in a predetermined manner to open and close the dumper doors;
   (b) an arm mounted adjacent the trackway for movement towards and away from the shaft extending from the car;
   (c) means coacting between the arm and shaft for engaging and rotating the shaft in the predetermined manner to open and close the dumper doors; and
   (d) means carried by the arm for abutting engagement with the side of the car to stop movement of the arm and to position the shaft-engaging and rotating means into operating engagement with the door operating shaft.

2. The apparatus of claim 1, wherein the shaft-engaging and rotating means, includes:
   (e) a crank secured to the shaft; and
   (f) means mounted on the arm for engaging and rotating the crank, whereby the shaft is rotated and the dumper doors opened and closed.

3. The apparatus of claim 2, wherein the crank-engaging and rotating means (f), includes:

(g) a pair of spaced arms for engaging a pin extending from the crank, one arm engaging the crank pin to rotate the crank in one direction, the other arm engaging the crank pin to rotate the crank in the opposite direction.

4. In combination:

(a) a fixed trackway;

(b) at least one car movable along the trackway, the car having at least one dumper door adjacent the trackway through which material in the car is dumped;

(c) means spaced from the car and trackway for receiving material dumped from the car;

(d) at least one shaft for operating the car dumper door, extending from a sidewall of the car, the shaft rotated in a predetermined manner to open and close the dumper door;

(e) an arm mounted adjacent the trackway for movement towards and away from the shaft extending from the car sidewall;

(f) means coacting between the arm and the shaft for rotating the shaft to open and close the car dumper door; and

(g) means carried by the arm for abutting engagement with the side of the car to stop movement of the arm and to position the shaft-engaging and rotating means into operating engagement with the door operating shaft.

5. The combination of claim 4, wherein the shaft-rotating means, includes:

(h) a crank mounted on the shaft, and extending from the car sidewall; and

(i) means carried by the arm for engaging and rotating the crank, whereby the shaft is rotated to open and close the dumper doors.

6. The combination of claim 5, wherein the crank-rotating means, includes:

(j) a pair of spaced arms for engaging a pin extending from the crank, one arm engaging the crank pin to rotate the crank in one direction, the other arm engaging the crank pin to rotate the crank in the opposite direction.

7. A system for unloading material from a train of cars movable along a fixed trackway, the material in each car being dumped from at least one dumper door adjacent the trackway into means disposed below the trackway for receiving material dumped from the cars, said system comprising in combination:

(a) means for sequentially positioning each of said train of cars, over the material-receiving means below the trackway in response to the unloading of an adjacent preceding car;

(b) an arm mounted adjacent the trackway for movement towards and away from a car on the trackway, the movement of the arm towards the car being responsive to the positioning of the car over the material-receiving means;

(c) means carried by the arm for positioning the arm relative to the positioned car on the trackway, said means responsive to compressive engagement with an adjacent sidewall of the car; and

(d) means coacting between the arm and a shaft extending from the adjacent sidewall of the car on the trackway, for rotating the shaft to open and close a dumper door of the car, said means responsive to the positioning of the arm relative to the car sidewall.

8. The system of claim 7, which includes:

(e) means for moving the arm away from the car on the trackway in response to the unloading of the car and the closing of the dumper door.

9. The system of claim 8, wherein the shaft-rotating means (d), includes:

(f) a crank mounted for rotation with the shaft, the crank extending from the sidewall of the car positioned on the trackway; and

(g) means carried by the arm for engaging and rotating the crank.

10. The system of claim 9, wherein the crank-engaging and rotating means, includes:

(h) a pair of spaced arms for engaging a pin extending from the crank, one arm engaging the crank pin to rotate the crank in one direction, the other arm engaging the crank pin to rotate the crank in the opposite direction.

11. An apparatus for operating dumper doors of railroad cars movable along a fixed trackway, comprising in combination:

(a) an arm mounted in predetermined relation adjacent the trackway for engaging the sidewall of a railroad car positioned on the trackway adjacent the arm;

(b) means carried by each railroad car for opening and closing the dumper doors on the car;

(c) means carried by the arm for engaging and operating said dumper door opening and closing means; and

(d) means carried by the arm for abutting engagement with the side of the car to stop movement of the arm and to position the shaft-engaging and rotating means into operating engagement with the door operating shaft.

12. The apparatus of claim 11, wherein the means carried by each car includes a crank secured to a shaft extending from the care sidewall, and the means carried by said arm includes separate means for engaging and rotating the crank.

13. The apparatus of claim 12, wherein the means carried by each car also includes a second shaft extending from the car for operating a safety mechanism to keep the other shaft and crank from being rotated and the means carried by the arm includes a ram for engaging and axially moving the second shaft such that the safety mechanism is disengaged and the dumper door operating shaft and crank can be rotated.

14. An automatically controlled system for opening and closing dumper doors of railroad cars when they are positioned on a trackway and over a hopper for receiving material cascading from the cars when their dumper doors are open, comprising in combination:

(a) a first shaft carried by each railroad car, said first shaft being movable in a predetermined manner to open and close the dumper doors of said car;

(b) a safety mechanism carried by each railroad car for engaging said first shaft to keep said first shaft from being inadvertently moved;

(c) a second shaft carried by each railroad car, said second shaft being moved in a predetermined manner to disengage the safety mechanism from said first shaft;

(d) an apparatus for moving said first and second shafts, fixedly mounted in predetermined relation adjacent the trackway and hopper, said apparatus including:

(1) an arm mounted for movement towards and away from the sidewall of each car positioned on the trackway and in material dumping relation to the hopper, said arm being moved for engagement with and disengagement from a car sidewall;

(2) a first means carried by the arm, for engaging and moving the second of said shafts carried by said cars, in said predetermined manner; and

(3) a second means also carried by the arm, for engaging and moving the first of said shafts carried by said cars, in said predetermined manner, said second means being responsive to said safety mechanism being disengaged from said first shaft.

15. The system of claim 14, which includes a crank mounted on the free end of the first shaft, and the second

means carried by the arm includes separate means for engaging and rotating the crank.

16. The system of claim **15**, wherein the first means carried by the arm includes means for engaging and axially moving the second of said shafts.

17. The system of claim **15**, wherein the first means carried by the arm includes means for rotating the second of said shafts.

18. An apparatus for operating dumper doors of railroad cars movable along a fixed trackway, comprising in combination:

(a) an arm mounted in predetermined relation adjacent the trackway for engaging the sidewall of a railroad car positioned on the trackway adjacent the arm;

(b) means carried by each railroad car for opening and closing the dumper doors on the car and including a crank secured to a shaft extending from the car sidewall, and including a second shaft extended from the car for operating a safety mechanism to keep

the other shaft and crank from being rotated; and

(c) means carried by the arm for engaging and operating said dumper door opening and closing means including separate means for engaging and rotating the crank, and including a ram for engaging and axially moving the said second shaft such that the safety mechanism is disengaged and the dumper door operating shaft and crank can be rotated.

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