United States Patent

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[72] Inventors **Eduardo M. Damy;**
Sergio Rene Damy, Apartado Postal 2041,
Guadalajara, Jalisco, Mexico

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[45] Patented **June 28, 1971**

[54] **SELECTIVELY ACTUATED HOPPER CAR DOORS**
6 Claims, 11 Drawing Figs.

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105/239, 105/253, 105/279, 105/283, 105/292, 105/300, 105/306, 105/311

[51] **Int. Cl.** **B61d 7/18,**
B61d 7/26, B61d 19/00

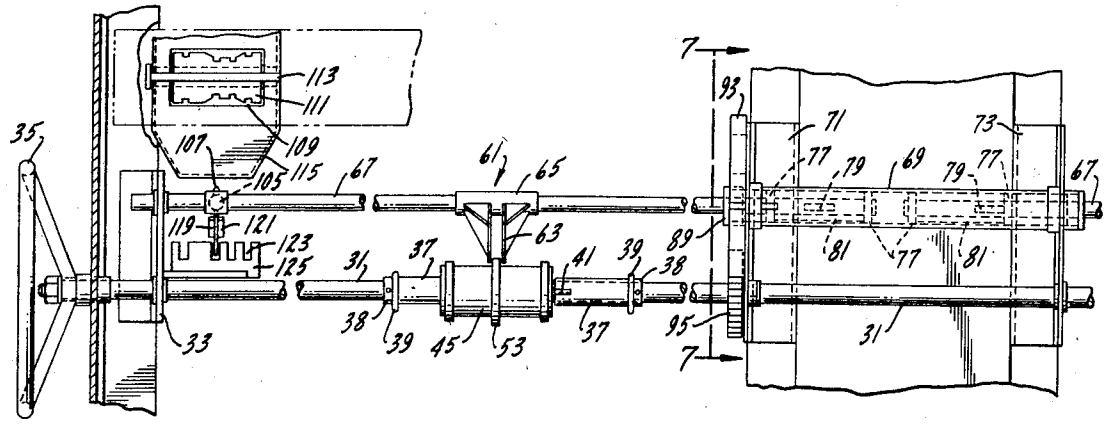
[50] **Field of Search** 105/295;
105/239, 253, 279, 283, 287, 292, 300, 306, 311

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Primary Examiner—Arthur L. La Point
Assistant Examiner—Howard Beltran
Attorney—Parker, Carter and Markey

ABSTRACT: A railroad hopper car of the ballasting type in which each discharge chute is closed by two doors which can be operated independently of one another. The doors of each chute are located on opposite sides of one of the rails on which the car is riding. A selector mechanism is provided to select either one, both or neither of each pair of doors for operation upon rotation of a common operating shaft. A pair of doors and a selecting and operating mechanism for a discharge chute comes in a package which can be removably connected to a discharge chute of a hopper car.



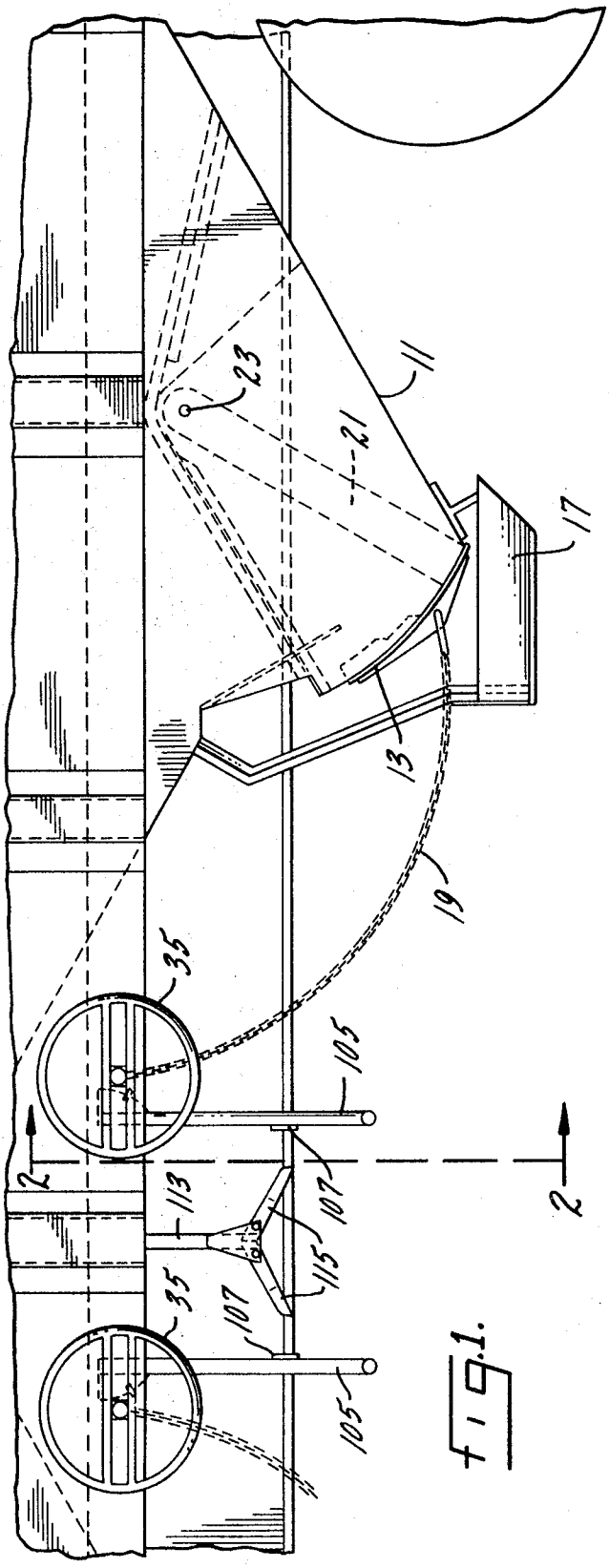
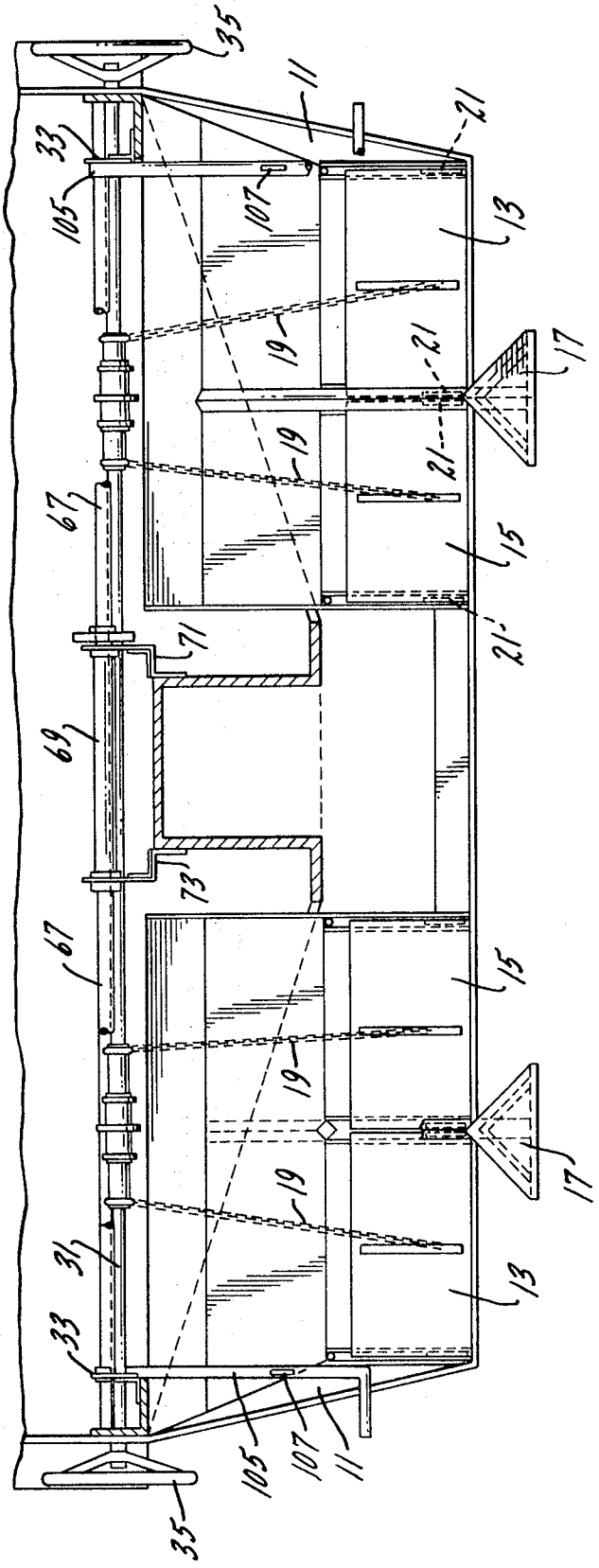


FIG. 1.

INVENTORS.
EDUARDO M. DAMY
SERGIO RENE DAMY
BY Parker, Carter & Markey
Attorneys.



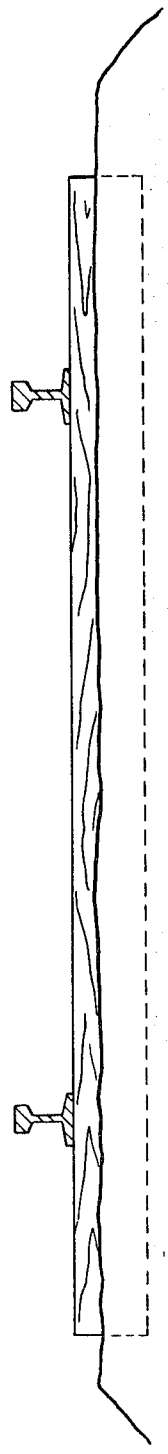


FIG. 2.

INVENTORS.
EDUARDO M. DAMY
SERGIO RENE DAMY
BY Parker, Carter & Markey
Attorneys.

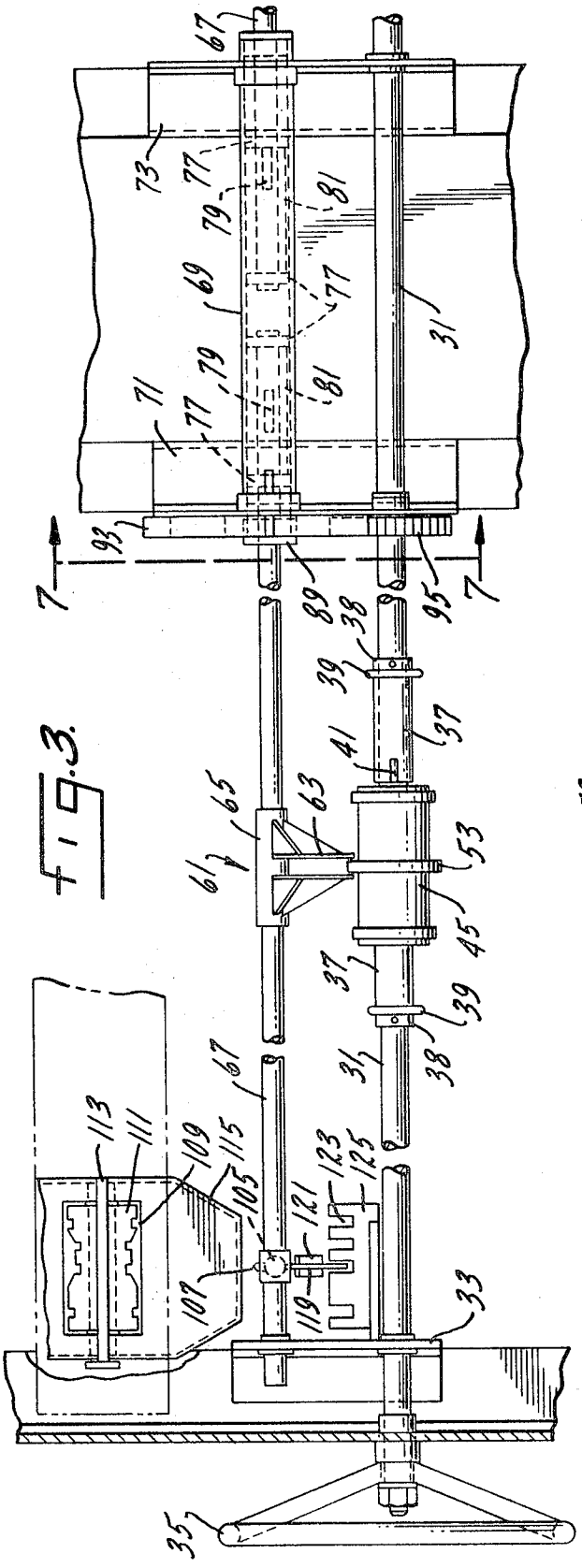


FIG. 3.

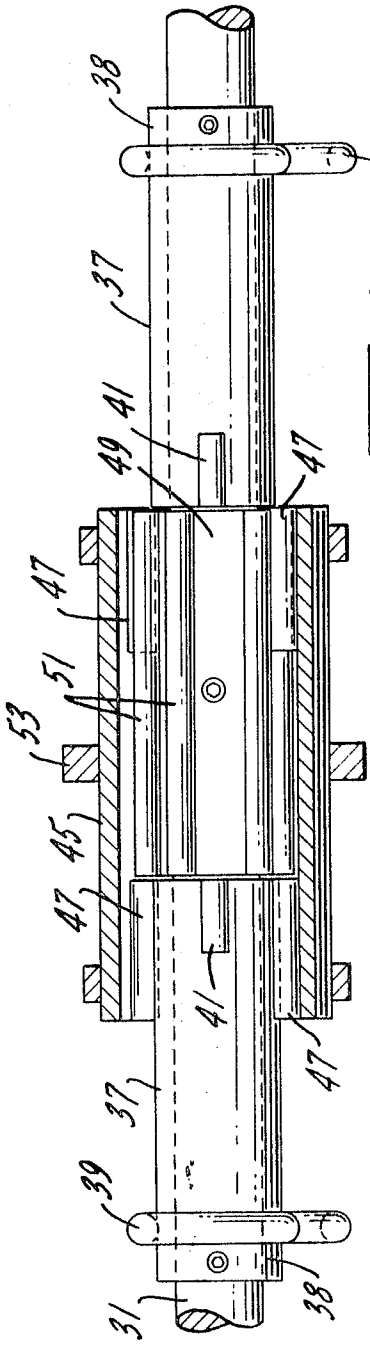


FIG. 4.

INVENTORS.
EDUARDO M. DAMY
SERGIO RENE DAMY
BY Parker, Carter & Markey
Attorneys.

fig. 5.

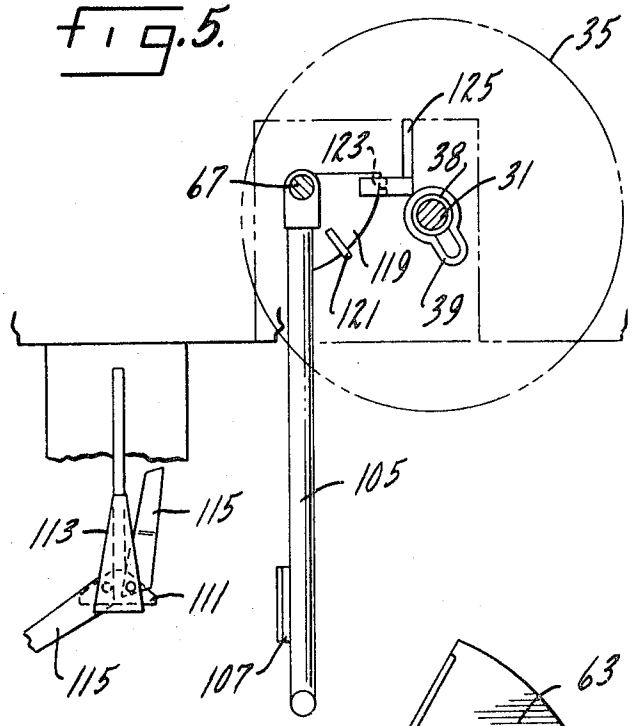


fig. 6.

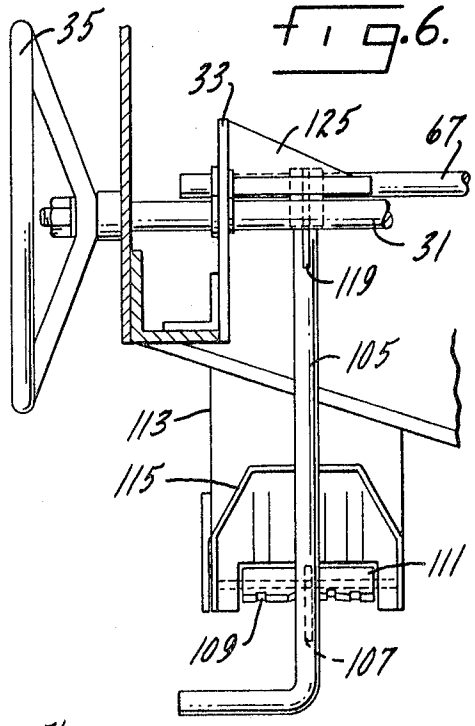
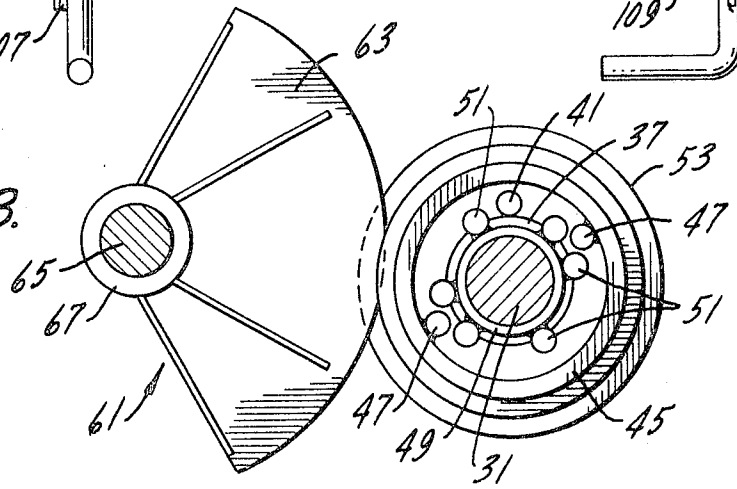


fig. 8.



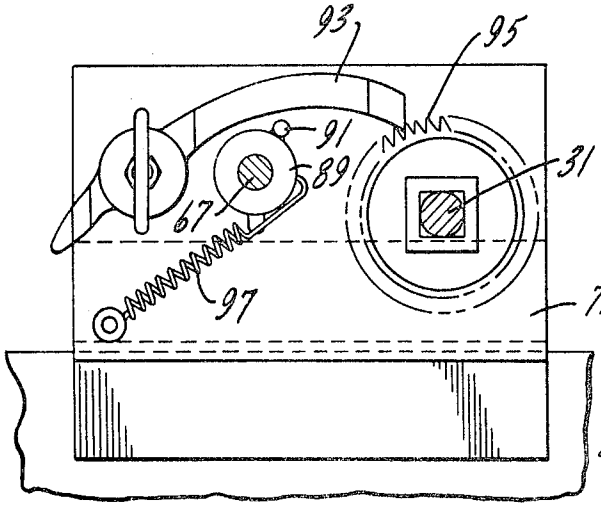


fig. 7.

INVENTORS.
EDUARDO M. DAMY
SERGIO RENE DAMY
BY Parker, Carter & Markey
Attorneys.

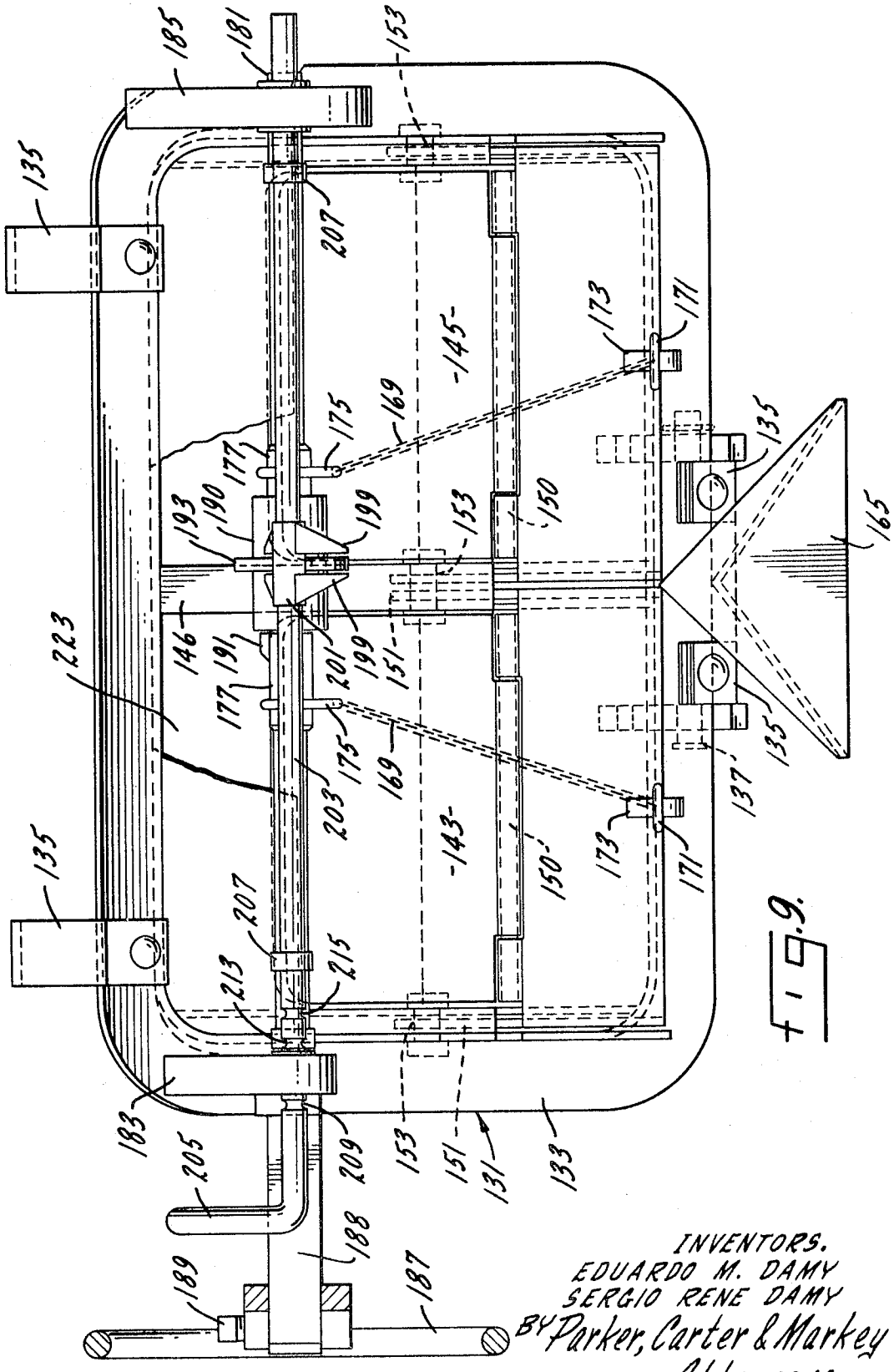
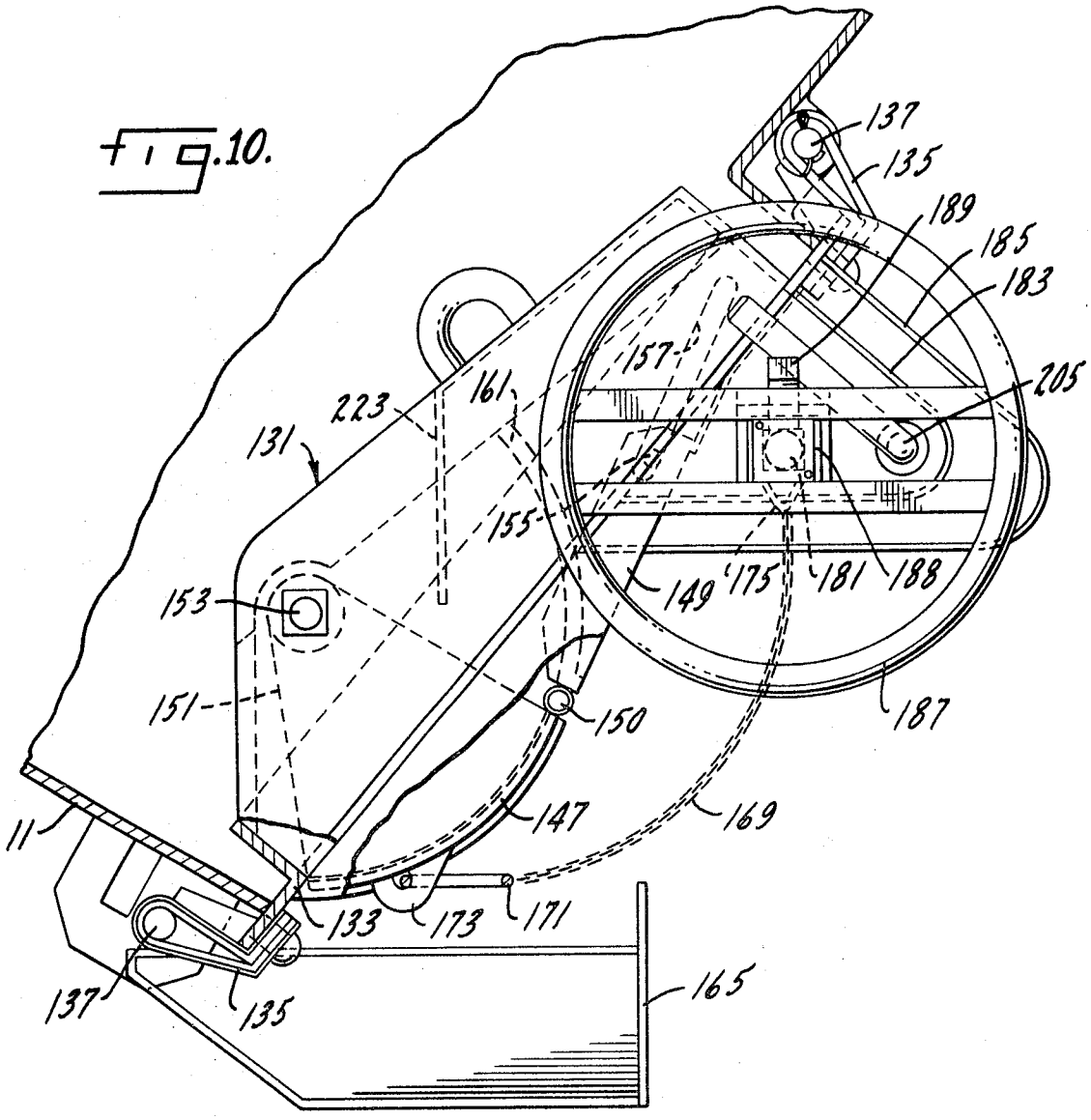


FIG. 9.

INVENTORS.
EDUARDO M. DAMY
SERGIO RENE DAMY
BY Parker, Carter & Markey
Attorneys.

fig. 10.



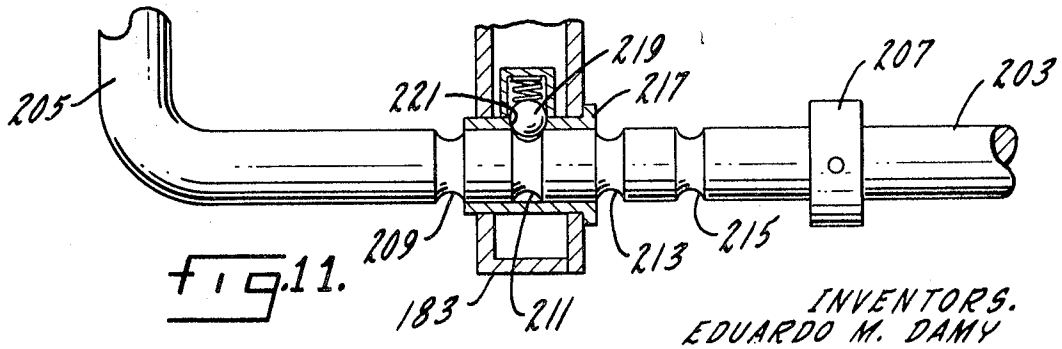


fig. 11.

INVENTORS.
EDUARDO M. DAMY
SERGIO RENE DAMY
BY Parker, Carter & Markey
Attorneys.

SELECTIVELY ACTUATED HOPPER CAR DOORS

SUMMARY OF THE INVENTION

This invention relates to a railroad hopper car of the ballasting type and more particularly to such a car having a plurality of discharge doors located across the width of the car and a mechanism for selectively operating one or more of the doors.

An object of this invention is a selector mechanism for selectively operating either one or both of a pair of doors of a discharge chute.

Another object is a door-operating mechanism adapted to open one or more of side-by-side doors of a ballasting car.

Another object is a selector mechanism which indicates the door or doors selected to be operated.

Another object is a door-operating mechanism arranged so that all of the doors extending across a car can be opened or closed from either side of the car.

Another object is a selector mechanism which can be positively locked in each selected position.

Another object is a ballasting car in which the amount of opening of each door can be controlled.

Another object is a ballasting car having a discharge chute located over each rail with each discharge chute having a pair of doors and in which the doors of each pair are located on opposite sides of a rail.

Another object is a ballasting car in which the discharge chute doors swing by gravity to closed positions and are lifted by chains to open positions.

Another object is a conversion unit for a hopper car including a pair of side-by-side doors and a selecting and operating mechanism for these doors arranged in a unit which can be easily connected to and removed from an existing hopper car.

Another object is a sliding ballasting door that folds upon opening.

Other objects may be found in the following specification, claims and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated more or less diagrammatically in the following drawings wherein:

FIG. 1 is a partial side elevational view of a ballasting car embodying the novel features of this invention;

FIG. 2 is a partial view taken along line 2–2 of FIG. 1;

FIG. 3 is a partial top plan view of the door selecting and operating mechanism;

FIG. 4 is an enlarged partial cross-sectional view of a portion of the door selecting and operating mechanism;

FIG. 5 is an enlarged partial end elevational view of the door-selecting mechanism;

FIG. 6 is an enlarged partial side elevational view of the door selecting and operating mechanism;

FIG. 7 is a view taken along line 7–7 of FIG. 3;

FIG. 8 is an enlarged cross-sectional view of a portion of the door selecting and operating mechanism;

FIG. 9 is a front elevational view of a modified embodiment of the invention;

FIG. 10 is a side elevational view of the embodiment of FIG. 9 with parts broken away and others shown in cross section; and

FIG. 11 is an enlarged partial view of the selecting mechanism of FIG. 9 with portions shown in cross section.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 of the drawings show a railroad hopper car of the type used for applying ballast to a railroad track. A typical ballasting car has inclined discharge chutes 11 arranged in pairs positioned across the width of the car. The outlet opening of each chute is controlled by a pair of swinging doors 13 and 15, 13 being the outboard door and 15 the inboard door. A diverter 17 is located beneath each discharge chute and is positioned between the doors in order to separate the material discharged from the door. The doors 13 and 15 are lifted upwardly to open by chains 19. The doors will close of their own weight when the chains are released. As can be best seen in FIG. 1, each door is supported by a pair of arms 21 which are pivotably connected to pivot rods 23.

A door selecting and operating mechanism is provided to permit the opening and closing of the individual doors of each discharge chute. The door-operating mechanism includes a rod 31 which extends across the width of the car and is journaled adjacent its opposite ends in brackets 33 attached to the car. Hand wheels 35 for rotating the rod are connected to the opposite ends of the rod. As shown most clearly in FIG. 4, a sleeve 37, which telescopes over the rod 31, is provided for each of the doors 13 and 15 with each sleeve fixed against movement along the length of the rod 31 by a collar 38 but mounted to be free to rotate about the rod. A chain-connecting ring 39 is fastened to each sleeve. A lug 41 is also attached to each sleeve adjacent one end thereof.

A selector sleeve 45 telescopes over the rod 31 and the ends of the sleeves 37 to which the outwardly projecting lugs 41 are attached. The selector sleeve 45 is provided with inwardly projecting lugs 47 at each end thereof. The lugs at each end are located 180° apart and extend along the tube less than half the length thereof so that there is a spacing between the lugs at center of the sleeve.

A third sleeve 49 is secured to the rod 31 between the sleeves 37. Lugs 51 are attached to the outer surface of this sleeve and these lugs are adapted to mesh with the lugs 47 of the selector sleeve. The lugs 47 of the selector sleeve in turn mesh with the lugs 41 on the chain support sleeves so that by selective positioning of the selector sleeve, rotation of the rod 31 may be transferred to either one or both of the chain support sleeves to thereby operate either one or both doors 13 and 15 of a discharge chute 11.

The movement of the selector sleeve 45 along the shaft 31 is accomplished by a selector mechanism. The selector mechanism, generally designated as 61, engages a guide ring 53 which is attached to the outer surface of the selector sleeve 45. A selector mechanism for the doors of one discharge chute is shown in FIGS. 3, 5, 6, 7 and 8. A similar selector mechanism is provided for each discharge chute.

The door selector mechanism 61 includes a pair of generally fan-shaped tines 63 which are fastened to and extend radially from a sleeve 65. The sleeve 65 is fastened to a rod 67 which extends part way across the hopper car. One end of the rod 67 is journaled in a bracket 33 mounted near the outside of the car and the other end fits in a tubular member 69 which is supported on brackets 71 and 73 attached to the car frame at the center thereof. The rod 67 is mounted so that it also may be shifted back and forth across the car. To maintain alignment of the rod during this shifting, a pair of bearing rings 77 are attached to the end of the rod that fits within the tubular member 69. These bearing rings are spaced apart and are located on opposite sides of an internal stop lug 79 on the inside of the tubular member 69. An arcuate portion of each bearing ring 77 is removed to permit insertion of the rod 67 into the tube 69 past the internal stop 79. To limit angular rotation of the rod 67, a strap 81 extends between the annular bearing rings 77 and is positioned to engage the stop 79.

As can be seen most clearly in FIG. 7, a collar 89 is secured to the shaft 67 adjacent the bracket 71. This collar carries a projection 91 which is adapted to contact a pawl 93. The pawl 93 engages a ratchet wheel 95 attached to the shaft 31. The collar 89 is biased by a spring 97 to hold the projection 91 away from contact with the pawl 93.

A handle 105 for shifting and rotating the shaft 67 is shown in FIGS. 1, 2, 5 and 6. An indicator 107 is attached to one side of the handle near the bottom thereof. The indicator can be moved into engagement with any one of a number of notches 109 formed in a door selection template 111. A single template is provided for two handles on the same side of the car and has a series of notches 109 formed on each side thereof. The position selector template is attached to the car by means of a support bracket 113. Stop members 115 are pivotably attached to the support bracket 113 to prevent the handles and

position indicators 107 from being moved into engagement with the notches on the template. As is shown most clearly in FIG. 5, the stop members are pivotably connected to the support bracket 113 so that they may be swung out of the way to permit movement of the handles and indicators into engagement with the notches in the templates.

As depicted in FIGS. 3, 5 and 6, a quadrant-shaped plate 119 is affixed to each rod 67 adjacent its handle 105. This plate is equipped with a stop member 121 for limiting rotation of the rod 67. The plate fits into notches 123 formed in a selector guide 125 which guide is fixed to the bracket 33. The notches 123 in the selector guide are aligned with the corresponding notches 109 in the template 111.

A modified form of the invention is shown in FIGS. 9, 10 and 11 of the drawings. This modified form is arranged as a package which may be readily attached to a discharge chute of a standard hopper car to convert the hopper car into a ballast car. The conversion package includes a framework 131 which fits inside an opening formed in the discharge chute 11 of a hopper car. Formed as part of the framework is a flange 133 which fits flush against the discharge chute. Attached to the bottom and top of the flange are loops 135 which are adapted to receive pins 137 fastened to the hopper car for connecting the conversion package to the hopper car in the manner shown in FIG. 10. The door-selecting mechanism and door-operating mechanism are mounted on the framework 131 so that the entire conversion package can be attached to or removed from a discharge chute of a hopper car by the insertion or removal of three pins, 137, into or out of the loops 135.

An outboard door 143 and an inboard door are separated by a flange 146. Each door includes a lower arcuate section 147 and an upper planar section 149 connected by a pivot rod 150. Each arcuate door section 147 is mounted on fan shaped arms 151 which are pivoted on pins 153 mounted in the framework 131. The upper planar door sections have guide pins 155 projecting from the upper side edges thereof which guide pins ride in linear slots 157 formed in the framework 131. Arcuate slots 161 are formed in the framework to receive the edges of the lower arcuate door sections 147. A diverter 165 is attached to the flange 133 between and below the discharge doors.

Chains 169 are attached to loops 171 which extend through eyes 173 attached to the lower arcuate door sections 147 as by welding. The opposite ends of the chains are attached to chain connecting rings 175 which are affixed to sleeve 177 forming a part of a door-selecting and operating mechanism.

The door selecting and operating mechanism includes an operating rod 181 which extends across the framework 131 and is journaled in housings 183 and 185 mounted on the flange 133. An operating wheel 187 is mounted on the operating shaft outwardly of the housing 183. This wheel may be located in several operating positions relative to the shaft. These positions are located by spring biased ball checks (not shown) which fit into indentations (not shown) in the handle housing 188. A large setscrew 189 is provided to lock the wheel and its housing in the inward position shown in FIGS. 9 and 10. The operating shaft extends through the sleeves 177 and through a tubular gear (not shown) which is also secured to the shaft between the sleeves 177. This tubular gear is similar to the tubular gear 49 of the previously described embodiment. A selector sleeve 190 telescopes over the operating shaft 181 and is slidable to engage lugs 191 of either one or both of the sleeves 177. The selector sleeve is equipped with an outer annular flange or ring 193.

The movement of the selector sleeve 190 along the shaft 181 is accomplished by a selector mechanism which includes a pair of generally fan-shaped tines 199 which are fastened to and extend radially from a sleeve 201. The sleeve is fastened to a selector rod 203 which extends across the framework 131 and is journaled in the housings 183 and 185. One end of the selector rod is bent to form a handle 205 for manipulating the rod. The selector rod 203 is mounted so that it may be shifted back and forth across the framework. Collars 207 are affixed to the rod inside of the housings 183 and 185 to limit the movement of the shaft relative to these housings.

The selector sleeve 190 can be moved to any one of four predetermined operating positions by movement of the selector rod 203. The four operating positions are indicated by the circumferential grooves 209, 221, 213 and 215 formed in the shaft 203 adjacent the handle 205. A sleeve 217 surrounds the shaft 203 where it passes through the housing 183. A spring biased detent ball 219 extends part way through an opening 221 in the sleeve to fit into one of the circumferential slots for positioning the selector shaft.

A ratchet wheel similar to ratchet wheel 95 may be affixed to shaft 181 in the housing 185. Also, a pawl similar to pawl 93 may be mounted in this housing. For releasing the pawl, a collar similar to collar 89 is attached to operating shaft 203 with the collar having a projection similar to projection 91 for engaging and lifting the pawl upon rotation of the handle 205 in a clockwise direction as viewed in FIG. 10. A spring similar to spring 97 may also be provided to keep the projection out of contact with the pawl. To permit the shaft 203 to be slid across the framework relative to the collar containing the projection, a longitudinal slot may be cut in the shaft adjacent the collar and a key attached to the collar may fit into the slot but these details are not shown in the drawings.

The use, operation and function of this invention are as follows:

A railroad hopper car of the ballasting-type containing the novel features of this invention is shown in FIGS. 1 and 2. The ballasting doors are shown in their closed positions and the door selector mechanism is positioned so that operation of the hand wheel 35 will open the outboard door 13 on the left-hand side of the car as viewed in FIG. 2.

The selector sleeve shifting mechanism can be repositioned by raising the handle stop 115 to the position shown in FIG. 5 and by swinging the handle clockwise as viewed in this drawing until the quadrant plate 119 clears the selector guide 125. The rod 67 may then be slide transversely of the car until the handle indicator 107 aligns with the desired notch 109 in the template 111. Then, the handle is swung counterclockwise until the quadrant plate 119 fits into a notch 123 in the selector guide 125.

The sliding movement of the rod 67 during this positioning will move the selector sleeve 45 because of the engagement between the tines 63 on the rod 67 and the ring 53 on the sleeve 45. With the selector sleeve in the position shown in FIGS. 3 and 4, the internal lugs 47 of the selector sleeve will mesh with the external lugs 41 on the chain winding sleeve 37, which sleeve holds the chain for the outboard door 13. The other set of internal lugs 47 on the selector sleeve 45 will mesh with the external lugs 51 on the sleeve 49 affixed to the rod 31. As a result of this meshing, rotation of the hand wheel 35 and the attached shaft 31 will be transmitted through the sleeve 49 to the selector sleeve 45 and then to the chain winding sleeve 37, bringing about a lifting of the outboard door 13. When the door is raised to its desired position, rotation of the hand wheel 35 is stopped, the pawl 93 engaging the ratchet wheel 95 will prevent the shaft 31 from rotating in a reverse direction and will thereby hold the door open.

When a door of the hopper is opened, the material carried in the hopper will discharge through that door, in this case the outboard door 13, and will strike the diverter 17 to fall on the outboard clockwise of the left-hand rail as viewed in FIG. 2. When the hopper has emptied or when it is desired to close the open door 13, the selector handle 105 is moved in a counterclockwise direction as viewed in FIG. 5. As the selector handle is rotated in this counterclockwise direction, the projection 91 on the collar 89 attached to the shaft 67 will engage the pawl 93, thereby lifting the pawl out of engagement with the ratchet wheel 95. See FIG. 7. Upon release of the ratchet wheel, the weight of the door will rotate the shaft in a clockwise direction, as viewed in FIG. 7, unwinding the chain and thereby allowing the door to close. The amount of closing of the door may also by controlled or stopped at any time by

returning the selector handle **105** to its vertical position. This will remove the projection **91** from lifting contact with the pawl **93** and allow the pawl to engage the ratchet wheel **95** to stop rotation of the shaft **93**.

Other positions of the selector sleeve shifting mechanism **61** relative to the selector guide **125** will vary the pattern of door operation. For example, if the handle **105** is shifted so that the quadrant plate **119** is located in the notch **123** of the selector plate on the far left-hand side of FIG. **3**, the lugs **47** of selector sleeve **45** will not mesh with either set of lugs **41** on the chain winding sleeves **37**. Therefore, neither set of doors will be opened upon rotation of the hand wheels **35**. If the selector mechanism **61** is shifted so that the quadrant plate is located in the notch **123** located second from the right, as viewed in FIG. **3**, the selector sleeve **45** will be shifted so that its lugs **47** will mesh with the lugs **41** on both of the chain winding sleeves **37**. Therefore, rotation of the shaft **31** will open both sets of doors **13** and **15**. If the selector mechanism is shifted so that the quadrant plate **119** fits in the notch **123** of the selector plate on the far right-hand side as viewed in FIG. **3**, only the inboard door **15** will be opened upon rotation of the shaft **31**.

It is important to note that there is a door-selecting mechanism on each side of the car for each pair of doors on a chute. However, the shaft **31**, which extends completely across the car, is used to operate one or both pairs of doors from either side of the car. The man operating the car can set the door selector on one side of the car, then go to the opposite side of the car and set the other door selector, and then open both sets of doors by turning one handle **35**.

The modified embodiment of the invention shown in FIGS. **9, 10** and **11** is intended for conversion of existing hopper cars to ballasting cars. To that end, a pair of inboard and outboard doors **143** and **145** and the door selecting and operating mechanism are mounted on a framework **131** which can be installed in the opening of a standard discharge chute on a hopper car after the hopper doors are removed. Connection of this framework to the existing hopper car involves only the installation of locking pins **137** through straps **135** attached to the flange **133** at the top and bottom of the framework. This framework also carries its own diverter **165** for distributing the ballasting materials on opposite sides of the rail.

The operation of the door-selecting mechanism of this embodiment is very similar to the operation of the mechanism shown in FIGS. **1** through **8**, inclusive. The ballasting doors **143** and **145** are shown in their closed positions in FIGS. **9** and **10**. The door selector mechanism is positioned so that operation of the hand wheel **187** will open the inboard door **145** or the door on the right-hand side, as viewed in FIG. **9**. These doors are selected by sliding the rod **203** until the detent ball check **219** moves into the annular groove **211** in the selector rod **203**. Because the tines **199** engage the selector sleeve ring **193**, movement of the selector rod to this position moves the selector sleeve **190** into engagement with the lug **191** on the sleeve **177**. The chain from door **143** is attached to this sleeve.

With the rod **203** thus positioned, the hand wheel **187** may be turned in a counterclockwise direction, as viewed in FIG. **10**, to rotate the operating shaft **181**. Winding of the chain **169** around the operating shaft **181** will lift the lower arcuate section **147** of the door to pivot this section around the pivot pins **153**. As the lower section of the door is lifted, the upper planar section thereof will move upwardly as guided in slots **157**. As the lower arcuate door portion swings upwardly about its pivot pins **153**, the hinge **159** will move in an arc generally following the path of slot **161** thereby moving the lower part of the planar door section inwardly. When in the open position, the doors are protected against the ballast flowing down the discharge chute by the baffle plate **223**. The weight of the planar door section **149** aids in closing the door upon release of the chain **169**.

Whereas preferred forms of the invention have been shown and described, it should be understood that there are many modifications, changes and substitutions that may be made by one skilled in the art without departing from the fundamental theme of the invention.

We claim:

1. A mechanism for selectively opening and closing the discharge doors of a railroad hopper car of the type having at least one discharge chute and a pair of discharge doors for each such chute, including:

a door-operating shaft extending at least part way across the width of said hopper car and journaled for rotation about its longitudinal axis,

a separate sleeve mounted on said operating shaft for each discharge door with each sleeve free to rotate relative to said operating shaft and fixed against movement along the length of said operating shaft,

a chain connected to each of said sleeves and extending between such sleeve and its respective discharge door with each chain arranged to be wound around its sleeve to raise and open its door and to be unwound from its sleeve upon lowering and closing of said door by gravity,

a selector sleeve mounted on said operating shaft and movable along the operating shaft into and out of interlocking engagement of the operating shaft with said chain sleeves, and

means to move said selector sleeve into and out of operative engagement with said chain sleeves.

2. The structure of claim **1** further characterized in that said means to move said selector sleeve into and out of interlocking engagement with said chain sleeves includes a pair of spaced tines adapted to be moved transversely across the hopper car.

3. The structure of claim **2** further characterized in that said pair of spaced tines are mounted on a rotatable shaft which is slidable transversely of the hopper car, and

means are located at least at one side of the hopper car to indicate the position of the selector sleeve.

4. The structure of claim **3** further characterized in that said selector sleeve is movable between a first position in which it is free to rotate without rotating a chain-supporting sleeve,

a second position in which it engages and rotates a first of said chain-supporting sleeve,

a third position in which it engages and rotates said first and a second chain-supporting sleeves, and

a fourth position in which it engages and rotates only said second chain-supporting sleeve.

5. The structure of claim **4** further characterized in that said means to indicate the position of said selector sleeve includes;

an indicator member and a notched template member,

one of said members being operatively connected to the tine support rod, and

the other of said members being attached to said hopper car.

6. The structure of claim **5** further characterized in that said means to indicate the position of said selector sleeve includes:

a plurality of spaced annular grooves formed in said tine supporting rod and a detent member mounted on said hopper car and engageable with said slots.