March 19, 1968 E. J. DE RIDDER 3,373,700

RAILWAY CAR DOOR OPERATING MECHANISM

Filed April 29, 1964 4 Sheets-Sheet 1

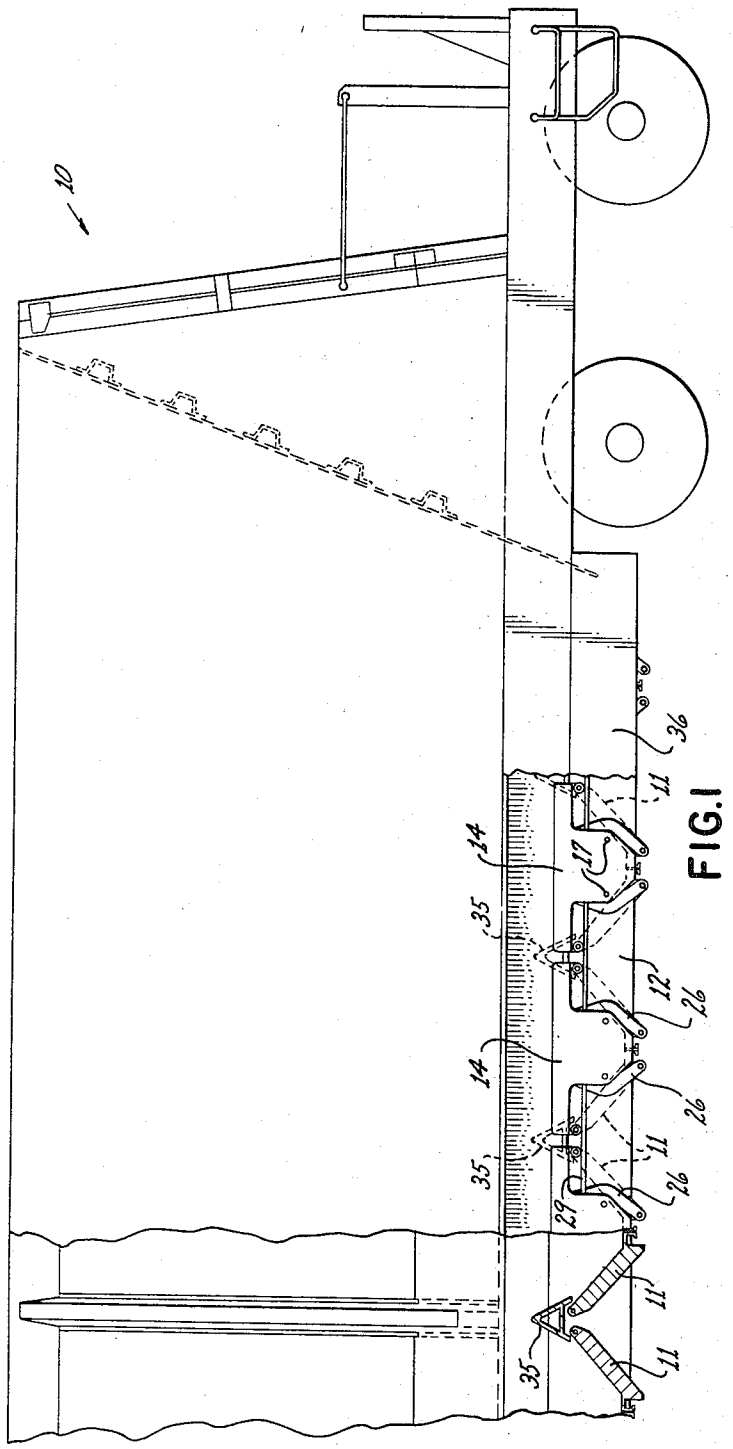


FIG. 1

INVENTOR
ERNST J. DeRIDDER

BY Glenn, Palmer & Matthews

HIS ATTORNEYS

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Filed April 29, 1964 4 Sheets-Sheet 2

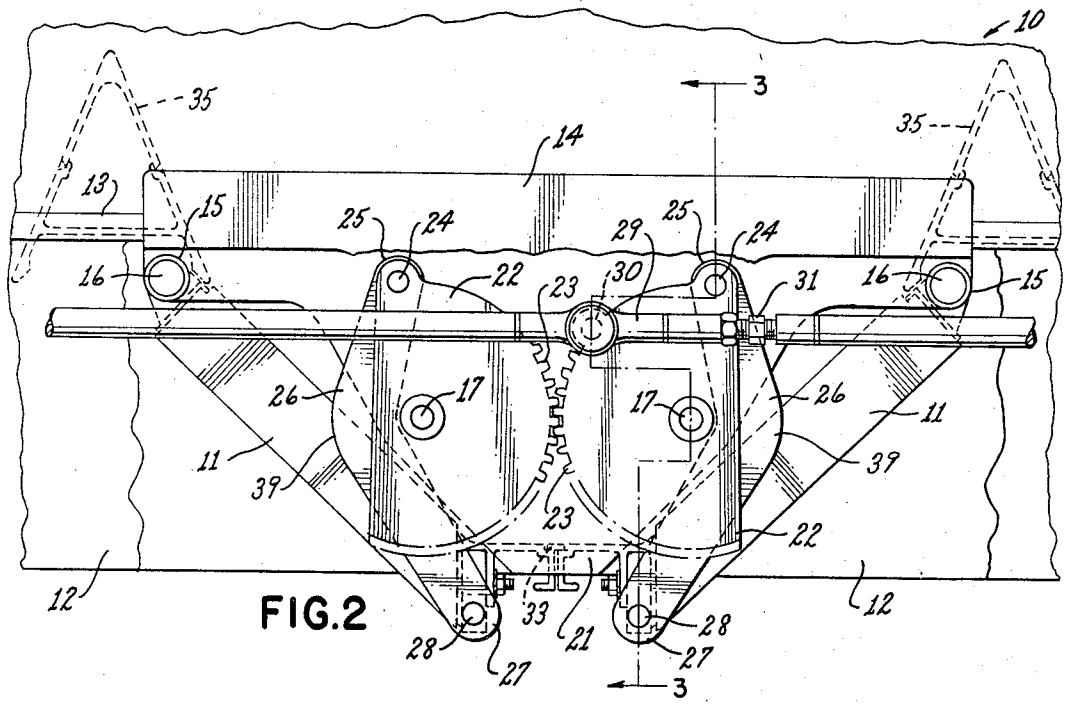


FIG.2

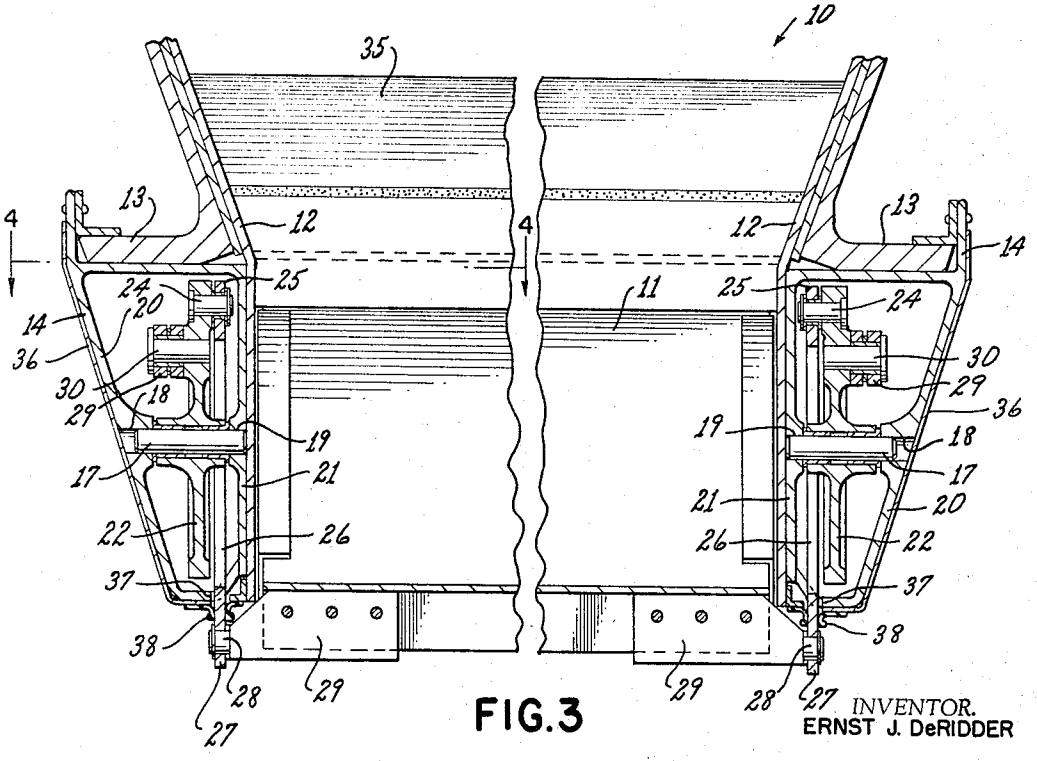


FIG.3

INVENTOR.
ERNST J. DeRIDDER

BY Glenn, Palmer & Matthews

HIS ATTORNEYS

March 19, 1968 E. J. DE RIDDER 3,373,700

RAILWAY CAR DOOR OPERATING MECHANISM

Filed April 29, 1964 4 Sheets-Sheet 3

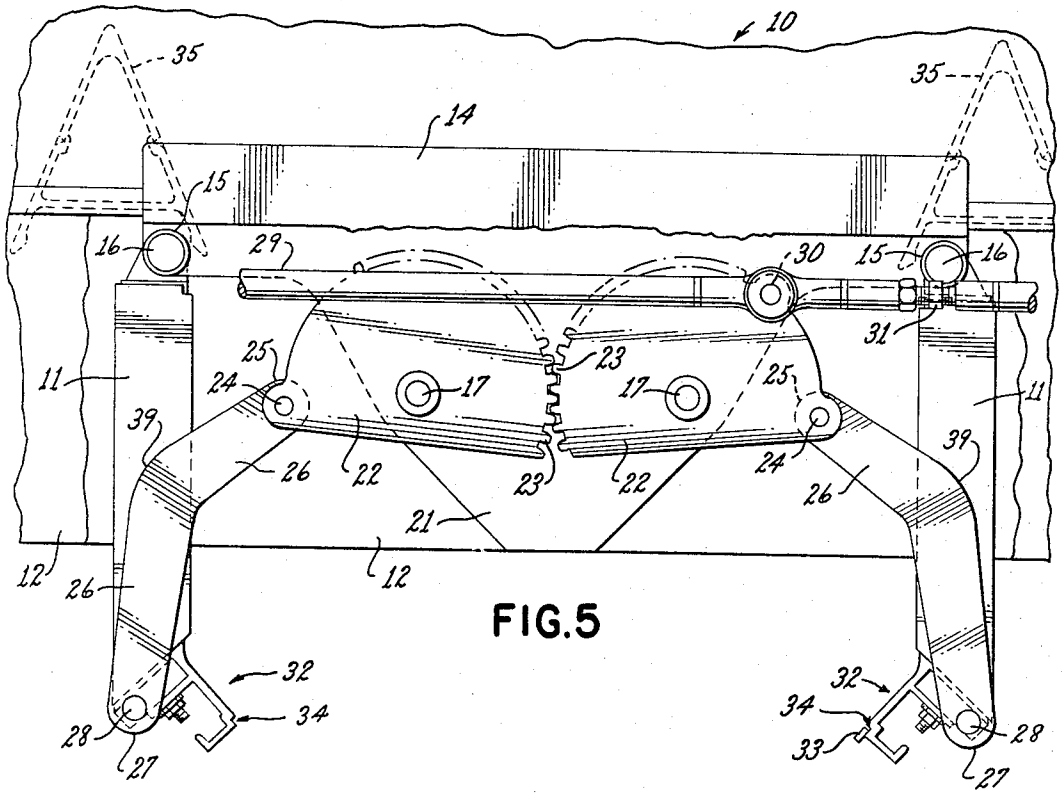


FIG.5

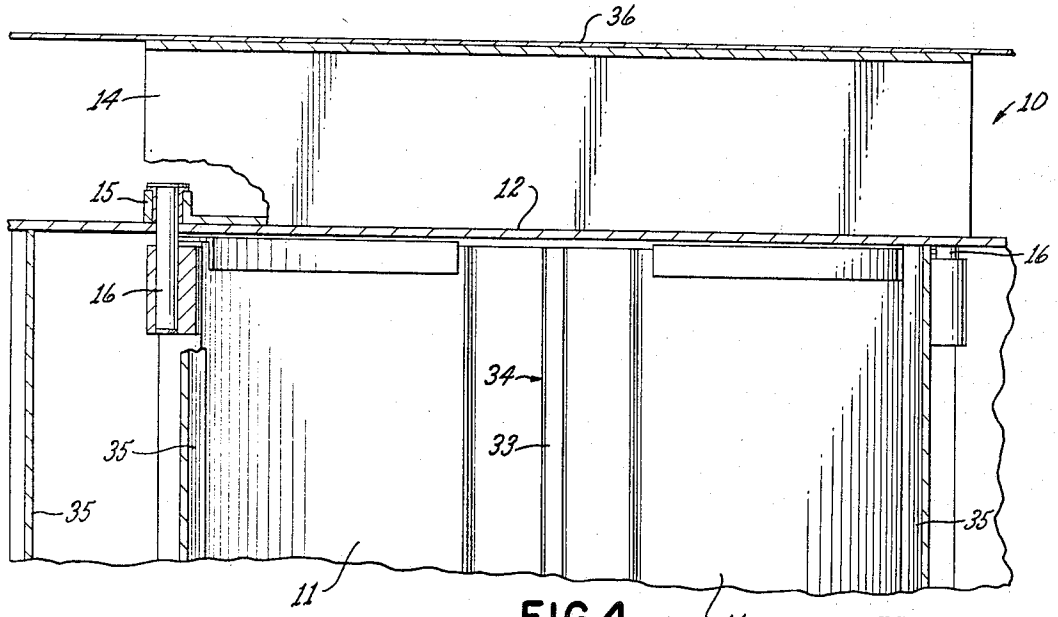


FIG.4

INVENTOR.
ERNST J. DeRIDDER

BY Glenn, Palmer & Matthews

HIS ATTORNEYS

March 19, 1968 E. J. DE RIDDER 3,373,700

RAILWAY CAR DOOR OPERATING MECHANISM

Filed April 29, 1964 4 Sheets-Sheet 4

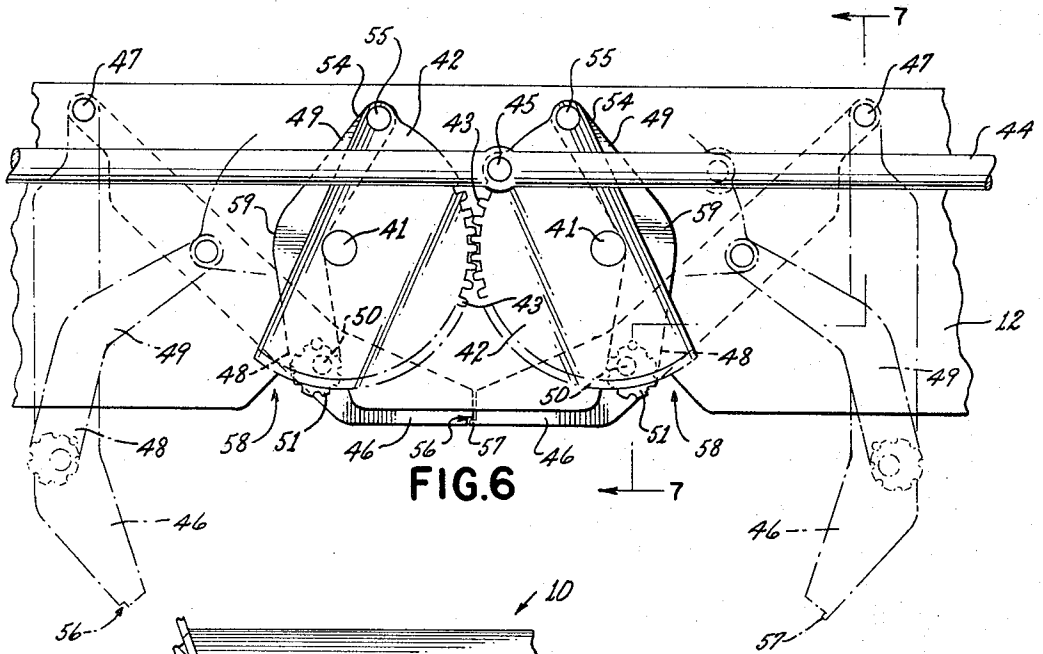


FIG.6

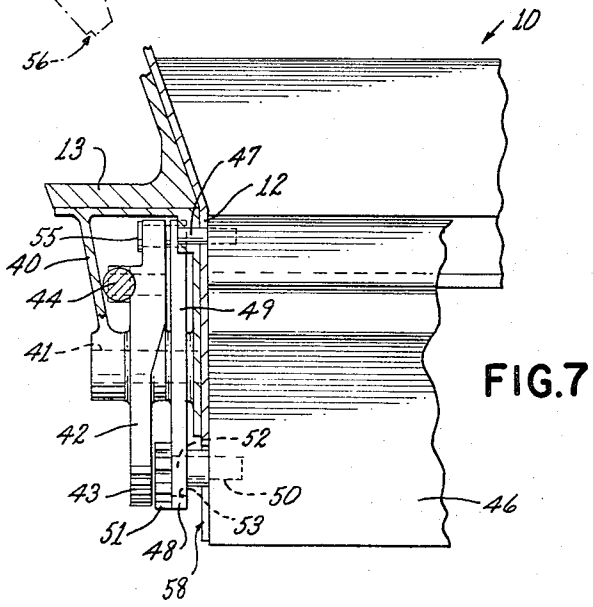


FIG.7

INVENTOR.
ERNST J. DeRIDDER

BY Alexander, Palmer & Matthews

HIS ATTORNEYS

United States Patent Office 3,373,700 Patented Mar. 19, 1968

3,373,700
RAILWAY CAR DOOR OPERATING MECHANISM

Ernst J. De Ridder, Richmond, Va., assignor to Reynolds Metals Company, Richmond, Va., a corporation of Delaware

Filed Apr. 29, 1964, Ser. No. 363,452
5 Claims. (Cl. 105—240)

This invention relates to an improved door actuating mechanism for railroad cars and the like, as well as to improved parts for such door actuating mechanism or the like.

It is well known from the copending patent application, Ser. No. 272,688, filed Apr. 12, 1963, that door actuating mechanism for railroad cars and the like can be readily provided wherein each railroad car has a plurality of bays of doors that can be individually opened at the bottom of the railroad car so that the product means in that particular bay can fall by gravity out through the open door means of its respective bay, each bay having a plurality of pairs of cooperating doors that operate in unison.

It is also well known from the copending patent application, Ser. No. 272,687, filed Apr. 12, 1963, now abandoned, that fluid motor means or the like can be provided for selectively actuating such door actuating mechanism.

This invention provides improved door actuating mechanism and parts therefor having many improved features over the door actuating mechanism described and claimed in the aforementioned patent applications.

Accordingly, it is an object of this invention to provide an improved door actuating mechanism or the like having one or more of the novel features of this invention as set forth above or hereinafter shown or described.

Another object of this invention is to provide improved parts for such a door actuating mechanism or the like.

Other objects, uses and advantages of this invention are apparent from a reading of this description which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIGURE 1 is a fragmentary, partially broken away side view of a railroad car or the like incorporating the features of this invention.

FIGURE 2 is a fragmentary broken away side view of the parts of this invention for operating a cooperating pair of door means for the railroad car of FIGURE 1.

FIGURE 3 is a cross-sectional view taken substantially on line 3—3 of FIGURE 2.

FIGURE 4 is a fragmentary, cross-sectional view taken substantially on line 4—4 of FIGURE 3.

FIGURE 5 is a view similar to FIGURE 2 and illustrates the door means in their open positions.

FIGURE 6 is a view similar to FIGURE 2 and illustrates another embodiment of this invention.

FIGURE 7 is a fragmentary, cross-sectional view taken substantially on line 7—7 of FIGURE 6.

While the various features of this invention are hereinafter described and illustrated as being particularly adaptable for forming the door actuating parts for a railroad car or the like, it is to be understood that the various features of this invention can be utilized singly or in any combination thereof to provide actuating mechanism for other structures as desired.

Therefore, this invention is not to be limited to only the embodiments illustrated in the drawings, because the drawings are merely utilized to illustrate one of the wide variety of uses of this invention.

Referring now to FIGURE 1, a conventional railroad car for carrying coal and the like is generally indicated by the reference numeral **10** and has a plurality of doors **11** pivotally mounted thereto in a manner hereinafter

described and cooperating together to open or close the bottom wall of the railroad car **10**.

In particular, a plurality of pairs of cooperating doors **11** can be provided for each bay of the railroad car **10** so that when it is desired to empty a particular bay of the railroad car **10**, the actuating mechanism of this invention is operated in a manner hereinafter described to simultaneously open all of the doors of a particular bay so that the product means in that particular bay can fall by gravity out through the open door means **11**.

As illustrated in FIGURES 1–3, the railroad car **10** has opposed side wall means **12** respectively provided with an outwardly directed sill means **13**.

A plurality of castings **14** of this invention are secured to the opposed side wall means **12** and sills **13** of the railroad car **10** in aligned relation by rivets, welding, or other desired fastening means in the position illustrated in the drawings and pivotally carry the door means **11** that extend between the opposed side wall means **12** at the bottom of the railroad car **10**.

In particular, it can be seen in FIGURES 2 and 4 that each casting **14** carries bushing means **15** which respectively receive adjacent pivot pins **16** of a cooperating pair of door means **11**.

While the castings **14** illustrated in FIGURE 1 have the outer surfaces thereof substantially enclosed, it is to be understood that the same could have recesses or openings provided therein to lighten the weight thereof, the castings **14** being formed of any suitable material, such as aluminum-containing material or the like.

As illustrated in FIGURES 2 and 3, each casting **14** carries a pair of spaced parallel shafts **17** journaled in openings **18** and **19** formed in opposed walls **20** and **21** thereof.

A segmental gear wheel **22** is rotatably mounted on each shaft **17** and has gear teeth **23** meshing with the gear teeth **23** on the adjacent gear wheel **22** in the manner illustrated in FIGURE 2 for a purpose hereinafter described.

Each gear wheel **22** is pivotally attached by a pivot pin **24** to one end **25** of an angled link **26**, the other end **27** of the respective link **26** being pivotally interconnected to the lower end of a respective door **11** by a pivot pin **28** carried by a bracket **29** suitably fastened to the lower portion of the respective door **11**.

One of the gear wheels **22** in the cooperating pair thereof is adapted to be pivotally attached to an actuating rod **29** by a pivot pin **30** in the manner illustrated in FIGURES 2 and 3, the actuating rod **29** thus being attached to one of the cooperating pair of gear wheels **22** of each pair of door means **11** for a particular bay of the railroad car **10** whereby all of the door means **11** of a particular bay can be operated in unison.

The actuating rod **29** has a plurality of adjustable turnbuckles **31** provided throughout the length thereof to permit adjustment of the rod **29** between adjacent pairs of doors **11** for a particular bay of the railroad car **10**.

Movement of the actuating rod **29** from the door closing position illustrated in FIGURE 2 to the door opening position illustrated in FIGURE 5 can be accomplished by any suitable apparatus or method. For example, movement of the rod **29** can be controlled by the fluid operated means described in the aforementioned copending patent applications.

Each door **11** has an inwardly directed portion **32** which cooperates with the portion **32** of its adjacent door to close the opening in the bottom wall means of the railroad car **10** in the manner illustrated in FIGURE 2, one of the portions **32** carrying a longitudinally disposed bar **33** in a recess **34** thereof which will be received in the recess **34** of the other door **11** in the manner illustrated in FIGURE 2 to completely seal the gap between the

doors 11 when the same are disposed in the closed positions thereof.

It can be seen that each door 11 is pivotally mounted underneath a substantially A-shaped frame member 35 extending between the opposed side walls 12 of the car 10 in the manner illustrated in FIGURES 1 and 2 whereby any coal dust or the like which would tend to collect at the pivot points 15 of the doors 11 can fall out from beneath the A frame members 35 to prevent adverse functioning of the pivot rods 16.

Further, it can be seen in FIGURES 1 and 3 that a cover plate 36 extends completely along the outside of the castings 14 to cover the same and protect the gear wheels 22 and the like from any dust which would tend to impede the operation thereof. For example, it can be seen that the links 26 project outwardly through slots 37, FIGURE 3, in the castings 14 and are effectively sealed by rubber sealing means 38.

The operation of the door actuating mechanism of this invention will now be described.

When the actuating rod 29 is moved in any suitable manner from the position illustrated in FIGURE 5 to the position illustrated in FIGURE 2, it can be seen that the right hand gear wheel 22 rotates in a counterclockwise direction about its shaft 17 and through the meshing teeth 23 thereof causes the left hand gear wheel 22 to simultaneously rotate in a clockwise direction about its respective shaft 17 whereby the doors 11 are pivoted to their closed positions by means of the links 26.

When the doors have been closed in the manner illustrated in FIGURE 2, it can be seen that when a load is placed in the railroad car 10 to be disposed against the closed doors 11, the force of the weight imposed downwardly on the doors 11 that tends to open the same causes the links 26 to tend to rotate the gear wheels 22 in their respective door closing directions whereby the elbows 39 of each link 26 is drawn against its respective shaft 17 to prevent the gear wheels 22 from being further rotated in their door closing directions. This feature is accomplished by the fact that a line drawn from the center of a pivot pin 28 on a particular door 11 and passing through the center of the respective shaft 17 will pass outboard of the respective pivot pin 24 so that the force component tending to open the doors 11 by means of the weight means thereon, causes the links 26 to tend to rotate the respective gear wheel 22 in its door closing direction.

Thus, it can be seen that the door actuating mechanism of this invention positively locks the doors 11 in their closed positions when a load is placed thereon, the links 26 acting as stop means to prevent the doors from being further moved in their closing direction.

When it is desired to open the doors 11 of a particular bay of a railroad car 10, the actuating rod 29 is moved from the position illustrated in FIGURE 2 to the position illustrated in FIGURE 5 whereby the right hand gear wheel 22 is rotated in a clockwise direction and the cooperating left hand gear wheel 22 is rotated in a counterclockwise direction to cause the doors 11 to move from their closed positions illustrated in FIGURE 2 to their opened positions illustrated in FIGURE 5 because of the link means 26 whereby a particular bay of the railroad car 10 can be emptied.

While the rod 29 can be actuated in any suitable manner, the rod 29 is so constructed and arranged that the same is placed under tension when being moved from its door closing position to its door opening position, whereby the rod 29 is only placed under compression when the doors are being moved to their closed position as there is no weight being imposed on the doors when the same are being moved to their closed positions.

Therefore, it can be seen that the door actuating mechanism illustrated in FIGURES 1–5 provides means wherein the door actuating mechanism can be completely encased and protected from coal dust and the like while still effectively being adapted to open and close cooperating door means of the railroad car 10 or the like, the door actuating mechanism being so constructed and arranged that when a load is placed on the doors 11, such force does not tend to open the doors 11 because the force tends to more fully close the doors 11 in the manner previously described.

As illustrated in FIGURES 6 and 7, another embodiment of this invention for opening and closing doors for a railroad car 10 or the like comprises casting means 40 or the like respectively secured to the sill means 13 and side wall means 12 of the railroad car 10 by riveting, welding or the like.

Each casting 40 carries a pair of parallel spaced shafts 41 respectively having segmental gear wheels 42 rotatably mounted thereon and having the teeth 43 thereof disposed in meshing relation.

The right hand gear wheel 42 is pivotally connected to an actuating rod 44 by a pivot pin 45, the actuating rod 44 being actuated in the same manner as the actuating rod 29 previously described.

The cooperating door means 46 respectively have their upper ends pivotally mounted to the castings 40 by pivot pins 47 while the lower ends are pivotally mounted to the ends 48 of links 49 by pivot pins 50. The pivot pins 50 are respectively carried by bushings 51 having eccentric portions 52 disposed in aperture means 53 of the links 49 whereby rotation of the bushings 51 relative to the links 49 will adjust the position of the door means 46 relative to the links 49 for a purpose hereinafter described.

The other ends 54 of the links 49 are pivotally interconnected to the gear wheels 42 by pivot pins 55.

One of the door means of a cooperating pair 46 thereof has a recess 56 which will receive a tang 57 of the other door means 46 when the respective pair of door means 46 are disposed in the closed position as illustrated in full lines in FIGURE 6 whereby the doors will effectively hold the product means thereabove when the door means 46 are disposed in the closed position thereof.

The side wall 12 of the railroad car 10 as illustrated in FIGURES 6 and 7 is cut away in the region of the reference numerals 58 to permit the pivot pins 50 of the doors 46 to move to their closed position as illustrated in full lines in FIGURE 6.

The operation of the door actuating mechanism illustrated in FIGURES 6 and 7 will now be described.

When the actuating rod 44 is disposed in the position illustrated in full lines in FIGURE 6, the door means 46 are disposed in their closed positions whereby any weight placed on top of the doors 46 and tending to open the same, such as caused by a payload in the railroad car 10, will produce a resulting force that tends to cause the gear wheels 42 to rotate in their door closing directions because the line of force from the center of the pivot pins 50 through the centers of the respective shafts 41 are disposed outboard of the pivot pins 55 in the manner previously described for the embodiment illustrated in FIGURE 2. Thus, the elbows 59 of the links 49 will engage against the shafts 41 to prevent further rotation of the gear wheels 42 in their closing directions.

When the elbows 59 of the links 49 are disposed against the shafts 41, it may be found that the doors 46 are not fully closed whereby adjustment of the eccentric bushings 51 thereof will permit the doors to be adjusted to their fully closed position even though the elbows 59 of the links 49 are disposed against the shafts 41.

When it is desired to open the doors 46, the actuating rod 44 is moved to the right to cause the right hand gear wheel 42 to rotate in a clockwise direction and cause the left hand gear wheel 42 to rotate in a counterclockwise direction whereby the links 49 pivot the doors 46 to their fully open positions as illustrated by dotted lines in FIGURE 6. Thus, subsequent movement of the actuating rod 44 from its open position to its closed position causes the right hand gear wheel 42 to rotate in a counterclock-

wise direction and the left hand gear wheel **42** to rotate in a clockwise direction whereby the doors **46** are moved to their closed position by the links **49**.

Accordingly, it can be seen that this invention provides improved door actuating mechanisms having many novel features. It can also be seen that this invention provides improved parts for such a door actuating mechanism or the like.

While the form of the invention now preferred has been disclosed as required by the statutes, other forms may be used, all coming within the scope of the claims which follow.

What is claimed is:

1. In a railroad car or the like, the combination comprising:

(a) a railroad car having a bottom and opposed sides,

(b) a pair of doors pivotally mounted for oscillation longitudinally of said car in order to close an opening in said bottom,

(c) a pair of parallel shafts respectively mounted on each of the opposed sides of said car and extending laterally thereof with the axes of pairs of shafts in alignment and parallel to each other,

(d) a pair of intermeshing gear segments, each segment mounted on a shaft of a pair of said shafts and rotatable therewith,

(e) a plurality of link means each pivotally connected at one end to one of said gear segments and at the other end to a respective door,

(f) and reversible power means connected to at least one of said gear segments and movable longitudinally of said car whereby upon actuation of said reversible power means said pairs of intermeshing gear segments are rotated thereby imparting pivotal motion to said pair of doors through said link means whereby said doors may be opened and closed,

(g) said link means engaging an associated shaft in an overcenter position relative to the axis of said shaft when said doors are closed to provide a stop for said doors.

2. In a railroad car or the like as defined in claim **1**, wherein said doors have portions thereof disposed in overlapping relation when said doors are in closed position.

3. In a railroad car or the like as defined in claim **1**, wherein said link means are received in their respective doors by eccentric bushing means whereby an adjustment may be made in the closed position of said door means.

4. In a railroad car or the like as defined in claim **1**, wherein each of said link means is angled so as to cradle its respective shaft and provide its said overcenter position.

5. In a railroad car or the like as defined in claim **1**, wherein a load imposed on said doors in a closed position thereof causes said gear segments to tend to rotate in their respective door closing directions due to said overcenter position of said link means.

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ARTHUR L. LA POINT, *Primary Examiner.*

JOSEPH R. LECLAIR, *Examiner.*

H. BELTRAN, *Assistant Examiner.*