United States Patent

[11] 3,626,865

[72] Inventors **Herman A. Aquino**
Hobart, Ind.;
James J. Schuller, Dolton, Ill.

[21] Appl. No. **752**
[22] Filed **Jan. 5, 1970**
[45] Patented **Dec. 14, 1971**

[73] Assignee **Pullman Incorporated**
Chicago, Ill.

---

[54] **MOTOR-ACTUATED RAILWAY HOPPER CAR DOORS**
17 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **105/240,** 105/251, 105/304, 105/308 C, 105/310

[51] **Int. Cl.** **B61d 7/08,** B61d 7/18, B61d 7/28

[50] **Field of Search** ..... 105/240, 245, 251, 283, 290, 299, 300, 304, 305, 308 R, 308 C, 308 E, 310

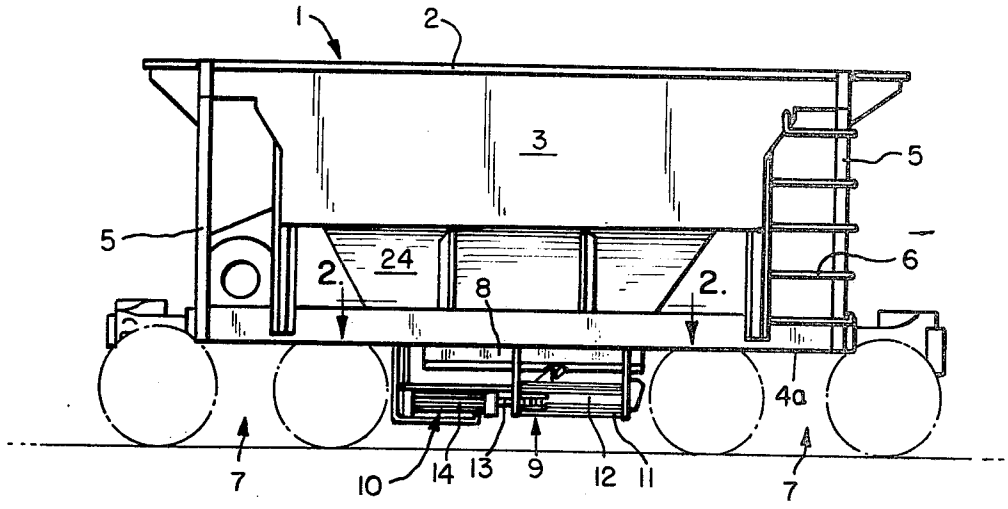
[56] **References Cited**

UNITED STATES PATENTS

644,890	3/1900	Bellows	105/304 X
1,000,753	8/1911	Olden	105/240
1,095,241	5/1914	Summers	105/240
1,267,363	5/1918	Blest	105/240
1,284,111	11/1918	Kestler	105/251
1,790,402	1/1931	Blest	105/305
2,469,220	5/1949	Zimmer	105/299
2,479,292	8/1949	Batho	105/300
3,316,857	5/1967	Floehr	105/290 X

Primary Examiner—Arthur L. La Point
Assistant Examiner—Howard Beltran
Attorneys—Hilmond O. Vogel and Wayne Morris Russell

ABSTRACT: In a hopper car having a pair of bottom hopper doors opening from the center laterally outward to the side, door-operating mechanism on each side of the car for each door comprising a side mounted air cylinder having a ram moving outwardly to move a rolling or slidable carriage to which is universally connected a door arm link which in turn is universally connected to a door-locking bar mounted on the door and biased to open whereupon when the air cylinder operated ram retracts the door is swung from a down generally vertically hanging position to an upright horizontal position with the lock bar locking the door to the center structure on the car, there being a similar cylinder carriage and door link arrangement for closing and opening a laterally opposed door on the other side of the car.



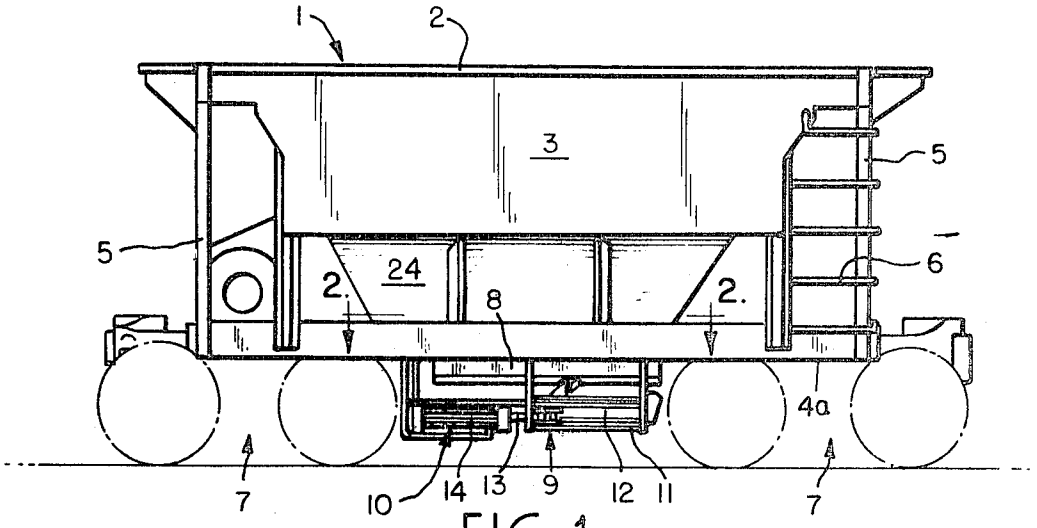


FIG. 1

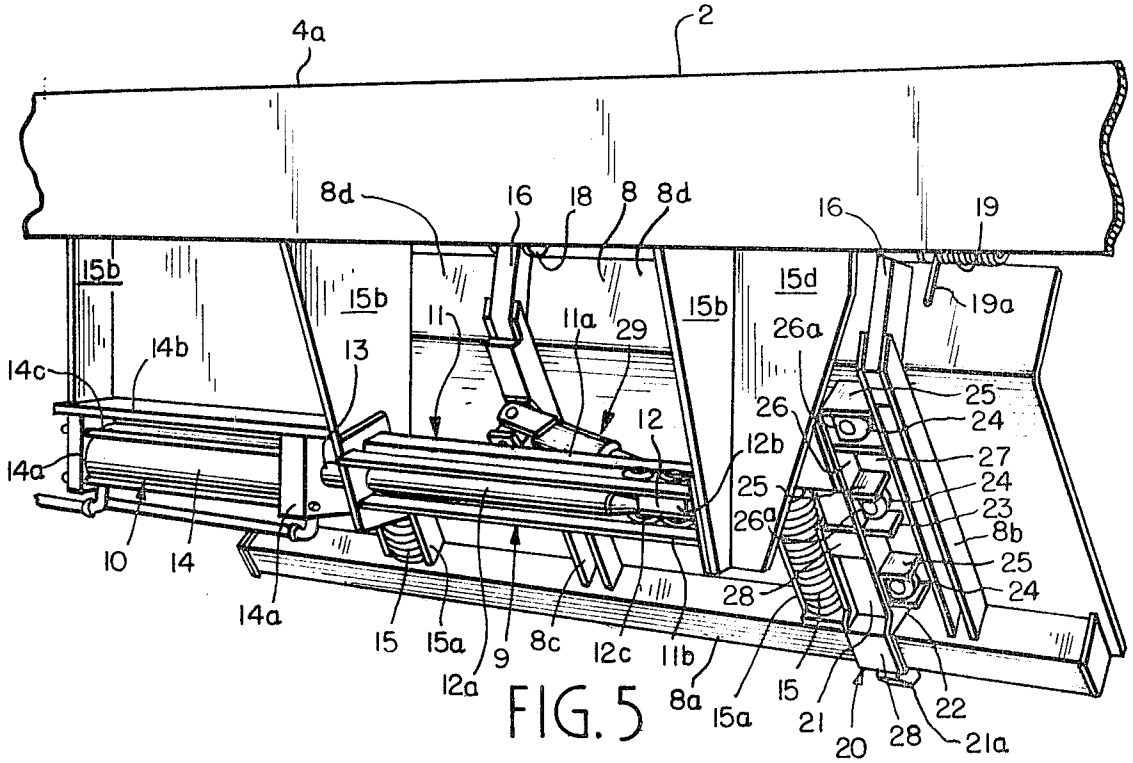


FIG. 5

Inventors
Herman A. Aquino
James J. Schuller

By Richard J. Myers
Attorney

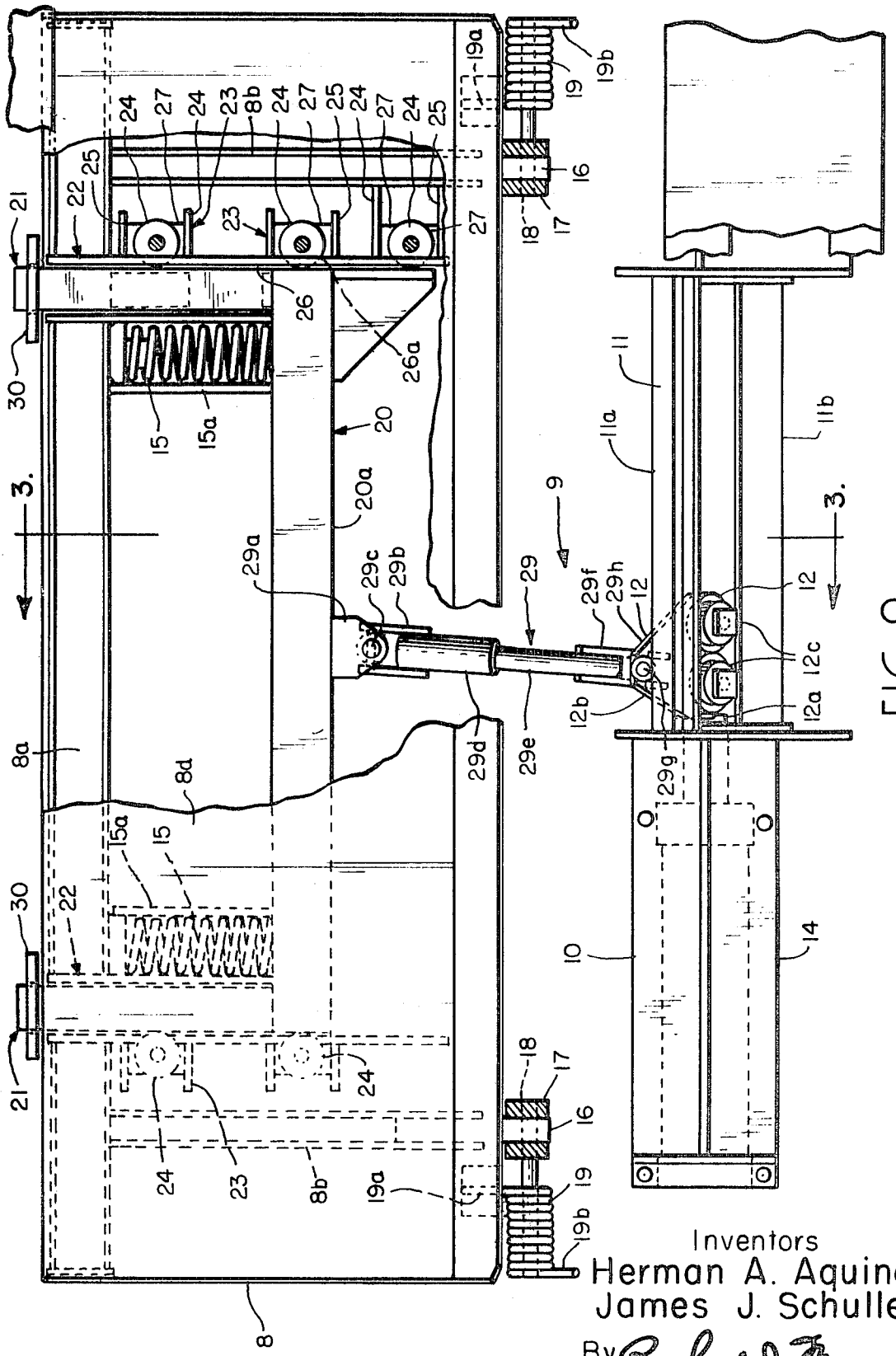
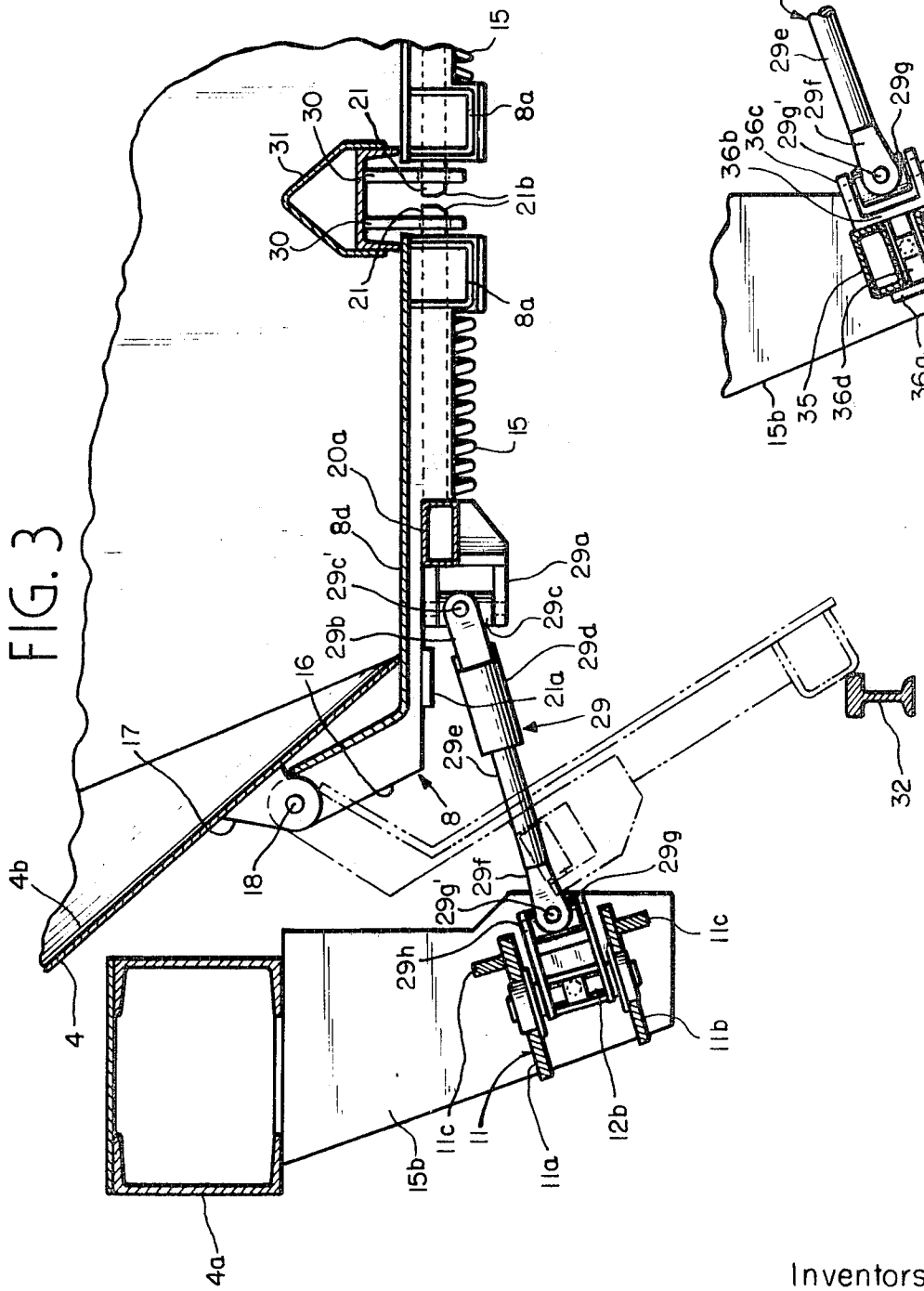


FIG. 2

Inventors
Herman A. Aquino
James J. Schuller
By Richard J. Myers
Attorney



Inventors
Herman A. Aquino
James J. Schuller
By Richard J. Myers
Attorney

MOTOR-ACTUATED RAILWAY HOPPER CAR DOORS

SUMMARY

This invention relates to hopper cars having bottom discharge doors operated by suitable linkage and in particular relates to side mounted drive means for each door including air cylinder means for operating door link moving means connected with a door link which in turn connects with the door for swinging the door from an open to a closed position.

It is therefore a general object of this invention to provide for side-mounted air cylinder means including a ram member for applying a longitudinal thrust to a door connecting link having a universal connection with the hopper door wherein the door may be raised and locked or unlocked and lowered.

Still another object of this invention is to provide for a novel door operating and locking mechanism for the hopper doors of a hopper car wherein a powered carriage is slidably or rollably mounted on the side of the car, there being such a carriage on each side of the car for operating a door link on each side of the car to unlock and open and close and lock either of a pair of laterally spaced bottom lockable hopper doors carrying door lock bars.

These and other objects of the invention will become more readily apparent when reference is made to the following description, the attached drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the hopper or ore car;

FIG. 2 is a partial top plan view of the car with parts in sections;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a partial view showing a modified form of the carriage connecting with the air cylinder and with the door link; and

FIG. 5 is a perspective view of the lower side of the railroad car illustrating the novel door operating mechanism.

DETAILED DESCRIPTION

With reference now to the drawings and in particular with reference to FIG. 1 there is shown a hopper ore car 1 having a hopper portion 2 including an upper hopper section 3 and a lower tapered hopper portion 4 provided with sloped sheets 4*b*. The ore car is provided with the usual side sills 4*a*, corner posts 5, ladder 6, truck 7 and a pair of laterally spaced bottom hopper doors 8 which are swingable about a longitudinal axis from a horizontal locked position to a downward depending generally vertical open and unlocked position, the free ends of the doors meeting at the central portion of the car and the hinged ends depending from the sides of the car. The hopper doors 8 are opened and closed by novel door-operating mechanism 9. The door includes a bottom stiffener 8*a* and transverse end stiffeners 8*b* and central reinforcing rib or beam 8*c* to which is attached the door sheet 8*d*.

The novel door-operating mechanism includes an air cylinder means or power cylinder means 10 connecting with a carriage 12 which is provided with a carriage drive rod 12*a* connecting with a piston rod 13 reciprocably extendable out of the air cylinder 14 of the air cylinder means 10. The carriage 12 is guided in guide structure 11 which includes upper guide beams 11*a* and lower guide beams 11*b*. The carriage 12 further includes the carriage member 12*b* having the carriage rollers 12*c* running along the upper and lower guide beams 11*a* and 11*b*. The guide structure 11 is also provided with upper and lower guide members 11*c* (see FIG. 3). Supports 15*b*, as seen in FIG. 5, depend from the side sills 4*a* and gussets 15*a* and carry the supporting structure which in turn supports the air cylinder means and the carriage means 12 which in turn connects with the door arm link means 29 as explained below. The air cylinder includes end plates 14*a* and a mounting 14*b* therefore and cylinder tie rods 14*c* tying the cylinder to the frame of the car.

Each of the doors carry thereon a pair of laterally extending locking bars 21 and each locking bar is urged to an open position by an end return spring 15 held in a housing 15*d* on the outside of each door. Each door is provided with hinge lugs 16 connected to the car hinge 17 by means of hinge pin 18. Each door is provided with counter balance spring 19 mounted on a respective hinge pin 18 having one end 19*a* abutting the door and the other end 19*b* abutting the car body portion. When the door locking bars are released or placed in the open position and the door starts to fall by gravity the rate of the door falling is reduced by the counter balance springs 19. The lock bar structure 20 which is operated by the air cylinder via the carriage and door links includes the lock bars 21, the lock bar support structure 22 for the lock bar, the roller support structure 23 for the rollers 24. The lock bar structure 20 is provided on each of the doors and includes a lock bar connecting link 20*a* connecting each of the lock bars 21 on each door. Lateral outward movement of the lock bar is limited by the lock bar stop 21*a* on the door. The lock bar support structure reciprocally holds the lock bars on the door in lateral position for lateral reciprocation and each lock bar engages the rollers 24 of its respective roller support structure 23 which includes horizontal roller plates 25 and the slotted roller receiving plates 26 and the roller back support plate 27, the roller receiving plates having slots 26*a* through which the rollers pass for engagement with and guiding of the smooth relatively frictionless guiding of the rollers 24. The free end of each of the lock bars 21 of the door-operating mechanism on each side of the car for each door is provided with tapered ends 21*a* for easy reception through a slot in the latch plates 30 as best seen in FIG. 3. The lock bar structure further includes the lock bar retainer brackets 28 which retain the lock bars 21 for lateral reciprocal movement between the latch plate 30 and the stop 21*a*. The lock bar is pivotally connected with the pivotal door arm link structure 29 which is in turn pivotally connected with its respective carriage 12. The slotted latch plates 30 which receive the free ends 21*b* of the locking bars 21 depend from the central reinforcing structure or foot 31 running centrally and longitudinally of the car.

Each pivotal door arm link structure 29 for each door has a universal connection with its respective locking bar 21 and with its respective carriage 12 and includes a lock bar pivot hinge or clevis 29*a* which is fixed on the lock bar and which is pivotally connected with door arm sleeve 29*b* which is threadily received in second sleeve member or extension 29*d*, the hinge 29*a* carrying a vertical pivot pin 29*c* to which is attached a horizontal pivot pin 29*c* which in turn connects with the horizontal pivot pin 29*c'* which in turn connects with the door arm sleeve 29*b*. The sleeve extension 29*d* connects with the rod extension 29*e* to which it is threadily attached and the member 29*e* threadily connects with carrier sleeve 29*f* to which it is adjustably attached as is member 29*b* to member 29*d*. The carriage sleeve 29*f* is pivotally connected to pivot pin 29*g'* which is a horizontal pivot pin which is pivotally connected to vertical pivot pin 29*g* which is connected to the carriage clevis or pivot hinge 29*h*. Thus there is provided a universal connection of the door link to both its carriage and its locking bar. As seen in FIG. 3 the free end of the door in the open position engages the rail 32.

With reference to FIG. 4 there is provided an alternate carriage form which instead of using rollers operates on the sliding principle and, as shown in the drawing, where the parts are similar, the same reference characters are used to that shown in the other figures. The rollers have been replaced by a sliding shoe structure 36 pivotally connected with its door link structure 29. The sliding shoe structure includes an outer vertical slide plate 36*a* connecting with a transverse structure 36*d* which connects with clevis means 36*c* which connects with the other vertical plate means 36*d*, the upper and lower rectangular guide tubes 35 being between the sliding shoe structure parts 36*a*, 36*b*, and 36*d*. This modified design permits relative sliding movement of the carriage relative to the universal pivotal connection with the door link.

FIGS. 1, 2 and 3 show the hopper doors 8 and therefore the door-operating mechanisms in the door closed position

whereas FIG. 5 shows the doors 8 and the door-operating mechanisms 9 therefore in the door open position, which open position is also shown in dotted line in FIG. 3. In the closed position the ram member of the air cylinder means is fully retracted within the cylinder such that the carriage is drawn completely to the left as viewed in FIGS. 1 and 2 and the door link 29 is in the closed overcenter position as best seen in FIG. 2 with the doors being horizontal and locked with the locking bar end extending into the latch plate member 30 as seen in FIG. 3. When it is desired to open the doors the air cylinder means operates such that its piston carries its piston rod or ram outwardly of the cylinder moving the carriage unit to the right whereby it passes overcenter carrying the door lock past center to unlock the doors. In passing from the closed overcenter position to the overcenter open position the door link has its outer lateral end moved to the right and the locking bar is permitted to move to the left as viewed in FIG. 3 due to the urging of the spring 15 when the link moves past the overcenter position to the door open center position. As the door link means 29 has its outer end pulled further to the right and longitudinally of the car, the link means pulls on the door because now the locking bar has seated against stop 21*a* of the door and therefore the door is pulled downward and allowed to swing downward with the door fall being cushioned by the counterbalance spring 19. Continued movement of the carriage to the left occurs with the door swinging fully open against the rail 32 (FIG. 3). In closing of either door its carriage moves from the extreme right position to the left and the door link has its outer end swinging to the left and positions itself laterally and then in a closed overcenter position with the piston being retracted within the cylinder such that the door is now in a closed locked position with its door link means in the locked overcenter position. In moving to the door-closed position, when the link means 29 approaches its overcenter position it starts to force the lock bar 21 against the spring 15 leaving the seat 21*a* and entering the latch plate 30, this latching action occuring only after the door is swung into the door-closed position at which time the latching of the door occurs and is held in the latch position since the link means 29 moves into the closed overcenter position.

The foregoing description and drawings merely explain and illustrate the invention and the invention is not limited thereto, except insofar as the appended claims are so limited, as those skilled in the art who have the disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

What is claimed is:

1. In a hopper means having bottom discharge means, door operating mechanism for hopper discharge door means, said door operating mechanism comprising:
- a car side mounted power means,
- longitudinally extending drive means being in longitudinal alignment with and connecting with said power means,
- said longitudinal drive means including a slidable carriage,
- door arm link means having a universal connection with said carriage and having a universal connection with said door means,
- said door means including door lock means reciprocably mounted thereon and having biasing means urging the lock means to a door open position,
- said carriage means holding said door arm link means in an overcenter locked position wherein said door arm link means urges said lock means into the locked position with the door means being closed, said power means moving said carriage and said door means thereby to a door open position with first releasing door lock means and then allowing said door means to move to the open position.

2. In a hopper means having bottom discharge means, door operating mechanism for hopper discharge door means, said door operating mechanism comprising:
- a car side mounted power means,
- longitudinally extending drive means being in longitudinal alignment with and connecting with said power means,
- said longitudinal drive means including a slidable carriage,
- door arm link means having a pivotal connection with said carriage and having a pivotal connection with said door means,
- said door means including door lock means reciprocably mounted thereon
- said carriage means holding said door link arm means in an over center locked position wherein said door link means urges said lock means into the locked position with the door means being closed, said power means moving said carriage and said door means thereby to a door-open position with first releasing door lock means and then allowing said door means to move to the open position.

3. The invention according to claim 2, and
- said door arm means having a universal connection with said carriage and with said door means.

4. The invention according to claim 2, and
- biasing means on said door means at said door lock means and a door stop on said door means wherein said biasing means urges said door lock means towards said stop in the unlocked door position,
- said power means in the door-locking position overcoming said biasing means and causing said lock means to lock the door means to the car.

5. The invention according to claim 2, and said power means comprising:
- a fluid cylinder and a ram within the cylinder and said ram having a member connecting with said carriage and operable thereupon for opening and closing the door means.

6. The invention according to claim 2, and
- said lock means including a locking bar extending laterally on the door means and positionable into locking position of the door with respect to the hopper means.

7. The invention according to claim 2, and
- guide means for said carriage, said carriage being longitudinally reciprocal in said guide means attendant to moving said door link arm length means from a lateral overcenter-locking position to a longitudinally extending door unlocked and open position past overcenter from the locked overcenter position.

8. The invention according to claim 7, and
- said carriage means having a sliding frictional contact with said guide means.

9. The invention according to claim 7, and
- said carriage means having roller means engaging said guide means for rolling movement.

10. In a railroad car having hopper means provided with horizontal extending bottom hopper door means,
- door-operating means being disposed beneath and to the side of said hopper means, said door-operating means comprising:
- a fluid-operated door operating power means in the form of a double acting fluid jack means,
- said jack means being car side mounted,
- carriage means having longitudinally extending drive means connecting with said jack means attendant to reciprocating said carriage means in a longitudinal direction, said carriage means being car side mounted and in longitudinal alignment with said jack means,
- door arm means having a pivotal connection with said carriage means,
- door lock bar means mounted on said door means and having biasing means urging said lock bar means in the door unlocking direction,
- said door arm means having a pivotal connection with said door lock bar means whereby upon moving of the power means towards a door opening position the door arm means moves from a locking overcenter position into the unlocked position with consequent movement of the door means to the open position.

11. In a railroad car having hopper means provided with horizontal extending bottom hopper door means,
- door-operating means being disposed beneath and to the side of said hopper means,
- said door operating means comprising:

a fluid operated door-operating power means, said power means being car side mounted,

carriage means having longitudinally extending drive means connecting with said jack means attendant to reciprocating carriage means in a longitudinal direction,

door arm means having a pivotal connection with said carriage means, door lock means mounted on said door means,

said door arm means having a pivotal connection with said door lock means whereby upon moving of the power means toward a door opening position the arm means moves from a locking overcenter position to an unlocked position with consequent movement of the door means to the open position.

12. The invention according to claim 11, and

said power means including a double-acting fluid jack means.

13. The invention according to claim 11, and

said carriage means being side mounted and in longitudinal alignment with said power means.

14. The invention according to claim 11, and

car side mounted guide means,

carriage means including roller means for rolling movement of the carriage means in the guide means.

15. The invention according to claim 11, and car side mounted guide means,

carriage means including sliding means for sliding movement of the carriage means in the guide means.

16. The invention according to claim 11, and

biasing means engaging and urging said locking means in the door unlocking direction.

17. The invention according to claim 16, and

said door lock means including a locking bar.

* * * * *