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[54] **RACK-AND-PINION-ACTUATED RAILWAY
 HOPPER CAR GATE**
 7 Claims, 4 Drawing Figs.

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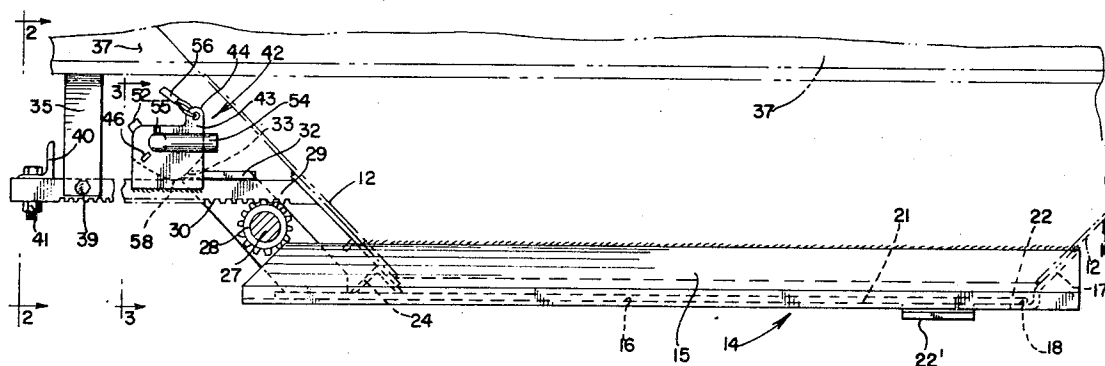
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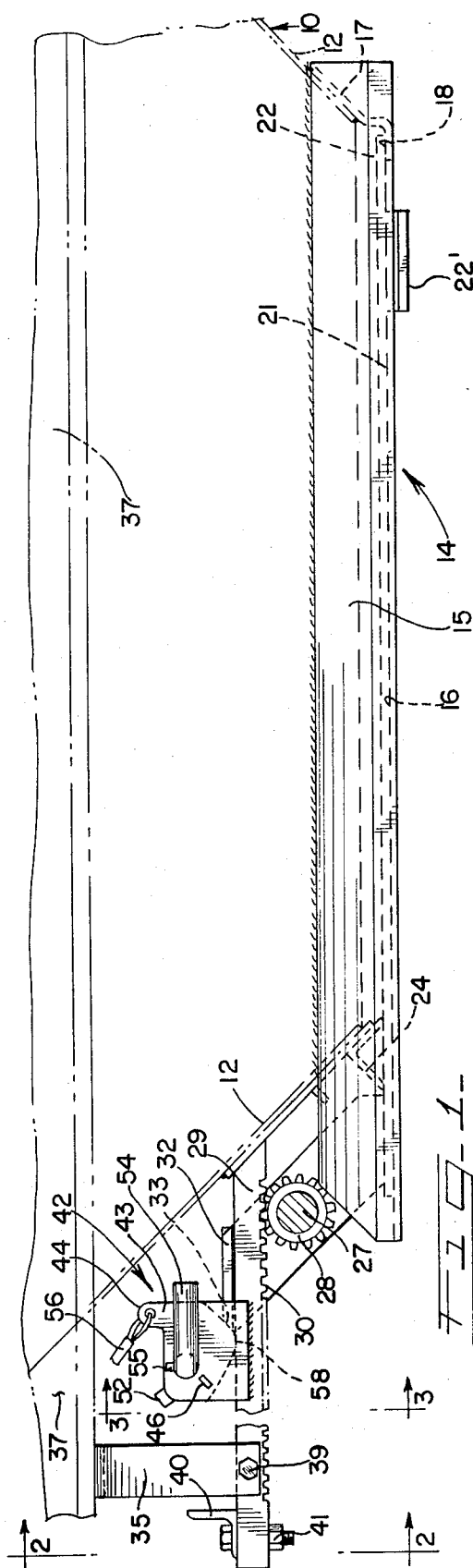
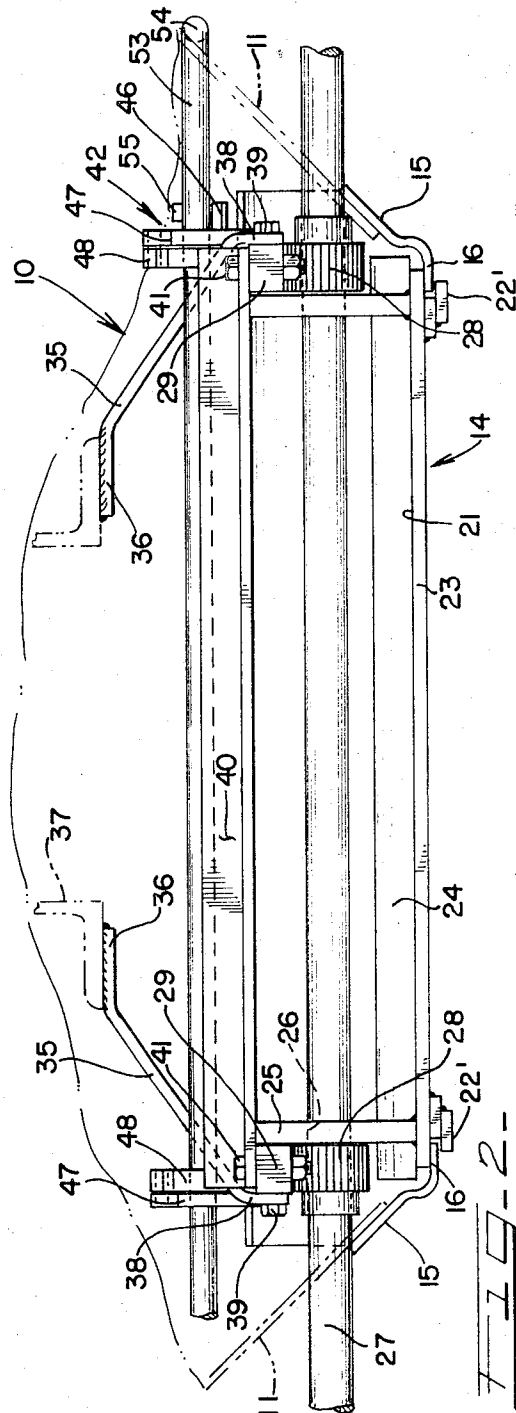
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ABSTRACT: The discharge end of a hopper positioned on a railway hopper car is provided with a closure gate. The closure gate is movable between open and closed positions by means of a pinion and rack arrangement. The rack arrangement extends perpendicularly to one side of the hopper and is suitably suspended from the under side of the railway car structure. During the movement of the gate to its open position it is entirely supported at one end on the rack arrangement by means of a pair of hangers connected to the gate and slidable on the rack arrangement so that the trailing or rear end of the gate is suspended thereon.



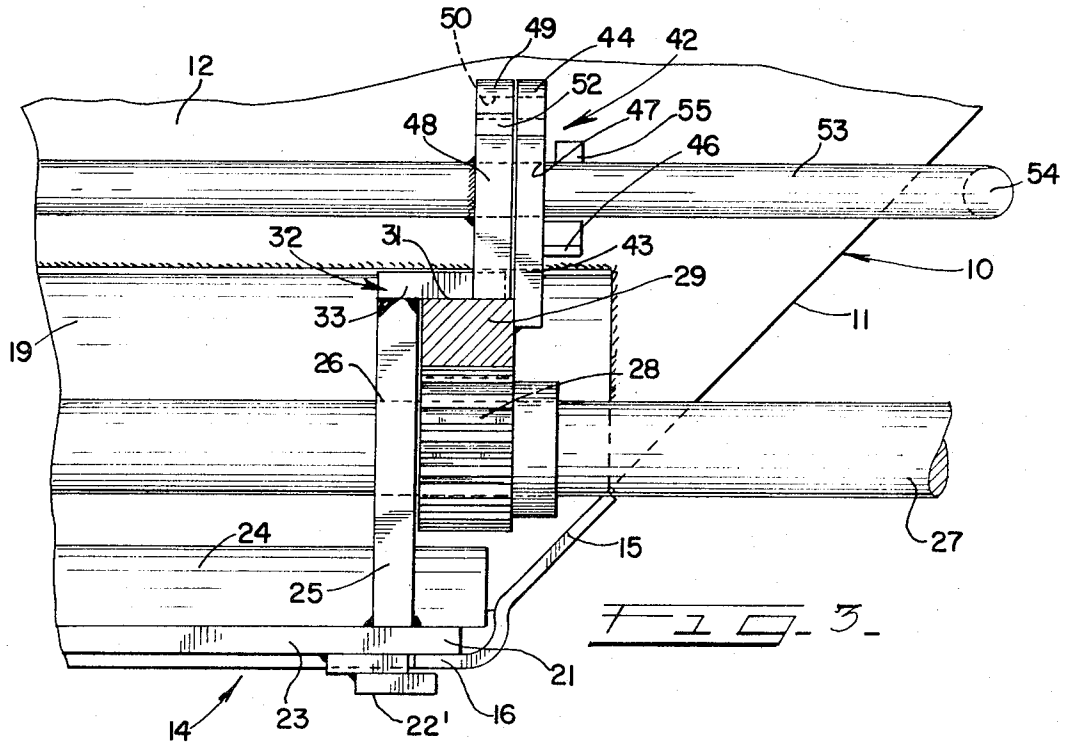
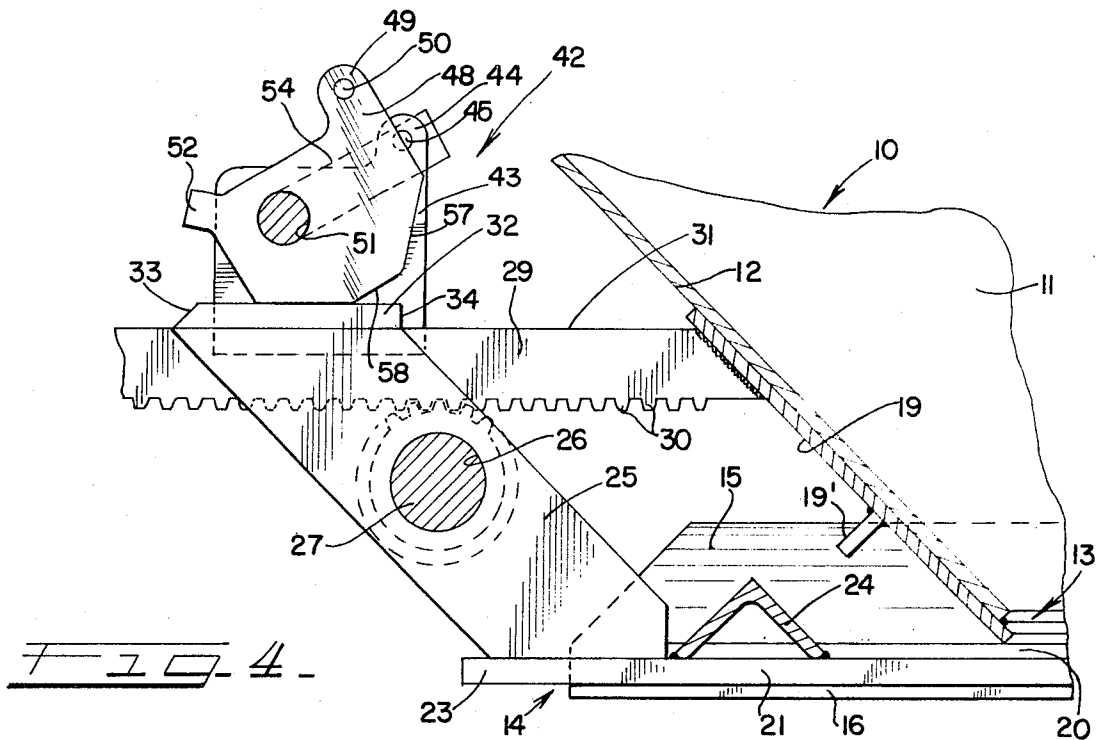


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RACK-AND-PINION-ACTUATED RAILWAY HOPPER CAR GATE

SUMMARY

The conventional discharge gate for a hopper is provided with a rack and pinion arrangement which moves the gate to open and closed positions. When the gate is in the open position the same is generally supported by a suitable frame which includes guide elements disposed to one side of the hopper for supporting the gate at an open or out-of-the-way position. Such a gate also includes a separate set of rack bars which contain a rack construction engaged by rotatable pinions mounted on the gate whereby the gate may be moved to its various positions. The present construction eliminates the necessity of a separate frame extending to one side of the hopper discharge opening by utilizing the rack bars as the supporting members for the trailing or rear edge of the gate when it is moved to its out-of-the-way or open position. The gate is suitably suspended on hanger brackets which slidingly engage the rack bars so that the gate is supported on its rear ends when moved to the open position and the leading edge or front edge of the gate is suitably supported on horizontal lateralspaced ledges. Thus the prime object of the arrangement of the invention is to provide an improved gate construction for the discharge end of hoppers wherein the gate is suspended from the rack bar thus precluding the necessity of having a separate frame extending outwardly from the discharge opening.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a hopper on a railway car disclosing a closure mechanism;

FIG. 2 is an elevational view taken substantially along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged cross-sectional view taken substantially along the line 3—3 of FIG. 1; and

FIG. 4 is an enlarged cross-sectional view from a portion of a hopper and closure mechanism in an operating position.

DETAILED DESCRIPTION

FIG. 1 discloses a hopper structure 10 which, as shown in FIGS. 2 and 3, includes side slope sheets 11 and, as shown in FIGS. 1 and 4, includes end slope sheets 12. The slope sheets 11 and 12 form at their lower ends a hopper discharge opening 13 around which a hopper discharge gate arrangement, generally designated at 14, is disposed. The discharge gate arrangement 14 comprises a pair of side frame members 15 having, as best shown in FIGS. 2 and 3, horizontal ledges 16. In FIG. 1, an end frame member 17 extends transversely with respect to the frame member 15 and is suitably connected thereto, said frame member 17 being provided at its lower edge with a ledge 18 in the plane of the horizontal ledges 16.

As best shown in FIG. 4, one of the slope sheets 12 has suitably connected thereto an end closure sheet 19 provided at its lower end, as indicated in FIG. 4, with a lower edge for providing an opening 20 through which a closure member or gravity gate 21 may be moved for opening or closing the discharge opening 13. The gate 21 is provided with a front or leading edge 22 which, as indicated in FIG. 1, in the closed position is seated in overlapping relation with respect to the ledge 18. Clips 22' secured to the underside of the gate adjacent the leading edge 22 underlie the ledges 16 at respectively opposite sides of the hopper discharge opening 13 and thereby prevent the edges of the gate from riding over lading on these ledges 16. The gate 21 also includes a trailing edge 23 which is adapted to project laterally outwardly with respect to the discharge opening 13. The gate 21 has connected thereto an angle-shaped closure stop 24 which is adapted to engage the closure sheet 19 for closing the opening 20 when the gate has been moved to its closed position. A rib 19' secured to the sheet 19 stiffens this member and acts as a watershed to deflect drainage flowing down the back side of the hopper 10 behind the angle 24 in the closed position of the gate. A pair of

hanger brackets 25 are also rigidly connected to the gate 21. The hanger brackets 25 are provided with transverse openings 26 within which an operating shaft 27 is rotatably positioned. The shaft 27 is provided at opposite ends thereof with operating heads (not shown) adapted to be engaged by a tool in the hands of an operator rotating the shaft and thereupon opening and closing the gravity gate 21. A pair of pinions 28, as best shown in FIG. 1, are also supported on the shaft 27 and are disposed below a pair of rack bars 29. The rack bars 29 are provided at their lower surfaces with a series of rack teeth 30 engaged by the pinions 28. The rack bars 29 also are provided with upper flat surfaces 31 which support a slider element or block 32 provided on each of the hanger brackets 25, as best shown in FIG. 3. The slider blocks 32, as best shown in FIG. 4, are also provided with a tapered surface 33 on one side and a vertical surface 34 on the other side.

As best shown in FIGS. 1 and 2, the rack bars 29 are suitably supported or suspended by means of brackets 35 each of which includes a flange 36 which may be suitably connected to the lower ends of a center sill 37. The center sill 37 is of conventional design and forms part of the underframe structure of a suitable hopper car on which the hopper 10 is supported. A vertical finger 38 on each bracket 35 is suitably connected by means of a bolt 39 to the ends of each rack bar 29. As best shown in FIGS. 1 and 2, an angle bar 40 suitably interconnects the rack bars 29 and is secured by bolts 41.

As best shown in FIGS. 1, 3 and 4, a latch mechanism is generally designated by the reference character 42. The latch mechanism 42 includes upright brackets 43 connected to the rack bars 29 with each including an ear 44 provided with a car seal opening 45. As best shown in FIGS. 1 and 3, a stop lug 46 projects outwardly from one face of each bracket 43. Each bracket 43 also includes a bore or opening 47.

A pair of cams 48 each include an ear 49 conforming in shape to the ear 44 and being provided with an opening 50 which is in registry in one position of said cam with the openings 47. Each cam 48 also is provided with an opening or bore 51 in alignment with the opening 47. A lug or projection 52 also extends from each of the cams 48. An operating shaft 53 extends through the openings 47 and 51 and each cam 48 is rigidly connected thereto with a shaft 53 being rotatably positioned in the openings 47. The shaft 53 is also provided at each of its opposite ends with a handle 54 adapted to be rotated by the operator as desired. As best shown in FIGS. 1 and 3, the shaft 53 also has rigidly connected thereto a stop 55 adapted to be moved into engagement with the stop lug 46 upon rotation of the shaft 53. FIG. 1 shows a car seal 56 suitably disposed through the openings 45 and 50 for locking of the cams 48 in the position indicated.

THE OPERATION

In the position shown in FIG. 1 the gate 21 is in a closed position and the latch mechanism 42 is locked with the car seal 56 in position. The tapered surface 33 of the slider block 32 is in blocked relation against the surface 57 (FIG. 1) of the cams 48. A surface 58 of each cam 48 is resting, as shown in FIG. 1, on top of each rack 29 and movement of the gate from its closed position is prevented by engagement of surface 57 with tapered shoulder 33.

Upon removal of the car seal 56 the operator now is free to rotate the handle 54 and cams 48 in a counterclockwise direction until the lugs 55 are in engagement with the lugs 46 and the cams 48 are now in an out-of-the-way position so that upon rotation of the shaft 27 the pinions are effective to move the gate 21 to the left in FIG. 4 toward the open position. As the gate 21 moves the tapered edge 33 now makes contact with the projection 52, which previously has been rotated into the path of movement of the slider block 32. As the surface 33 engages the lugs 52 the cams 48 are turned in a clockwise direction (FIG. 4) wherein the surfaces 58 engage the upper surfaces of the slider block 32. Continued rotation of the shaft 27 causes the gate to be moved completely to its out-of-the-

way position to one side of the discharge opening 13. As the slider blocks 32 pass beyond the cams 48 the cams then are free to drop downwardly into the position indicated in FIG. 1.

Reverse rotational movement of the shaft 27 causes movement of the gate 21 to the right in FIG. 4 whereupon the surface 34 engages each cam 48 to raise the same slightly upwardly but permitting the slider block 32 to move to the right and the gate 21 to its closed position. During this movement the lower surfaces 58 of each of the cams 48 ride or slide on the upper surface of each slider block 32. Once the gate is moved to its ultimate closed position the closure stop 24 seals the rear of the opening 20 and the leading edge 22 of the gate 21 is in the position shown in FIG. 1. The cams 48 now have dropped again to the position shown in FIG. 1 and the gate is locked against return movement. Insertion of the car seal then completes the locking procedure.

The invention shown discloses a simplified gate arrangement which eliminates the need for a separate frame extending outwardly from the frame members which are disposed immediately around or adjacent the opening 13. The racks 29 serve as a supporting means for the gate and these in turn are directly supported on the center sill by means of the brackets 35. Thus the trailing edge 23 of the gate, in the open position, is suspended from the racks 29 by means of the hangers 25 while the leading edge remains supported on the ledges provided by portions of the frame members 15 which project outwardly from the hopper 10 as best shown in FIG. 4. A lightweight gate, simple of construction and of fewer parts, thus is provided since additional framing is unnecessary by the utilization of the rack bars 29 as not only operating members but as structural members for supporting the gate in a suspended position. Thus the advantages of the invention disclosed have been achieved.

What is claimed is:

1. A discharge gate arrangement for a hopper having a discharge opening adjacent the lower end thereof comprising: side frame members including first horizontal ledge portions spaced on opposite sides of said opening, an end frame member having a second horizontal ledge portion extending transversely between said first ledge portions, a gate carried on said first ledge portions for relative sliding movement over said opening, a pair of rack bars supported one on each side of said opening and including rack teeth disposed along one side thereof, support means movably supporting said gate below said rack bars and movably supported by the rack bars and said gate having one end portion suspended from said rack bars during movement of said gate to the open position to one side of said opening, and an opposite end portion of said gate being supported on portions of said first ledges, and rotatable means being connected with said support means and operatively engaged with said rack teeth.
2. The invention according to claim 1, support means movably supporting said gate on said rack

bars and including a pair of hanger members connected to said gate and engaging said rack bars in relative sliding relation.

3. The invention according to claim 2, each hanger member including a slider element slidably engaging an upper surface of each rack bar, said rack teeth being disposed along a lower surface of said rack bars, and said rotatable means including pinions rotatably carried by said hanger means.
4. The invention according to claim 3, including a latch arrangement comprising a cam pivotally supported above said rack bars and said cam in a first position being disposed in the path of movement of said slider element to engage said slider element and retain said gate in a locked position.
5. The invention according to claim 4, a support means mounting said cam, a stop member attached to the support means, an associated stop member attached to the cam, a projecting element extending from the cam, said cam being rotatable to a second position whereby said stop member engages the associated stop member attached to the cam and whereby the projecting element of said cam is in the path of movement of said slider element and is engaged thereby during movement of said gate to the open position, thereby rotating said cam toward said first position.
6. A discharge gate arrangement for a hopper having a discharge opening adjacent the lower end thereof comprising: side frame members including first horizontal ledge portions spaced on opposite sides of said opening, an end frame member having a second horizontal ledge portion extending transversely between said first ledge portions, a gate carried on said first ledge portions for relative sliding movement over said opening, a pair of rack bars supported one at each side of said opening and including rack teeth disposed thereon, bracket means slidably supporting said gate from said rack bars outwardly of said opening, a latch arrangement comprising a cam pivotally supported above said rack bars and said cam in a first position being disposed in the path of movement of said means supporting the gate to engage same and retain said gate in a locked position.
7. The invention according to claim 6, and a support means mounting said cam, a stop member attached to the support means, an associated stop member attached to the cam, a projecting element extending from the cam, said cam being rotatable to a second position whereby said stop member engages the associated stop member attached to the cam and whereby the projecting element of said cam is in the path of movement of said means supporting the gate and is engaged thereby during movement of said gate to the open position, thereby rotating said cam toward said first position.

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