Aug. 25, 1931. W. L. BURNER 1,820,525

DOOR OPERATING MECHANISM FOR DUMP CARS

Filed April 28, 1928 2 Sheets-Sheet 1

Fig. 1.

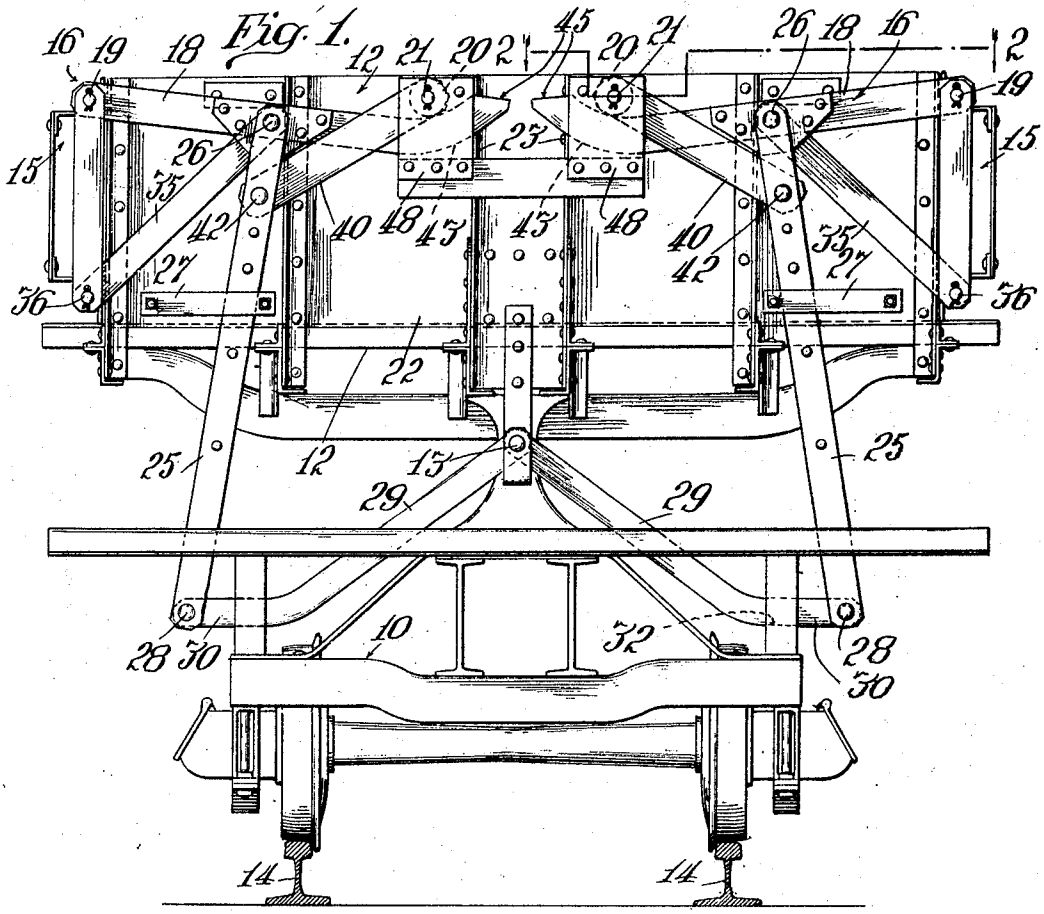
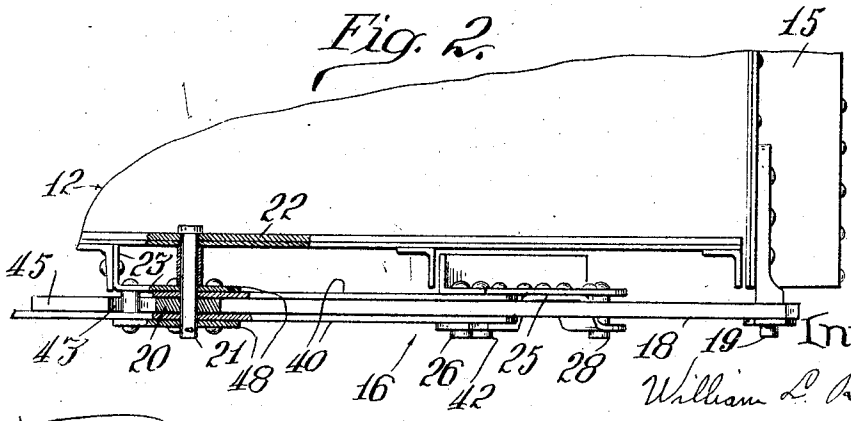


Fig. 2.



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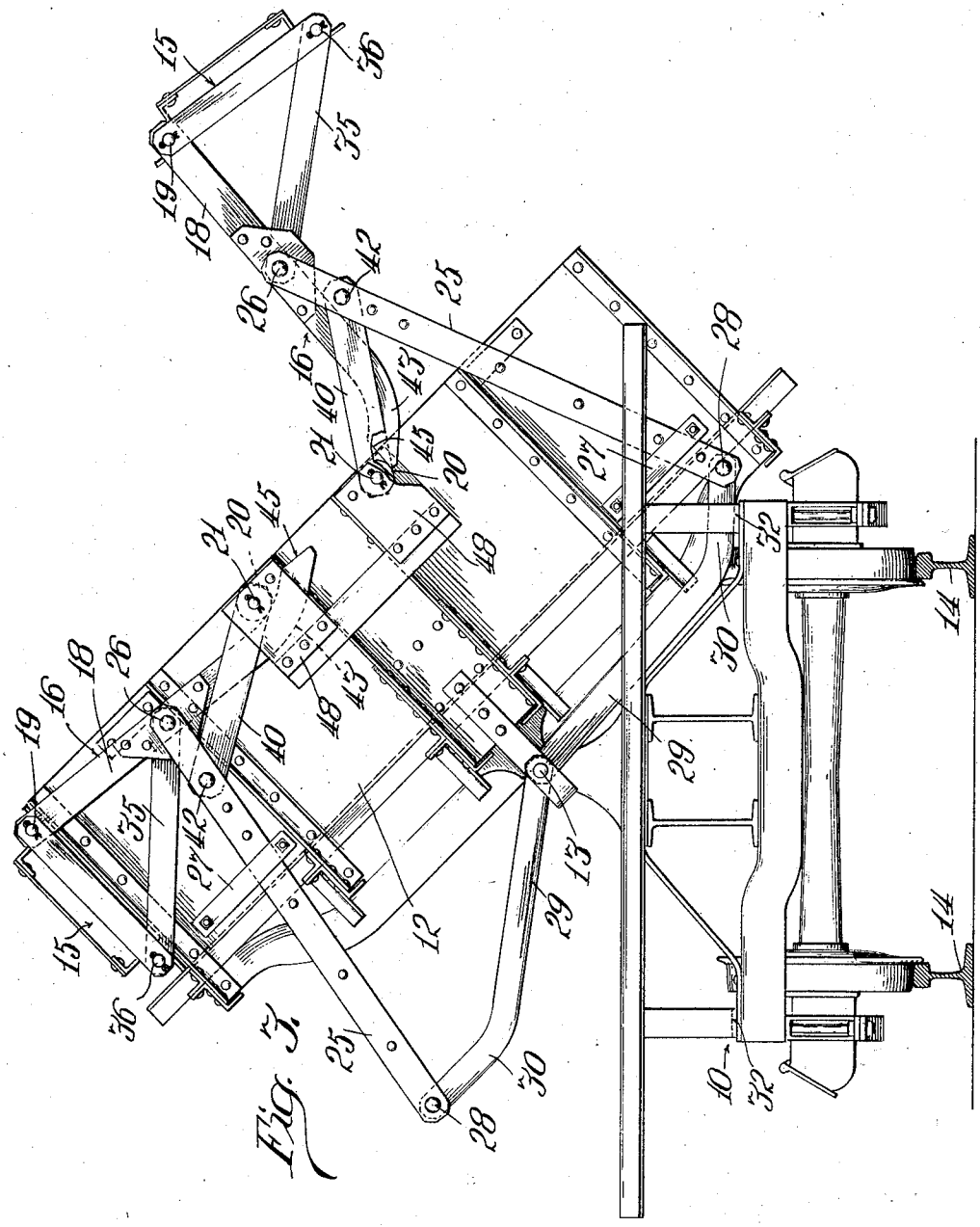


Fig. 3.

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UNITED STATES PATENT OFFICE

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DOOR OPERATING MECHANISM FOR DUMP CARS

Application filed April 28, 1928. Serial No. 273,562.

This invention relates to door operating mechanisms for dump cars.

While the particular device which I shall describe hereinafter in connection with the drawings is a mechanism adapted for use with dump cars of the type in which a car body or bed is arranged to be tilted to either side to discharge the load or contents to either side of the body or bed or to either side of the tracks on which the car runs where the car is moved on tracks, it is to be understood that the present invention is not limited to such use but may be employed in all similar work, for example, in connection with a one-way dumping body or bed.

In various dump cars and particularly in dump cars of the type referred to above a wide door opening is desirable. Particularly in side dump car bodies where it is usually desirable for the door opening to extend over substantially the entire length of the side of the car the doors become relatively large and heavy. With the door operating mechanisms heretofore provided there has been a tendency for the weight of the door when the door is in open position to right the car body or bed or return same to its horizontal non-dumping position.

With the prior mechanisms of this sort this righting tendency has been applied with relatively great force or effort or through relatively great leverages and with objectionable results particularly in connection with wide opening doors or with doors or gates that are relatively heavy. Heretofore, for example, it has frequently become necessary to reduce the size of the door opening in order to reduce the size and weight of the door sufficiently that this body righting tendency will not become objectionable, and it is an object of my present invention to provide a generally improved door operating mechanism that many be employed with relatively wide opening doors and with doors that are relatively large and heavy without any objectionable tendency of the door to right the bed or body when in raised position and without reducing the width or weight of the door. This permits a wide or large door opening as well as relatively large and heavy doors or gates where desirable or necessary without any objectionable body righting tendency therefrom. Another object is to obtain a relatively high lift of the door. Another object is to impart a relatively slow initial lift to the door followed by a faster lifting action after the initial dumping movement of the body. Another object is to reduce the leverage of the door with the door opening movement. In the present embodiment of the invention this door leverage reduction is used to reduce the body righting tendency referred to but it is to be understood that other manners of reducing or overcoming this tendency may be employed within the scope of the present invention.

The foregoing and other features and advantages of the present invention will appear from the following detailed description and the claims taken with an inspection of the accompanying drawings, in which

Fig. 1 is an end view of a dumping car embodying the present invention showing the car bed in its normal horizontal non-dumping position.

Fig. 2 is a fragmentary detail view partially in section and taken on the line 2—2 of Fig. 1; and

Fig. 3 is an end view similar to Fig. 1 with the car bed or body tilted to discharge the load from the right hand side and with the door or gate on the right hand side in open position.

It will be understood that in the two-way dumping car illustrated the door operating devices provided at the two sides of the car are alike and it is believed, therefore, that a description of the door operating mechanism at one side will suffice for both sides. I have already pointed out that the present invention may be applied to a one-way dumping body in which case only such of the present mechanism will be used as is necessary to effect the desired operations.

Referring to the drawings, 10 indicates the underbody or truck portion of the car, which, except as otherwise stated, may be of any suitable or approved construction. The car bed or body is indicated at 12 and may be of the usual or any suitable type. The car bed

or body 12 is pivoted centrally between its opposite sides at 13 on the underbody or truck portion of the car. The central longitudinal pivot 13 permits the car body to be tilted selectively toward either side to dump or discharge the load to either side of the tracks 14.

The opposite sides of the body 12 are provided with discharge openings which extend longitudinally and preferably from end to end of the opposite sides of the body. These openings are normally closed by the side doors or gates 15 which extend longitudinally along the opposite sides of the body 12 over the entire widths of the door openings so that where these openings extend from end to end of the body 12 the doors 15 may be relatively large and heavy.

As well understood by those skilled in the art, means is usually provided for locking the car body in its horizontal position while the load is being transported to keep the body from tilting toward one side or the other, either side of the body being adapted to be released or unlocked to permit the body to tilt toward that side and discharge the load therefrom.

The door operating mechanism for one door 15 is designated in its entirety at 16, it being understood that the mechanism 16 may be and is preferably duplicated at the opposite ends of the car or each door 15. Where the mechanism 16 is duplicated at opposite ends of the car the duplicate mechanisms are identical with the mechanism 16 shown. It is, therefore, believed that the description of the operating mechanism 16 at one end of the door 15 will suffice for both ends as well as for any other combination of a plurality of said mechanisms 16 or for a single mechanism 16 used alone.

The door operating mechanism 16 comprises a strut 18 pivoted at 19 to the upper marginal edge of the door 15 and preferably adjacent one end thereof. The opposite end of the strut 18 normally underlies an abutment 20 suitably secured to the body 12 to track over the upper edge of the strut 18 in the tilting movement of the body. The abutment means 20 is preferably in the form of a roller journaled upon a pin 21 anchored at its inner end in the adjacent end wall 22 of the body, as shown in Fig. 2. The outer end of the pin 21 may be additionally supported in bracket means 23 fastened to the wall 22 of the body 12.

For the purpose of holding the door or gate 15 at the dumping side of the body up when the body is tilted or dumped there is a bar 25 pivoted at its upper end at 26 to the strut 18. The bar 25 extends down along the end of the body preferably through a keeper 27 which may be in the form of a metal strap secured at its opposite ends to the end of the body and spaced from the end of the body between its opposite ends to receive the bar 25 for swinging movement therebetween. The lower end of the bar 25 is pivoted at 28 to a laterally extending link 29 which is preferably pivoted at the center of oscillation of the body 12 as upon the pivot 13. The lower end of the link 29 is preferably bowed or turned out at 30 to lie substantially horizontally in the normal horizontal position of the body and the link 29 is limited against swinging downward from the position shown in Fig. 1 and at the right in Fig. 2 by engagement of said outwardly turned or generally horizontal portion 30 with a suitable shoulder or abutment 32 on the underbody or truck portion of the car. The laterally extending link 29 may because of its pivotal connection at the center of oscillation of the body 12 be connected to the underbody or to the dumping body or bed of the car. For maintaining the door or gate 15 properly positioned relative the strut 18 so that it will be properly closed when the body 12 is returned to its normal horizontal position a brace 35 is secured at one end at 36 to the lower margin of the door or gate 15, and at its opposite end this brace 35 is pivoted, for example, at the pivotal connection 26 between the bar 25 and the strut 18. The strut 18 may, of course, be suitably reinforced or strengthened along the pivotal connection 26 of the bar 25 and link 35 therewith.

The bar 25 for holding the door or gate 15 up when the body 12 is tilted has linked connection with the body 12 as by means of a link 40 pivoted at one end to the body 12, as for example, upon the pin 21 and pivoted at its opposite end at 42 to the bar 25. Any of the connected bars, struts or links of the door operating mechanism may be offset to bring the pivotally connected portions together and at the same time permit the various links to overlap as shown without interfering with the operation of this mechanism. The inner end of the strut 18 upon which the roller 20 tracks or travels is preferably curved or bowed upwardly at 43 for the purpose of imparting a relatively high lift to the door or gate as the roller 20 travels over the upper edge of this upwardly turned end 43 toward the free end of the link. The end of the strut 18 is preferably provided with a flat surface 45 to receive the roller 20 as it leaves the upwardly curved portion 43, this flat surface 45 permitting the strut 18 to move longitudinally outwardly with the continued tilting of the body after the door or gate reaches substantially its full lift and without any substantial or material further lift of the door or gate. Any of the links may be of single or double formation, and the upwardly curved end 43 of the strut 18 is shown as operating between the bracket 23 and an outer keeper plate 48 secured to the

bracket 23 and spaced therefrom. With the arrangement shown the curved end of the strut 18 is held against lateral displacement from beneath the roller 20, but it is to be understood that the strut may be held in place in other manners as for example between the end of the body and the link 40, which link is also shown as disposed between the bracket 23 and the keeper plate 48.

Assuming that the body 12 is in the position shown in Fig. 1, the operation of the door operating mechanism in tilting the body 12 to the position shown in Fig. 3 is as follows:

As the body 12 begins its tilting movement the weight of the door 15 holds the upper edge of the upwardly curved end 43 of the strut 18 firmly in tangential engagement with the roller 20, and the roller 20 moving with the body 12 in a clockwise direction (with reference to the operating mechanism for the gate on the right hand side as viewed in Figs. 1 and 3) about the pivot 13 travels along the upper curved edge of the strut 18 toward the flat surface 45. At the same time the tilting movement of the body 12 acts through its pivotal connection 21 with the link 40 to swing the bar 25 in a clockwise direction about the pivot 28 to its ultimate or final position to the right, as shown in Fig. 3, the resulting action of the swinging support and operating mechanism moving the door upwardly and outwardly away from the door opening to open or uncover same. The strut 18 produces a slow initial lift upon the door for about the first fifteen degrees followed by a faster lift to the point of engagement of the flat end 45 of the strut with the roller 20, although this may vary with the shape and contour of the strut. This slow initial lift is due to the relatively slight initial component of movement of the roller or abutment means 20 laterally with respect to the strut 18, which relatively slight initial lateral component is accompanied by a relatively greater component of movement of the roller 20 lengthwise or longitudinally of the strut.

As the tilting continues, however, the lateral component of displacement of the roller or abutment 20 with reference to the strut 18 becomes greater and the longitudinal component of displacement becomes less with a result that as the lateral component of displacement of the roller 20 with reference to the strut becomes greater the door or gate is lifted faster or with greater speed until the roller 20 reaches the flat surface 45 whereupon the door is not lifted further to any material or substantial extent but the continued tilting movement of the body moves the strut substantially longitudinally with an accompanying outward movement of the door or gate and an accompanying lengthening of the inner lever arm of the strut 18, that is, the inner portion of the strut 18 from the pivot 26 to the roller 20. This reduces the leverage of the door 15 and thereby the body righting tendency of the door. The result is a wide opening door and an effective application of the door operating forces, and at the same time any objectionable tendency of the weight of the door to right or return the body to its horizontal position is reduced. The movement along the flat surface 45 reduces the leverage of the door so that it does not tend so much to right the bed or body, and at the same time any upward leverage imposed upon the roller 20 by the weight of the door necessarily has an inward component of movement and this is opposed by the weight of the door upon the bar 25 for holding the door open. The result of this is that the leverage of any righting tendency of the door is reduced and at the same time the weight of the door sets up an opposition to any righting tendency, which reduces the same and eliminates any objectionable tendency of this sort. It is believed that the return movement of the body and the closing action of the door is apparent without further description.

I do not intend, of course, to be limited to the precise details shown or described.

I claim:

1. In combination, a dumping body, an abutment on said body, a door for said body, and swinging means for operating said door, said means including a strut connected with the door and tangentially engaging said abutment.

2. In combination, a dumping body, an abutment on said body, a door for said body, and swinging means for operating said door, said means including a strut connected with the door and having an upwardly curved portion tangentially engaging said abutment.

3. In combination, a dumping body, an abutment on said body, a door for said body, swinging means for operating said door, said means including a strut connected with the door and having an upwardly curved portion tangentially engaging said abutment, and a substantially flat surface on said strut beyond said upwardly curved portion and adapted for tangentially engaging said abutment as the abutment moves from engagement with said curved portion.

4. In combination, a dumping body, an abutment on said body, a door for said body, swinging means for operating said door, said means including a strut connected with the door and tangentially engaging said abutment, a lateral link pivoted at the center of tilting movement of the body and a supporting arm connected between said link and said strut.

5. In combination, an underbody, a dumping body, an abutment on said dumping body, a door for said dumping body, swing-

ing means for operating said door, said means including a strut connected with the door and tangentially engaging said abutment, a lateral link pivoted to the underbody, a supporting arm connected between said link and said strut, and a link connected between said supporting arm and the body.

6. In combination, a dumping body, an abutment on said body, a door for said body, swinging means for operating said door, said means including a strut connected with the door and tangentially engaging said abutment, a lateral link pivoted at the center of tilting movement of the body, a supporting arm connected between said link and said strut, a link connected between said supporting arm and the body, and a link connected between the strut and the door below the connection of said strut therewith.

7. In combination, a dumping body, a door for said body, swinging means for operating said door, said means comprising a strut pivotally connected with said door, and having a curved portion, a lateral link pivoted at the center of tilting movement of the body, a supporting bar pivoted to said link and to said strut, a link pivoted to said supporting bar and to said body, and a roller journaled on the pivotal connection between the body and said last link and tangentially engaging the curved end of said strut.

8. In combination, a dumping body, a door for said body, swinging means for operating said door, said means comprising a strut pivotally connected with said door, and having a curved portion, a lateral link pivoted at the center of tilting movement of the body, a supporting bar pivoted to said link and to said strut, a link pivoted to said supporting bar and to said body, and a roller journaled on the pivotal connection between the body and said last link and tangentially engaging the curved end of said strut, said strut having a substantially flat portion beyond said upwardly curved portion and adapted for tangentially engaging said roller as the roller leaves said curved portion.

9. In combination, a dumping body, a door for said body, swinging means for operating said door, said means comprising a strut pivotally connected with said door, and having a curved portion, a lateral link pivoted at the center of tilting movement of the body, a supporting bar pivoted to said link and to said strut, a link pivoted to said supporting bar and to said body, a roller journaled on the pivotal connection between the body and said last link and tangentially engaging the curved end of said strut, said strut having a substantially flat portion beyond said upwardly curved portion and adapted for tangentially engaging said roller as the roller leaves said curved portion, and a link connected between the strut and the door below the connection of said strut therewith.

10. In combination, a dumping body, a door for said body, swinging means for operating said door, said swinging operating means including a lateral link pivoted at the center of tilting movement of the body, said lateral link being bowed within its length to form an out-turned lower end, a roller on said body, a strut connected with the door and tangentially engaging said roller and a supporting arm connected between said strut and the out-turned lower end of said lateral link.

11. In combination, a dumping body having a door opening, an abutment on said body, a door for said opening, swinging means for operating said door, and means connected with the door and tangentially engaging said abutment for reducing the leverage of the door toward open position.

12. In combination, a body pivoted to tilt to dumping position, an abutment on said body, a door for said body, and swinging means for operating said door, said means including means connected with the door and tangentially engaging said abutment for reducing the tendency of the door to right said body to normal position about said pivot.

13. In combination, a dumping body, a door for said body, an abutment on said body, and a swinging strut connected with the door and tangentially engaging said abutment and slidable outwardly to reduce the leverage of the door in the opening movement thereof.

14. In combination, a dumping body having a door opening, a door for said opening, swinging means for operating said door, said means including leverage for imposing the weight of the tilted side of the body against any body righting tendency of the door, said leverage being variable to increase the leverage of the opposition to said body righting tendency in the opening movement of the door.

15. In combination, a dumping body, an abutment on said body, a door for said body, and swinging means for operating said door, said means including means connected with said door and tangentially engaging said abutment for causing the door to move with an accelerated motion during the latter part of its opening movement.

In witness whereof I hereunto subscribe my name this 19th day of April, 1928.

WILLIAM L. BURNER.