No. 752,310. PATENTED FEB. 16, 1904.

A. STUCKI.

DOOR OPERATING DEVICE FOR HOPPER CARS.

APPLICATION FILED AUG. 21, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

fig. 6.

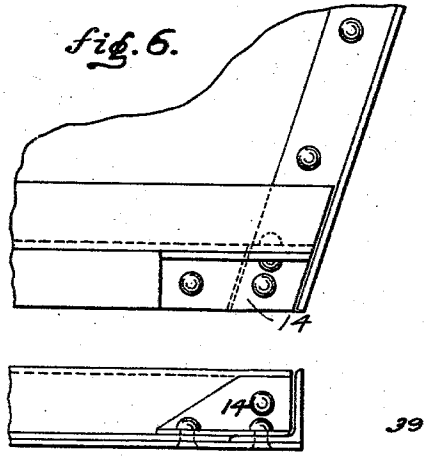


fig. 5.

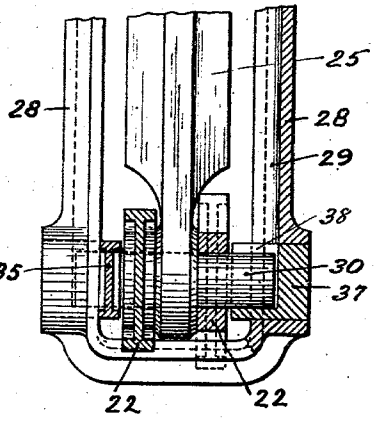


fig. 1.

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NO MODEL. 3 SHEETS—SHEET 2.

fig. 4.

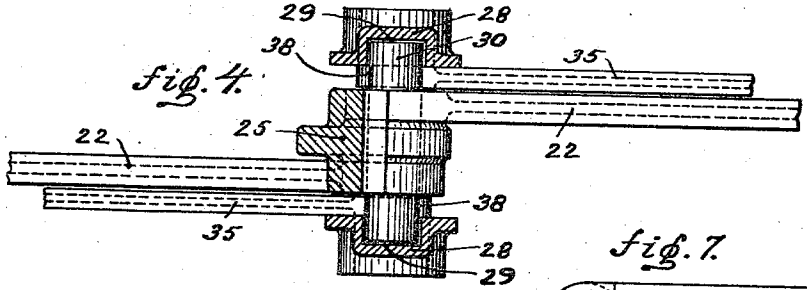


fig. 7.

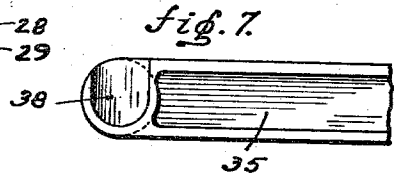


fig. 2.

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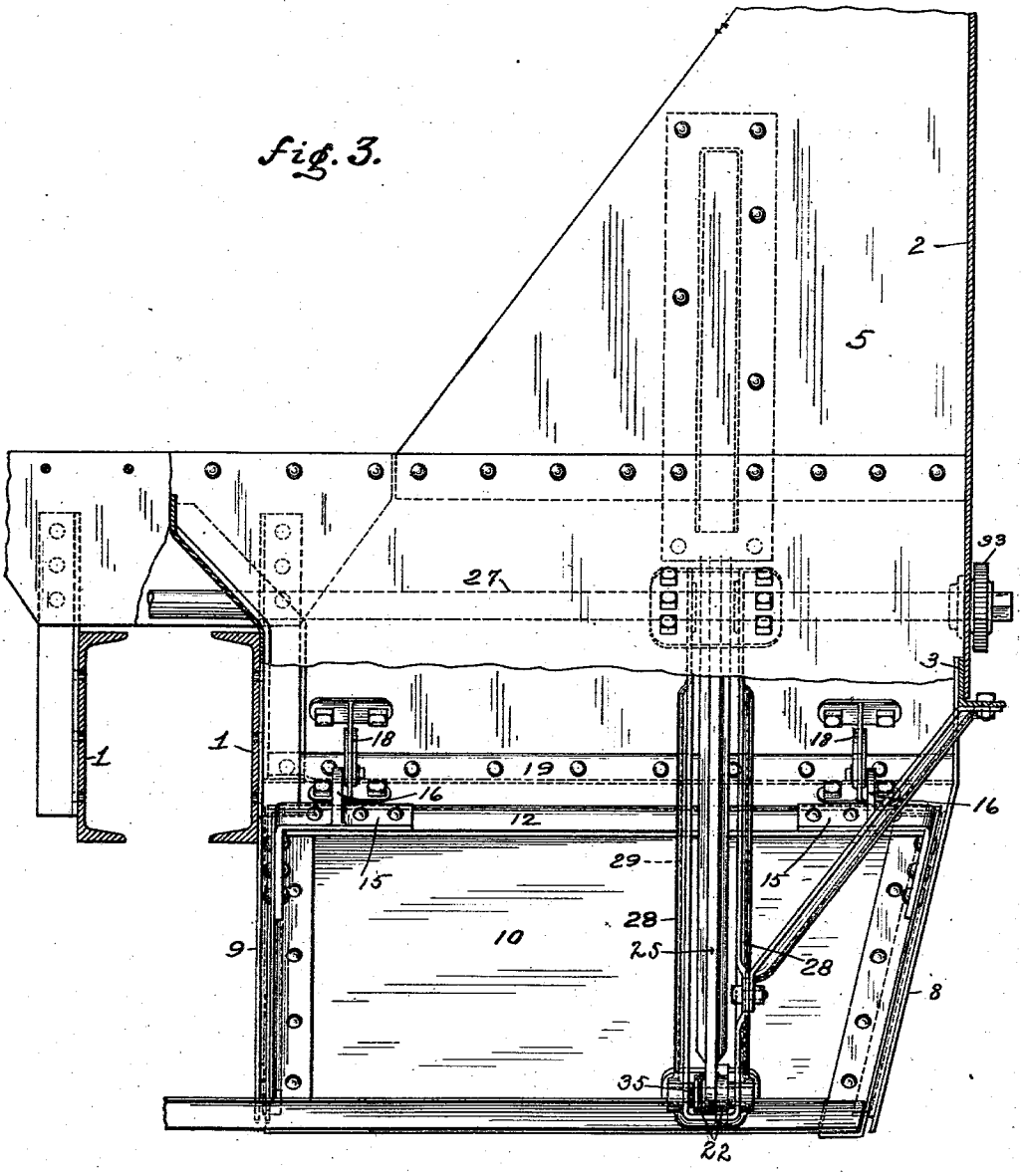
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DOOR OPERATING DEVICE FOR HOPPER CARS.

APPLICATION FILED AUG. 21, 1903.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 3.



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No. 752,310. Patented February 16, 1904.

UNITED STATES PATENT OFFICE.

ARNOLD STUCKI, OF ALLEGHENY, PENNSYLVANIA, ASSIGNOR TO STANDARD STEEL CAR COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

DOOR-OPERATING DEVICE FOR HOPPER-CARS.

SPECIFICATION forming part of Letters Patent No. 752,310, dated February 16, 1904.

Application filed August 21, 1903. Serial No. 170,330. (No model.)

To all whom it may concern:

Be it known that I, ARNOLD STUCKI, a resident of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Door-Operating Devices for Hopper-Cars; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to door-operating mechanism for use on hopper-cars and the like; and the object of the invention is to provide operating mechanism for this purpose so constructed that the lower edge of the doors will travel in a comparatively straight line, thus permitting the hoppers of the car to be built closer down to the track and also permitting the doors to be placed closer together and decreasing the width and height of the cross-ridge and correspondingly increasing the cubical contents of the car.

A further object of my invention is to provide door-operating mechanism which will enable the lower edges of the doors to be brought much closer together in opening the same than heretofore, thereby increasing the discharge-opening.

In hopper-cars for coal, coke, ore, and the like it is very desirable to have as large a cubical capacity as possible without unnecessarily increasing the height, width, and length of the car. As a consequence the hopper-bottoms should be brought as low down as possible. With swinging doors, however, a difficulty is encountered because the lower edges of the doors swing on the arc of a circle, thereby rendering them liable to come into contact with the track if the hopper is placed low down. This has made it necessary to place the hopper higher up than would otherwise be necessary. This difficulty has been attempted to be overcome by using horizontal doors swinging on links or the like and located very close to the track, thus increasing the cubical capacity of the car. The difficulty with such doors, however, is that such doors must be pulled or slid along the lading, and during the winter season they will freeze fast to the lading and cannot be easily opened. This difficulty of freezing is not encountered with pivotally-swinging or hinged doors, as they swing away from the lading instead of sliding past the same, so that they can be readily opened even if frozen to the lading.

The object of my invention is to use such swinging doors and to so mount the same and arrange the operating mechanism therefor that the hoppers can be placed comparatively low down.

To this end the invention consists, generally speaking, in so hinging the doors that they will not only swing on their axes, but will also move transversely with reference thereto and in providing in connection with the doors so hinged suitable links which will give to the same a somewhat parallel movement, so that the lower edges of the doors will travel in a comparatively straight line.

The invention also consists in a guide for the operating mechanism which is arranged to strengthen and stiffen the cross-ridge plates and also form a bearing for the winding-shaft, as well as in certain details of construction, such as adjusting means for the door-operating links, to adapt the same to various cars, and various other details which will hereinafter be specifically described and claimed.

In the accompanying drawings, Figure 1 is a cross-section through a portion of a hopper-car with my invention applied thereto, showing the doors closed. Fig. 2 is a similar view showing the doors in process of opening. Fig. 3 is a view taken transversely of the car and through the hopper-ridge. Fig. 4 is a section on the line 4 4, Fig. 1. Fig. 5 is a detail sectional view of the guide and links. Fig. 6 shows details of the corners of the doors, and Fig. 7 is a side view of the inner end of one of the toggle-links.

The car-body may be of any suitable construction and in the drawings only a small part thereof has been shown. In the drawings the center sill is shown at 1 and the car side at 2, the latter being strengthened at its bottom by the angle-rail 3. 4 represents the cross-ridge plates, which may be of the usual or any preferred construction. They are con-

nected to the car sides by means of a gusset-plate 5, which is of general triangular form, as shown in Fig. 3. The longitudinal ridge is shown at 6, the inclined hopper-floor plates at 7, the outside hopper-sheets at 8, and the inside hopper-sheets at 9. All of these parts may be varied within wide limits, and the specific forms shown have been selected for purposes of illustration merely.

The doors are shown at 10, and these preferably will be arranged as shown in Figs. 1 and 2—that is, so as to swing in opposite directions and toward each other. Preferably, also, they will be arranged in pairs—that is, one on each side of the center sills—the doors of each being connected by means of a suitable transverse beam, such as the Z-bar 11. Each door is provided with an integral flange 12 at its upper edge, while the two side edges are stiffened by means of sections of angle-bar 13 riveted thereto, and the Z-bar beam 11 forms a stiffening member for the lower edge of these doors. At each of the lower corners is riveted a small piece of angle-bar 14 for strengthening the same. At the upper corners of the door are applied angle-brackets 15, which are riveted to the flanges 12 and 13, thus serving to strengthen the corners of the door. These angle-brackets are provided with one member of the hinge, said member being shown as an arm 16, provided with a pintle 17. The hinge-butts 18 are secured directly to the lower edges of the cross-ridge plates 4, said edges being stiffened or strengthened by means of Z-bars 19.

In order to permit the parallel movement of the door heretofore described, the hinge connection is such as to permit also a movement of the door transversely of its axis. This can be accomplished in various ways, but most conveniently by providing the hinge-butts 18 with slots 20, in which the hinge-pintles 17 move, so that in the opening of the door these pintles, together with the door, can move upwardly, as shown in the drawings, whereas when the doors are in a closed position the lower ends of the slots act in the ordinary way of the usual hinge-butt.

The door-operating mechanism comprises a pair of toggle-links 22, having their outer ends pivotally connected to the lower edges of the door, and in order to adapt the device to variations which naturally exist between different cars these toggle-links are made adjustable in length. This may be accomplished in various ways, and, as shown in the drawings, said links are provided with ends 23, which are separate from the bodies thereof and screw into sockets in the latter, these ends being provided at their outer ends with jaws which are pivotally connected to ears secured to the doors. To the inner or knuckle ends of these toggle-links is connected suitable means for raising and lowering the same. This means may be of various forms, which are well known to those skilled in the art, that shown in the drawings comprising a rack-bar 25, connected to the knuckle-joint of the toggle-links and extending upwardly and engaged by a pinion 26 on the transverse operating-shaft 27. To insure the movement of this knuckle in a practically straight line and to make both doors move the same amount at any time, I provide a suitable guide therefor, this guide consisting of a forging, stamping, or casting 28, having two parallel legs, each of which is provided with a groove 29, into which grooves the ends of the pin 30 of the knuckle-joint project, so that said joint is guided thereby. This guide has its upper end enlarged laterally and secured to the cross-ridge plates 4, thus serving to strengthen and stiffen the latter. A lateral brace 31 has one end secured to the car sides and its opposite end secured to the guide 28 near the lower end of the latter, thus bracing the latter. In this guide is also formed a bearing 32 for holding the rack-bar 25 against the pinion 26. The operating-shaft 27 is also mounted in this guide and extends to the sides of the car, where it is provided with the usual means for operating the same, as well as a ratchet 33 and pawl for holding it in position. A single operating-shaft, it will be observed, serves to operate all four of the doors of the hopper.

In order to cause the doors to move upwardly when swinging open, supplemental links 35 are provided, these links having their outer ends pivotally connected to the toggle-links 22 near the middle of the latter—that is, at the point 36—and having their inner ends pivotally secured to any suitable support, preferably to the lower end of the guide 28. The inner ends of these links preferably have pivotal studs 37 formed integral therewith, which studs are mounted in openings in the lower end of the guide 28, said studs being provided with U-shaped depressions 38 on their upper faces, as shown in Fig. 4, in order to permit the knuckle-pin 30 to assume its proper position when the doors are closed. When the knuckle-joint of the toggle-links is raised, as shown in Fig. 2, these supplemental links swing around their pivots and raise the doors and cause their hinged pintels to slide upwardly in the slots 20 in the hinge-butts. This causes the lower edge of the door to move in a comparatively straight line and prevents the same from swinging downwardly as far as with old types of swinging doors.

The rack-bar 25 when elevated naturally projects up into the body of the car, and in order to relieve it of the resistance of the lading a suitable guide-channel 39 is provided therefor, this guide-channel being shown of general trough-form, closed at its upper edge and riveted to the gusset-plate 5 of the cross-ridge.

It will be readily understood that with my door-operating mechanism the lower edge of

the door is held farther above the rails than with the ordinary pivoted doors, and as a consequence the hoppers can be lowered to the extent of this distance, thereby increasing the cubical capacity of the car. The operating mechanism furthermore is very compact and permits the two oppositely-arranged doors to be placed very close together, thus enabling the use of a comparatively narrow and low cross-ridge, which further increases the cubical capacity of the car. Furthermore, the operating means permits the lower edges of the doors to swing close together, thus increasing the discharge-opening and facilitating the unloading of the car.

While my invention has been shown applied to doors arranged transversely of the car, it is evident that the invention might be applied equally as well to doors arranged longitudinally of the car and even to doors other than car-doors or even to those arranged on a vertical axis. No limitations are therefore to be imposed on the terms of the claims by the specific illustration.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a door for cars and the like, the combination with a door, of hinges therefor arranged to permit movement of the door transversely to its axis, and guiding-links connected to said door and arranged to cause the same to move in a somewhat parallel plane.

2. In door-operating mechanism, the combination of a hinged door, of hinges therefor arranged to permit movement of the door transversely of its axis, a link pivotally connected at one end to said door, a guide in which the opposite end of said link moves, and means for moving said last-named end in said guide.

3. In door-operating mechanism, the combination of a hinged door, hinges therefor comprising coöperating slots and pins whereby the door may move transversely of its axis, a link pivoted at one end to said door, a guide in which the opposite end of said link moves, and means for moving said last-named end in said guide.

4. In door-operating mechanism, the combination of a hinged door, hinges therefor arranged to permit movement of the door transversely of its axis, an operating-link pivotally connected at one end to said door, a guide in which the opposite end of said link moves, means for moving said last-named end in said guide, a supplemental link having one end pivotally connected to said operating-link, and a suitable support to which the opposite end of said supplemental link is pivotally connected.

5. In door-operating mechanism, the combination of a hinged door, hinges therefor comprising coöperating pins and slots whereby the door is permitted to move transversely of its axis, an operating-link pivotally connected at one end to said door, a guide in which the opposite end of said link moves, means for moving said last-named end in said guide, and a supplemental link having one end pivotally connected to said operating-link and having its opposite end pivotally connected to said guide.

6. In door-operating means, the combination with oppositely-swinging doors, of hinges therefor arranged to permit movement of said doors transversely of their axes, and guiding-links connected to said doors and arranged to cause said doors to move transversely of their axes in opening and closing.

7. In door-operating mechanism, the combination with oppositely-swinging doors, of hinges therefor arranged to permit movement of the doors transversely of their axes, toggle-links pivotally connected to said doors, and means for moving the knuckle of said links to open and close the doors.

8. In door-operating mechanism, the combination with oppositely-swinging doors, of hinges therefor comprising coöperating slots and pins whereby said doors can move transversely of their axes, toggle-links pivotally connected to said doors, and means for moving the knuckle of said toggle-links to open and close the doors.

9. In door-operating mechanism, the combination with oppositely-swinging doors, of hinges therefor arranged to permit movement of the doors transversely of their axes, toggle-links pivotally connected to said doors, means for moving the knuckle of said toggle-links to open and close the doors, supplemental links each having one end pivotally connected to one of the toggle-links, and a suitable support to which the opposite end of each of said links is pivotally connected.

10. In door-operating mechanism, the combination with oppositely-swinging doors, of hinges therefor comprising coöperating slots and pins whereby the doors are permitted to move transversely of their axes, toggle-links pivotally connected to said doors, means for moving the knuckle of said toggle-links to open and close the doors, supplemental links each having one end pivotally connected to one of the toggle-links, and a suitable support to which the opposite end of each of said supplemental links is pivotally connected.

11. In door-operating mechanism, the combination with oppositely-swinging doors, of hinges therefor arranged to permit movement of the doors transversely of their axes, toggle-links pivotally connected to said doors, a guide in which the knuckle-joint of said links moves, and means for moving said knuckle-joint in said guide to open and close the doors.

12. In door-operating mechanism, the combination with oppositely-swinging doors, of hinges therefor arranged to permit movement of the doors laterally of the axes thereof, toggle-links pivotally connected to said doors, a

guide in which the knuckle of said toggle-links moves, means for moving said knuckle to open and close the doors, supplemental links each having one end pivotally connected to one of said toggle-links, and a suitable support to which the opposite end of each of said supplemental links is pivotally connected.

13. In door-operating mechanism, the combination with oppositely-swinging doors, of hinges therefor comprising coöperating slots and pins whereby the doors are permitted to move transversely of their axes, toggle-links pivotally connected to said doors, a guide in which the knuckle of said toggle-links moves, means for moving said knuckle in said guide, and a pair of supplemental links each having one end pivotally connected to a toggle-link and having its opposite end pivotally connected to said guide.

14. In a hopper-car, the combination with the ridge-plates, of oppositely-swinging doors hinged to the lower edges of said plates, a pair of toggle-links connected to said doors, a guide for the knuckle of said links, means for raising and lowering said knuckle, and a lateral brace secured to the car-body and to said guide.

15. In a hopper-car, the combination with the ridge-plates, of oppositely-swinging doors hinged to said plates, a pair of toggle-links connected to said doors, a guide for the knuckle of said links, said guide being secured to the ridge-plates, a rack connected to the knuckle of said links, and a pinion journaled in said guide and engaging said rack.

16. In a hopper-car, the combination with the cross-ridge, of oppositely-swinging doors, toggle-links connected to said doors, a rack connected to the knuckle of said toggle, a pinion engaging said rack, and a guide-channel for said rack projecting in the body of the car.

17. In a hopper-car, the combination with the cross-ridge, of a strengthening gusset-plate therefor, oppositely-swinging doors, toggle-links connected to said doors, a rack connected to said toggles for operating the same, and a guide-channel for said rack connected to the gusset-plate.

18. In a hopper-car, the combination of a hinged door, operating means therefor, and brackets secured at the upper corners of said door, said brackets being provided with one member of the hinges and being of angle shape and serving as corner-braces.

19. In a hopper-car, the combination of a hinged door, flanges on the edges of said door, and brackets secured to the door-flanges at the upper corners and being provided with one member of the hinges.

In testimony whereof I, the said ARNOLD STUCKI, have hereunto set my hand.

ARNOLD STUCKI.

Witnesses:
ROBERT C. TOTTEN,
G. KREMER.