July 28, 1925. 1,547,640

A. CAMPBELL

DUMP CAR DOOR OPERATING MECHANISM

Filed Nov. 30, 1923 3 Sheets-Sheet 1

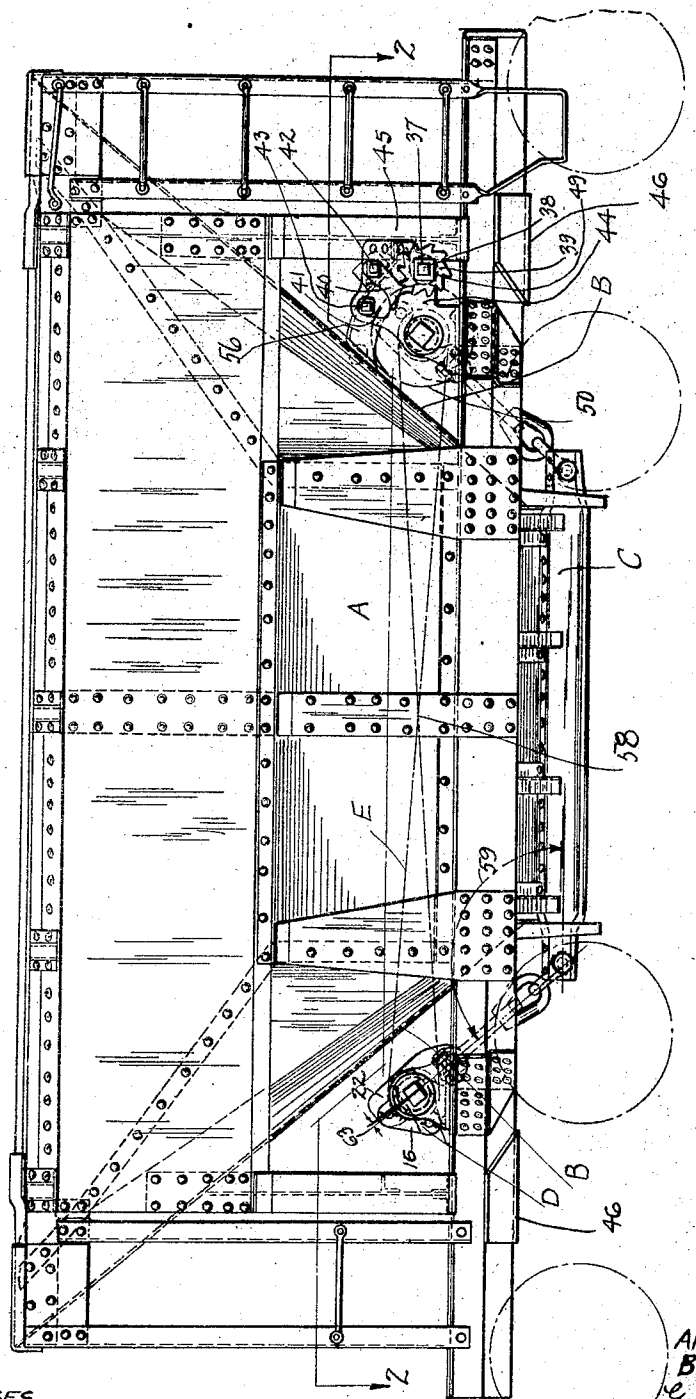


FIG 1.

WITNESSES
Geo. D. Dorey

INVENTOR
ARGYLE CAMPBELL
BY
George I. Haight
HIS ATTORNEY

July 28, 1925. 1,547,640

A. CAMPBELL

DUMP CAR DOOR OPERATING MECHANISM

Filed Nov. 30, 1923 3 Sheets-Sheet 2

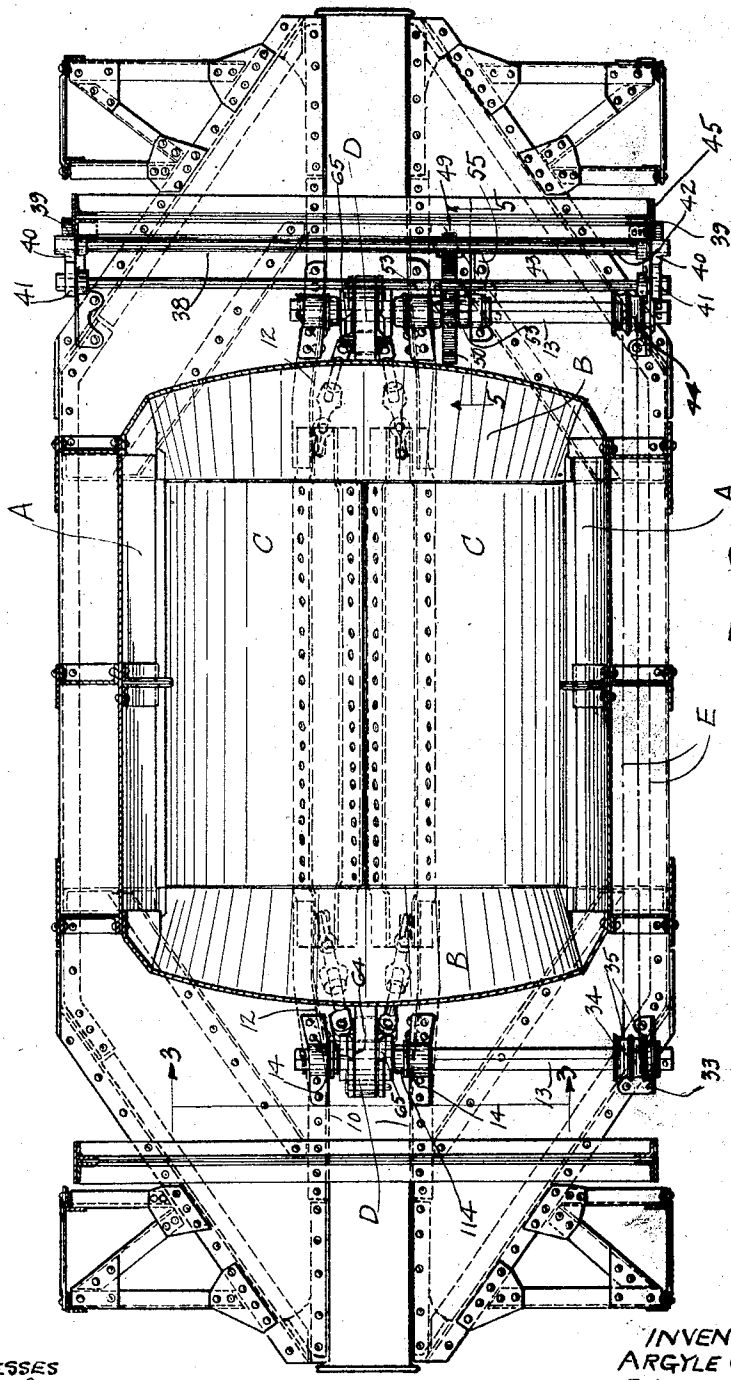


FIG 2.

WITNESSES

INVENTOR
ARGYLE CAMPBELL
BY George J. Knight
HIS ATTORNEY

July 28, 1925. 1,547,640

A. CAMPBELL

DUMP CAR DOOR OPERATING MECHANISM

Filed Nov. 30, 1923 3 Sheets-Sheet 3

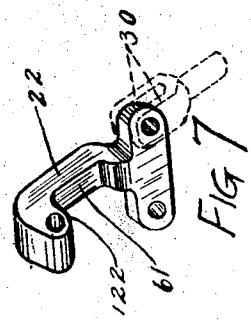


FIG 7

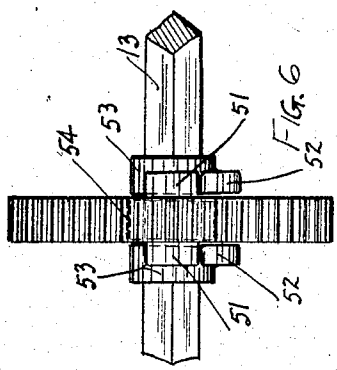


FIG. 6

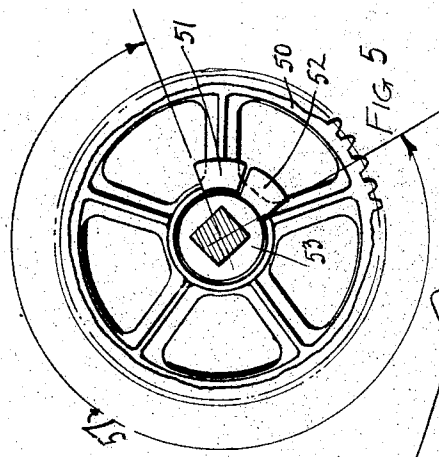


FIG 5

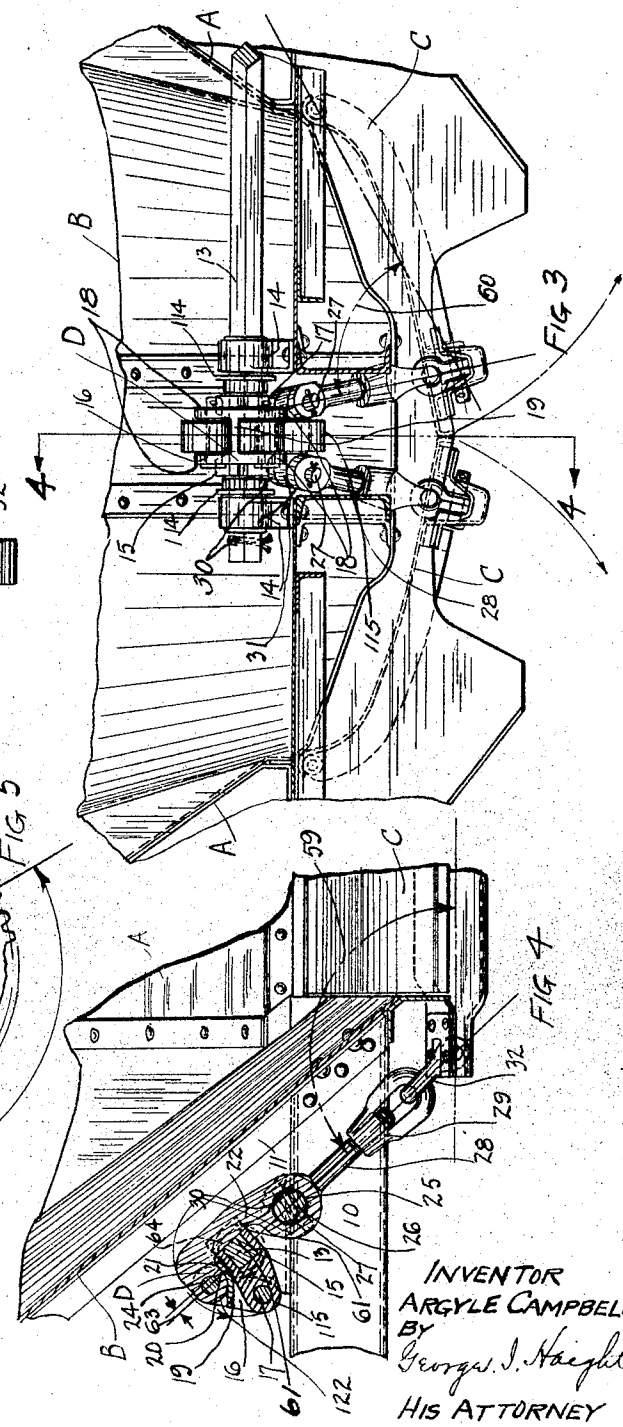


FIG 3

FIG 4

WITNESSES
Geo. D. Dorey

INVENTOR
ARGYLE CAMPBELL
BY
Georges. J. Knight
HIS ATTORNEY

Patented July 28, 1925. 1,547,640

UNITED STATES PATENT OFFICE.

ARGYLE CAMPBELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO ENTERPRISE RAILWAY EQUIPMENT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

DUMP-CAR-DOOR-OPERATING MECHANISM.

Application filed November 30, 1923. Serial No. 677,869.

To all whom it may concern:

Be it known that I, ARGYLE CAMPBELL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Dump-Car-Door-Operating Mechanisms, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to improvements in dump cars and door operating mechanisms therefor.

One object of the present invention is to provide an improved self-locking door operating mechanism for that type of car having longitudinally hinged doors operable in unison by means of shafts arranged at right angles to the hinge axes of the doors.

A second object of the present invention is to provide a dump car door mechanism which is efficient, simple and strong and which insures safety and convenience for the operator.

Another object of the invention is to provide a door mechanism of the general character above indicated having the parts so arranged that, when the doors are moved towards closed position, the angle between the doors and the lifting mechanism will be such as to insure the power exerted by the operator effecting a more direct lifting force on the door than has heretofore been possible with existing types of door raising and locking mechanism used on cars of the indicated class.

A more specific object of the present invention is to provide a very positive locking device for dump cars having sloping ends and longitudinally hinged doors and wherein the doors are supported from shafts disposed below the end floors and above the doors and spaced an appreciable distance from the side edges thereof. In cars of such construction, the connecting mechanism between the shaft and doors must necessarily be at an angle from the vertical inasmuch as it slopes upwardly and outwardly from the doors, and it has heretofore been customary to rotate the shafts, to close the doors, in a direction which causes the connecting mechanism to first move upwardly and away from the doors and thereafter inwardly towards the doors when the mechanism is of the self-locking type. This locking action, which is usually effected by causing the pivotal point of the supporting mechanism, as in the closing action of a toggle joint, to pass slightly beyond the center of the operating shaft, is dependent upon the parts being finely adjusted. When any looseness occurs in such mechanisms there is a tendency for the parts thereof to sag, the weight of which alone is sufficient to break the toggle joint and thereafter the locking action of the mechanism fails and the operating shaft is subject to torsion. My present invention remedies this defect by reversing the direction of rotation of the operating shaft from the usual practice and disposing the parts of the mechanism in such a manner that they will be firmly supported in locked position and any jarring of the car or increased looseness in the connections, will automatically tend to augment the self-locking effect of said mechanism rather than tend to unlock the same.

In order to attain this desirable result, I have produced a mechanism which may operate in a very restricted space and which, due to its compactness, may be placed beneath a sloping end floor and wherein certain of the parts may assume a position between the said floor and the shaft without unduly spacing the shaft from the said end floor.

Other objects and advantages of this invention will be more fully pointed out and claimed hereinafter.

In the drawings forming a part of this specification, Figure 1 is a side elevation of an ore car embodying my improved construction. Figure 2 is a horizontal sectional view of the car corresponding substantially to the line 2—2 of Figure 1. Figure 3 is a transverse, partial sectional view corresponding substantially to line 3—3 of Figure 2 and showing the door operating mechanism on an enlarged scale. Figure 4 is a vertical sectional view corresponding substantially to line 4—4 of Figure 3. Fig-

ure 5 is a side elevational view of the operating wheel and clutch arrangement, as viewed on a section line corresponding substantially to line 5—5 of Fig. 2. Figure 6 is an end elevational view of the operating wheel and clutch arrangement shown in Figure 5. And Figure 7 is a perspective view of an alternate construction for the locking hanger.

In the drawings, A—A denote the sloping side walls of the car, B—B the sloping end walls of the car, and C—C dump doors hinged with their axes extending longitudinally of the car, said doors depending from the side walls A of the car. At each end of the car and beneath the sloping end floors there are provided winding mechanisms D—D adapted to have rotation in a plane substantially at right angles to the axes of the dump doors, the winding mechanisms on the respective ends of the car being preferably connected for simultaneous operation by means of connections E—E.

The operating mechanism is especially adapted for cars having a single unobstructed discharge opening and, as shown on the drawings, the center sills 10—10 of the car underframe extend only to the end floors B and are secured thereto by means of riveted connections 11. Said sills are diverged at 12 in order to present a transversely widened space for accommodating the car door operating mechanism. The construction of the car, broadly, is on the general lines indicated in my prior U. S. Patent 1,400,866 dated December 20, 1921, for ore car.

In so far as the lifting and winding mechanism is concerned, the construction at the two ends of the car is the same and a description of one end will suffice. Said mechanism, broadly, consists of an operating shaft 13 journaled in suitable bearings 14 carried by the underframe above the center sills 10—10 and beneath the sloping floor B. The shaft 13 is preferably formed of rectangular cross-section and, in order to provide a circular bearing to form journals for the shaft, thimbles 114 are employed as indicated. Intermediate the bearings 14, a drum 15 having an arm 115 is rigidly secured to the shaft and is pivotally connected at 17 with a block 16. Said block is formed with a pair of spaced wings 18—18 (see Fig. 3) which straddle the arm 115 and are connected by means of a web 19 having the outer portion thereof arcuate shape. The lower or inner portion 20 of the web 19 constitutes a bearing face adapted to rest on the drum 15 and the upper face 21 of said web constitutes a bearing surface for the hooked portion 122 of a locking hanger 22 which is mounted intermediate the spaced wings 18—18 and pivotally secured thereto by means of a pivot 24. Said locking hanger 22 has a depending shank which extends below the shaft and the lower end thereof is formed with a perforation 25 adapted to carry a heavy trunnion 26, in which are disposed, near each end thereof, pivots 27 with their axes disposed transversely thereof for the purpose of adapting link connections 28—28, extending between the pivots 27—27 and the respective doors C—C, to have movement in the direction of swinging movement of the said doors. The link connections 28—28 preferably include a threaded member as shown at 29 whereby adjustment for length is rendered possible. The upper end of each link 28 is formed with bifurcated portions 30—30 adapted to embrace an end of the trunnion 26 which is there formed with a flattened portion 31. Connection between each link 28 and door C is effected by means of a clevis 32 secured to the end of a longitudinally extending beam which projects outwardly beyond the side edge of each door and near the free edge thereof as shown best in Figures 1 and 4.

While any desired form of construction may be utilized for connecitng the links 28—28 with the locking hanger 22, a desirable construction is to provide a gimbal joint between the parts by means of a trunnion 26 as shown in Fig. 3 and Fig. 4 but it is to be understood that an effective construction may also be employed wherein the gimbal joint between the hanger and the link is dispensed with and the links are pivoted directly to the hanger as shown in Fig. 7, one of the said links being shown in dotted lines.

The winding shafts 13 are each extended outwardly to the side of the car, and there mounted in a suitable bearing 33. Each of said shafts 13 carries a sheave wheel 34, formed with a plurality of parallel grooves 35 in which flexible connections E—E are adapted to be retained, the respective connections E—E being connected to the respective sheave wheels 34 at each end of the car and adapted to transmit rotary movement from one shaft to the other, one of said connections being adapted to wind on one groove as the other connection unwinds from the adjacent groove.

The mechanism for rotating the shafts 13 and operating the doors is employed at one end only of the car and is so formed that the car may be operated from either side thereof and for this purpose a shaft 38 extends from side to side of the car and is fitted at each end thereof with a ratchet wheel 39. Cooperable with said ratchet wheels are pawls 40. The pawls are securely locked in their engaging position with their corresponding ratchet wheels by means of cams 41. A transversely extending shaft 42 connects the respective pawls 40 so that the pawls on either side of the car are operated in unison

and a shaft 43 connects the cams 41 in a similar manner and for a similar purpose. On the operating end of the car the various shafts included in the operating and locking mechanism pass through a bearing casting 44 which thus effectively serves to maintain the shafts in their proper relation. The bearing casting 44 is secured to the underframe of the car and also to an upwardly and outwardly sloping framework 45 disposed in alignment with the body bolster 46 of the car. The opposite ends of the shafts 38, 42 and 43 are journaled in a suitable bearing bracket as shown in Fig. 2.

The end of the shaft 38 is provided at its ends with squared portions 37 or any suitable formation adapted to receive the end of a wrench or other operating tool. A pinion 49 rigidly secured to the shaft 39 is adapted to co-operate with a gear wheel 50 loosely mounted on the shaft 13. Said gear wheel 50 is provided with segmental clutch projections 51—51 disposed on either side thereof (see Fig. 6) and preferably integral therewith which are adapted to engage segmental clutch lugs 52 rigid with respect to the shaft 13 and preferably formed on collars 53 which are disposed on either side of the wheel 50 as clearly shown in Figs. 5 and 6. In order to provide a circular bearing on which the wheel 50 may turn freely, a small collar 54 is mounted on the shaft intermediate the clutch members 53. As will be noted by reference to Fig. 2, the wheel 50 and adjacent clutch collar 53 are disposed immediately adjacent one of the supporting shaft bearings 14 and between the same and an additional bearing 55 thereby insuring that these members will be adequately supported and maintained in their proper relative position. A shield 56 is disposed immediately above the gear wheel 50 which also provides a support for the shafts 42 and 43 preventing the same from sagging intermediate the sides of the car. Said shield 56 extends from the sloping end floor B to the framework 45 and is secured to both of said members as shown in Fig. 1. This member has been omitted from Fig. 2 in order to show the operating wheel 50 and allied parts more clearly.

With the parts of the mechanism in position as shown in Fig. 1 and the locking hangers 22 seated upon their respective drums in such a way as to eliminate torsion on the shafts 13, the operation of releasing the doors is as follows: The operator rotates the cam 41 in a counter-clockwise direction thereby releasing the same from the pawl 40 which is then in turn released from engagement with the ratchet wheel 39. The operator next engages the end of the shaft at 37 by means of a suitable tool and rotates the same in a clockwise direction thereby turning the gear wheel (which is now in position as shown in Fig. 5) through an arc as indicated by the numeral 57 until such time as it engages the lower faces of the segmental clutch portions formed on the collars 54. Continued rotation of the gear wheel 50 thereafter causes the same to rotate in unison with the shaft 13 and also causes the shaft 13 on the opposite end of the car to rotate in the opposite direction in unison therewith, such reversal of movement being preferably carried out by crossing the flexible connections E—E connecting the respective shafts 13, as indicated at 58 in Fig. 1. Partial rotation of the shafts 13 in an unlocking direction moves the locking hangers 22 out of engagement with their respective shafts and thereafter the doors open by reason of the weight of the load thereon. The closing operation of the doors is merely a reversal of the operation described above. Inasmuch as heretofore this feature of the operation of cars of this type has been attended with considerable difficulty I have made provision for a more direct lifting action on the door in the direction of swinging movement of the doors as well as in the plane of rotation of the operating shafts. I accomplish this by rotating the shafts 13 in a direction which provides that the angle, indicated at 59 in Fig. 4, between the lifting mechanism and the door will be at its maximum when the doors are in closed position. This is accomplished by rotating the shafts in the opposite direction to that which is common practice, and thereby disposing the linkage mechanism intermediate the shafts and the sloping end floors.

Similarly it is desirable that the lift on the doors in the direction of swinging thereof should be directly exerted. In order to accomplish this result it is important that the angle as indicated at 60 in Fig. 3 shall, at all times, be such that a direct pull is exerted. I attain this object by pivoting the links at a point intermediate the shaft and the doors, and am thus enabled to shorten the links without the necessity of lowering the location of the shafts 13 relatively to the doors.

When the doors are in closed position as indicated in Figure 1, the inner face 61 of the shank of the locking hanger 22 rests directly against the shaft 13 and is firmly supported thereby and by the hooked portion 122 of the hanger 22, and, due to the fact that the pivotal connection 24 between the locking block 16 and the hanger 22 is then extended a limited distance 63 beyond the center of the shaft, the doors are firmly locked in position and the severest jarring encountered in service would not be sufficient to displace the said hangers from their locked position. This secure locking action is due to the fact that a line extending between the effective point of connection with

the door and the pivot 24 lies slightly beyond a line joining the same point of connection on the floor with the center of the shaft and any wearing of the parts will accentuate this angularity between the two lines thereby increasing the effectiveness of the lock. In order that the hanger 22 may approach as closely as possible to the shaft 13, the hub of the drum 15 is formed with an opening 64 (see Fig. 4) and the sides of said opening are flared as indicated at 65 in Fig. 2 for the purpose of guiding the hanger 22 into locked position. The winding portion of the mechanism as disclosed is unusually compact and, as will be apparent from an inspection of Fig. 4, the same may be used in a very restricted space.

Although I have herein shown and described what I now consider the preferred manner of carrying out the invention, the same is merely illustrative and by way of description and not by way of limitation. All changes and modifications are contemplated that come within the scope of the claims appended hereto.

I claim:

1. In a dump car, the combination with oppositely disposed pivoted doors; of a shaft disposed at right angles to the pivotal axes of said doors; and linkage mechanism connecting the shaft and respective doors, the aforesaid shaft being adapted to rotate, to close the doors, in a direction to first move the point of connection between the shaft and linkage mechanism towards the adjacent car structure and thereafter upwardly and away from the said car structure, said mechanism being arranged to support the entire load from said shaft when the doors are in closed position.

2. In a dump car, the combination with a longitudinally extending hopper having a sloping end floor and longitudinally extending doors hinged on either side of the hopper; of a shaft disposed beneath the sloping end floor; and self-locking linkage mechanism connecting the shaft and doors and arranged to support the load entirely on said shaft, said mechanism forming an obtuse angle with the plane of the door and extending between the shaft and the sloping floor when the doors are in closed position.

3. In a dump car, the combination with a longitudinally extending hopper having a sloping end floor; of doors hinged longitudinally of the hopper and meeting with their free edges centrally thereof; a shaft mounted beneath the sloping end floor; and linkage mechanism connecting the shaft and respective doors, the aforesaid shaft being adapted to close the doors by rotating in a direction to first move the point of attachment of the connection between the shaft and linkage mechanism towards the adjacent hopper structure and thereafter upwardly and away from the said hopper structure, the maximum angle between the linkage mechanism and the plane of the doors occurring when the doors are in closed position, said mechanism being arranged to support the entire load from said shaft when the doors are closed.

4. In a dump car, the combination with a longitudinally extending hopper having a sloping end floor; of doors hinged on either side of the hopper with their pivotal axes extending longitudinally of the car; a shaft disposed above the doors and beneath the sloping end floor and spaced appreciably therefrom, said shaft being disposed transversely of the pivotal axes of the doors; and self-locking linkage mechanism connecting the door and shaft, said mechanism including separate link members connected to the respective doors and to a locking member adapted to support the load entirely upon the shaft when the doors are in closed position, said locking member being adapted to pass between the shaft and the sloping end floor during the opening or closing operation of the doors.

5. In a dump car, the combination with a longitudinally extending hopper having a sloping end floor and doors hinged on either side of the hopper and extending longitudinally thereof; of a shaft disposed beneath the sloping end floor; winding mechanism connecting the shaft and doors, said mechanism being disposed at an incline and extending between the shaft and the sloping end floor when the doors are in closed position, said mechanism having self-locking means arranged to rest on said shaft in such position that the line of force is below the axis of said shaft.

6. In a dump car, the combination with oppositely disposed pivoted doors; of a shaft disposed outwardly beyond the edges of the doors at right angles to the pivotal axes of said doors; and mechanism extending at an incline and connecting the shaft and the respective doors, said mechanism including: a hook having movement at an angle to the shaft and having a portion depending below the same, link members secured to the depending portion of said hook and to the respective doors and having movement at an angle to said hook, said mechanism being arranged to dispose the entire load on said shaft when the doors are in closed position.

7. In a dump car having a sloping end floor, the combination with dumping doors swinging towards each other; of a rotatable shaft disposed at right angles to the pivotal axes of the doors and beneath the sloping end floor; and operating mechanism comprising an arm rigid with the shaft; a block pivoted to the arm; a link pivoted to the block and adapted to have movement at an angle to said shaft, and link members con-

necting the respective doors with the aforesaid link, each of said link members being adapted to have movement at an angle to said link and also in the direction of rotation of the shaft, said operating mechanism being arranged to support the entire load from said shaft when the doors are in closed position.

8. In a dump car having a door opening, the combination with two doors hinged at their opposite edges and opening and closing together, of an operating shaft; a polygonal winding drum on said shaft having a locking face; a locking block pivoted to the drum and engaging the locking face of the drum; a hook carried by the locking block; a rotary supporting pin extending through said locking hook with its axis disposed intermediately of the shaft and the doors; and a pair of door supporting elements each connected to one of said doors and having a pivotal connection with said rotary supporting pin, each of said door supporting elements having a two-way pivotal connection with the door to which it is attached.

9. In a dump car, the combination with a shaft; of a door; and self-locking linkage mechanism connecting said shaft and door, said mechanism including; a drum rigidly secured to the shaft, a locking hanger having a hook portion adapted to lie above the shaft when the door is in closed position, and a block connecting the drum and the hanger, said block being formed with spaced walls disposed on either side of the hanger and united by a web.

10. In a dump car, the combination with a plurality of dumping doors meeting with their free edges adjacent to each other when the doors are closed; of means for closing the doors in unison, said means comprising a plurality of links having movement in the direction of swing of the doors and also having movement in a direction at an angle thereto, a locking hanger connecting the said links, said hanger having the upper portion thereof formed hook shaped and having a shank portion depending below the shaft; a locking block secured to the hook-shaped portion of the hanger; a hub secured to the shaft and having an arm extending therefrom to which the locking block is also pivotally secured, the locking hanger being adapted to be drawn upwardly by rotation of the shaft until the hook portion thereof is drawn above the operating shaft with the pivotal point between the said hanger and the aforesaid locking block lying slightly beyond the center of the shaft when the doors are in closed position, and supporting the load entirely from said shaft.

11. In a dump car, the combination with a winding shaft; of dumping doors; and self-locking linkage mechanism connecting the said doors and shaft, said mechanism including; a drum rigidly secured to the shaft, an arm outstanding from the drum, a locking block pivoted to the arm, a hanger having a hook portion adapted to be drawn upwardly over the shaft when the doors are in closed position and supporting the load entirely from said shaft, and links pivotally connected to the hanger and the doors, the aforesaid hanger having the pivotal connection with the locking block so disposed that, when the doors are closed, a line passing through the said pivotal point and the effective point of connection with the doors will lie slightly beyond and to one side of a line extending from the center of the shaft and the effective point of connection with the doors.

12. In a dump car, the combination with a sloping floor and dump doors; of a shaft located above the doors and beneath the sloping floor, said shaft extending transversely of the doors and spaced outwardly from the side edges thereof; a drum secured to the shaft, said drum having an arm extending outwardly therefrom; a locking block secured to the aforesaid arm, said block including spaced arms disposed on either side of the arm and connected together by a transversely extending body portion; a locking hanger having a hook portion lying between the spaced walls of the block and pivotally secured thereto, said hanger having a depending shank portion; and a plurality of links connected to the hanger, each of said links having one end pivoted to a door and having the opposite end thereto pivoted to the hanger, the aforesaid hanger being adapted to be drawn upwardly when the doors are closed with the hook portion disposed above the shaft and the shank portion of the hanger lying between the shaft and the sloping floor and resting against the shaft, the pivotal point of the said hanger with the locking block being adapted to be rotated slightly beyond the center of the shaft.

13. In a dump car having sloping end floors, the combination with a plurality of dumping doors having their axes extending longitudinally of the car and with their free edges adjacent when the doors are closed; of an operating shaft extending transversely of the pivotal axes of the doors disposed beneath each sloping end floor; mechanism connecting the doors and each shaft, said mechanism being inclined upwardly and outwardly from the doors when the same are in closed position and each including; a locking hanger having a hook-shaped portion adapted to seat on the shaft and a shank portion depending below the shaft, a link member disposed on each side of the depending portion of the hanger having one end connected thereto and the opposite end

connected with a door, and means between the shaft and the hook portion of the locking hanger, said means comprising a drum rigid with the shaft and a locking block pivotally secured to the drum and to the hook shaped portion of the locking hanger, the pivotal connection between the block and the hanger, when the doors are in closed position, lying slightly beyond a line extending from the effective point of connection with the door and passing through the center of the shaft.

14. In a dump car having sloping end floors, the combination with dumping doors hinged with their axes extending longitudinally of the car and having their free edges meeting centrally of the car; of a winding shaft disposed beneath each sloping floor, each of said shafts being disposed above the doors and spaced appreciably from the side edges thereof; self-locking linkage mechanism extending between the respective shafts and doors, each of said mechanisms including: a hub rigid with the shaft and having an arm outstanding therefrom, a block pivotally carried by said arm, a locking member pivotally mounted to the block and formed with a hook-shaped portion adapted to be drawn upwardly above the shaft when the doors are in closed position, said member having a depending portion extending below the shaft when in locking position; and a link pivoted to each door and to the hanger; power transmitting means between the respective shafts to cause the said shafts to rotate in unison and in opposite directions; and means for rotating the winding shafts, said means including: a rotating shaft, a pinion secured to the shaft, a gear wheel engaging the pinion and loosely mounted on one of said winding shafts, and clutch mechanism between the gear wheel and the said winding shaft.

15. In a dump car, the combination with an operating shaft and a drop door; of self-locking linkage mechanism connecting said shaft and door; an operating wheel loosely mounted on the operating shaft, said wheel having segmental clutch projections extending outwardly therefrom on each side thereof; collars rigidly secured to the shaft and disposed on either side of said gear wheel, each collar having a segmental lug disposed in the plane of the said lugs on the gear wheel and engageable therewith, said gear wheel having rotary movement on the shaft independent of the collars.

16. In a dump car, the combination with an operating shaft and a drop door; of self-locking linkage mechanism between the shaft and the door including, a pivoted member having a hook-shaped portion adapted to be drawn upwardly to a position on top of said shaft and locked into position by having the pivotal point thereof pass beyond the center line of the shaft when the doors are closed; means for rotating the shaft; and a lost motion device between said operating means and the shaft, said lost motion device including a plurality of elements rigidly mounted on the shaft and a loosely mounted rotatable clutch element disposed between said rigidly mounted elements and engageable with both of said members.

17. In a dump car, the combination with oppositely disposed, swingable doors; of a shaft disposed at an angle to the axes about which said doors swing; a connection between said shaft and said doors having a locking element adapted to assume a position at the far side of the axis of said shaft when the doors are closed; and means adapted to bear against said locking element to support the weight of the doors entirely on said shaft.

18. In a dump car, the combination with oppositely disposed, swingable doors; of a shaft disposed at an angle to the axes about which said doors swing; a connecting element between said shaft and said doors, said connecting element including locking means comprising a member adapted to automatically assume a position at the far side of the axis of said shaft when the doors are closed; and automatically acting means associated with said connecting element and having means adapted to bear against said locking element to support the weight of said doors entirely from said shaft.

In witness that I claim the foregoing I have hereunto subscribed my name this 12th day of November, 1923.

ARGYLE CAMPBELL.

Witnesses:
FRANCES SAVAGE,
HARRIETTE M. DEAMER.