April 19, 1966 M. J. LINDSTROM 3,246,610

RAILWAY DUMP CAR WITH CLOSURE SEALING MEANS

Filed Dec. 3, 1962 5 Sheets-Sheet 1

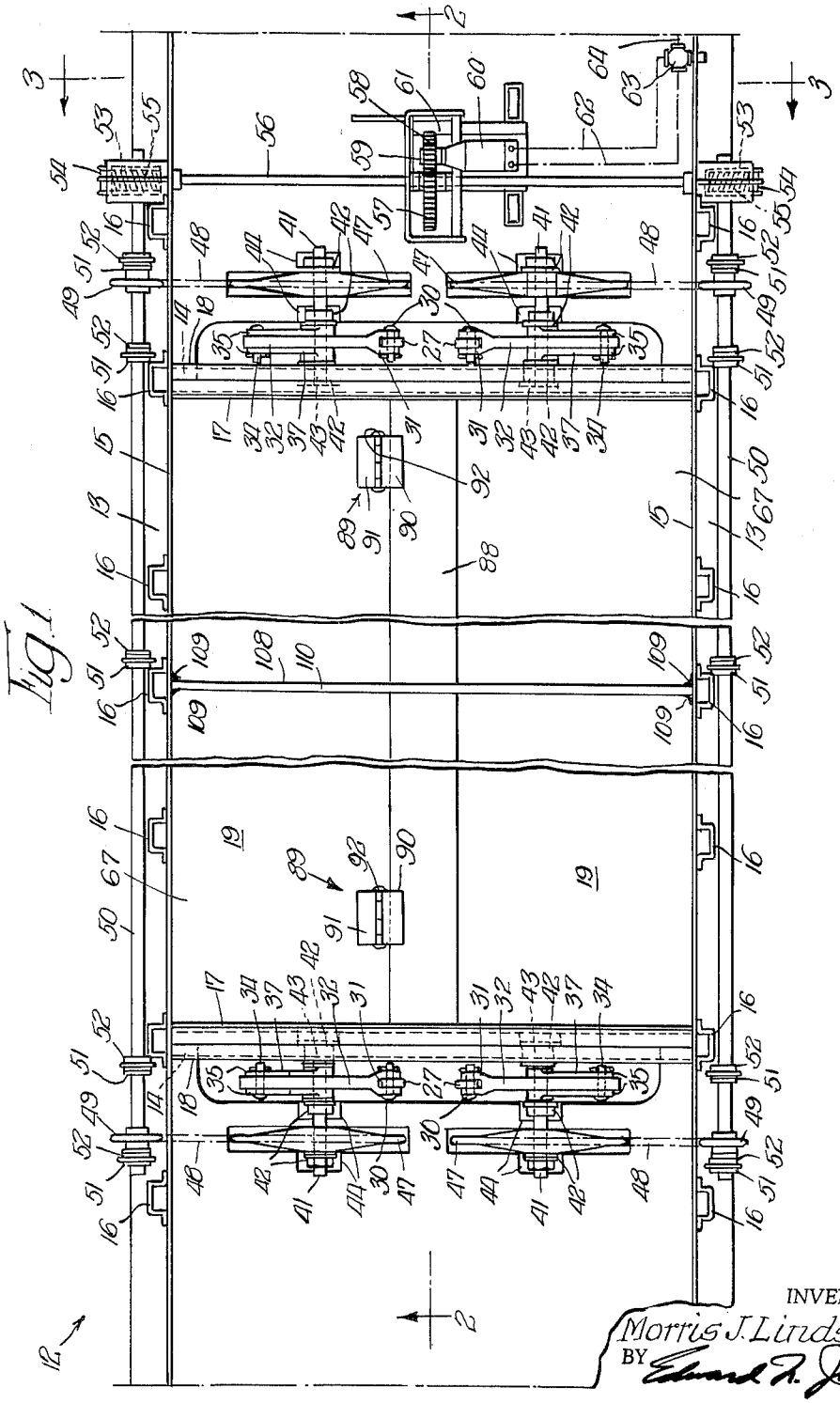


Fig. 1

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April 19, 1966 M. J. LINDSTROM 3,246,610

RAILWAY DUMP CAR WITH CLOSURE SEALING MEANS

Filed Dec. 3, 1962 5 Sheets-Sheet 2

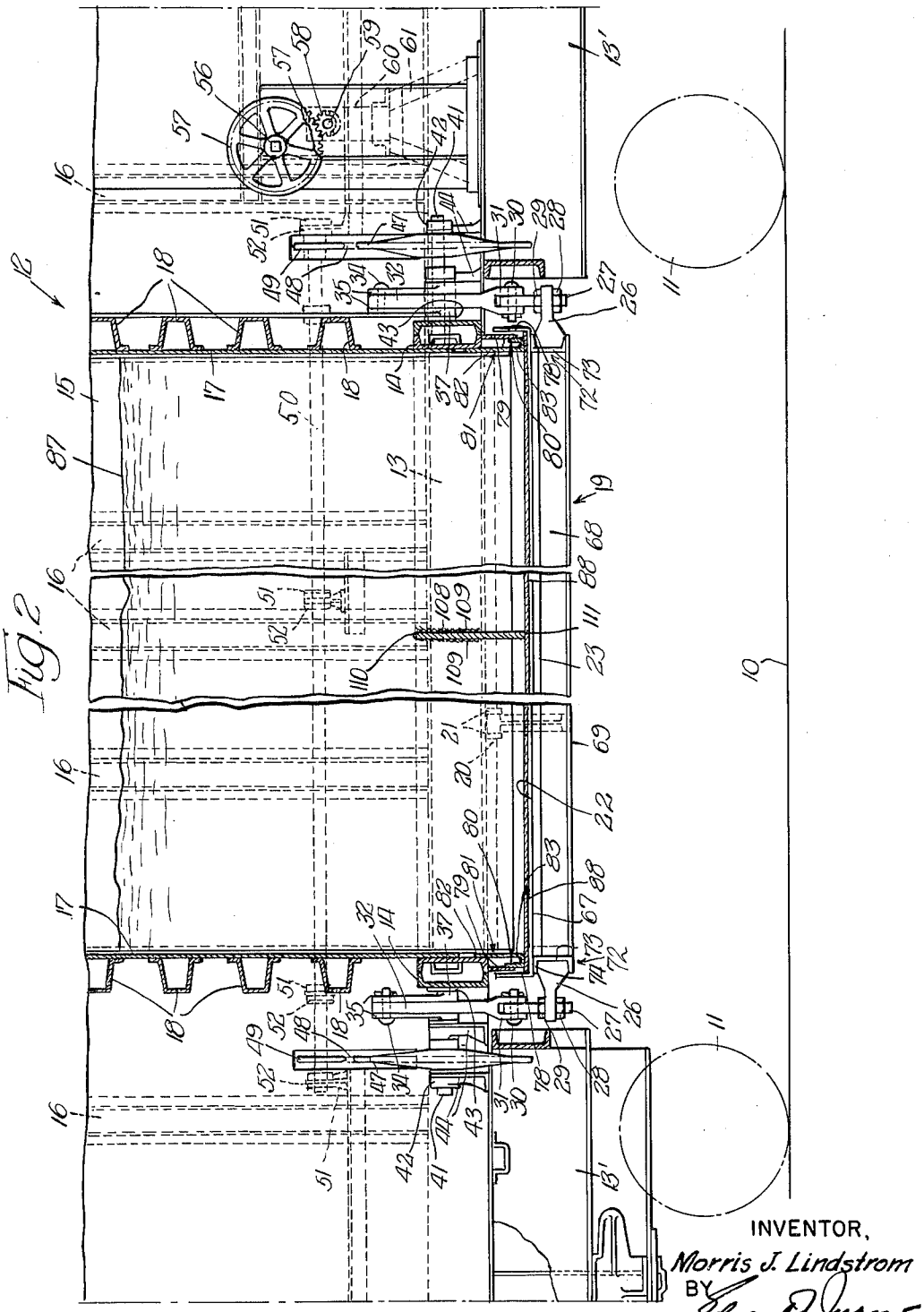


Fig. 2

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RAILWAY DUMP CAR WITH CLOSURE SEALING MEANS

Filed Dec. 3, 1962 5 Sheets-Sheet 3

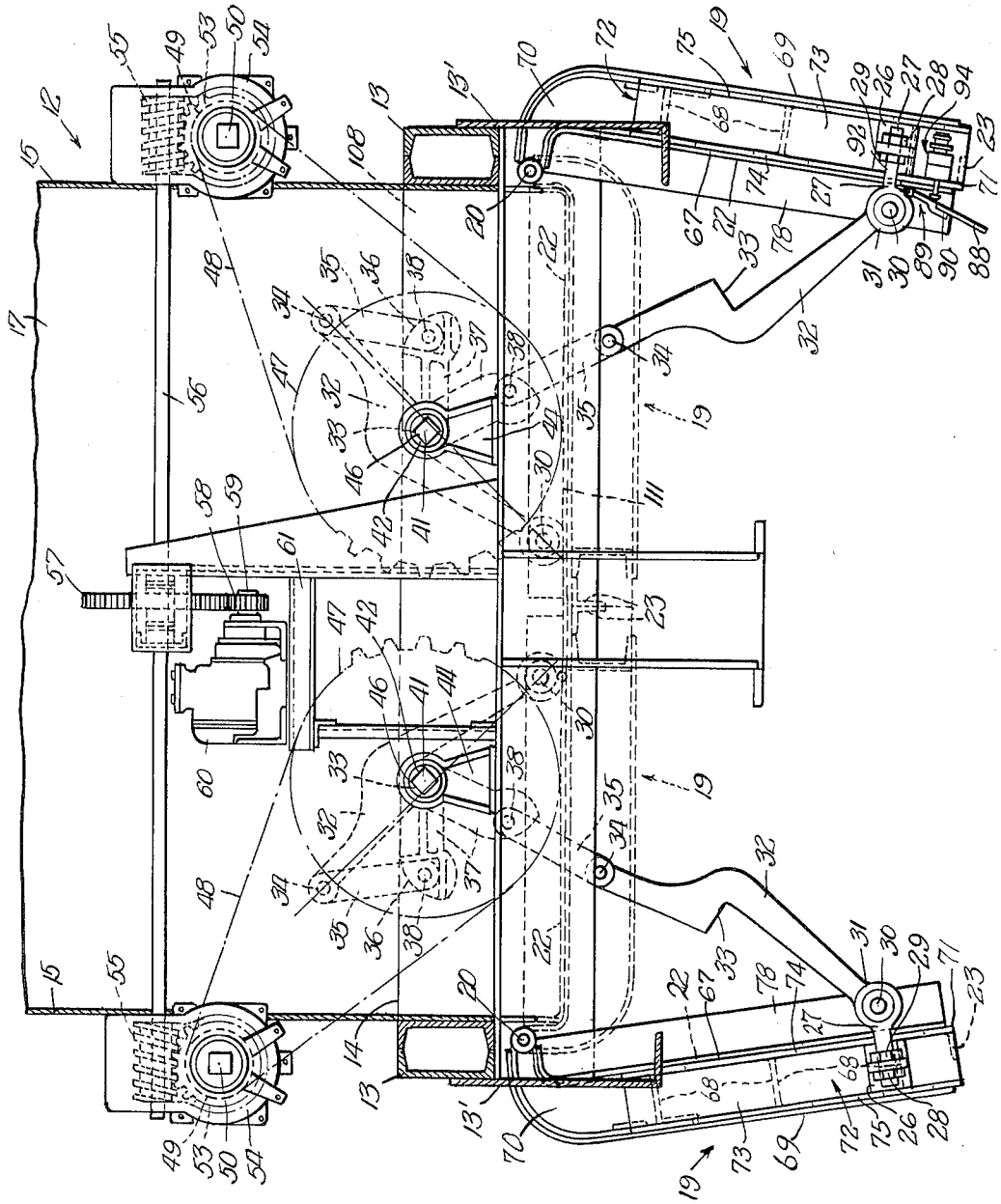


Fig. 3

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RAILWAY DUMP CAR WITH CLOSURE SEALING MEANS

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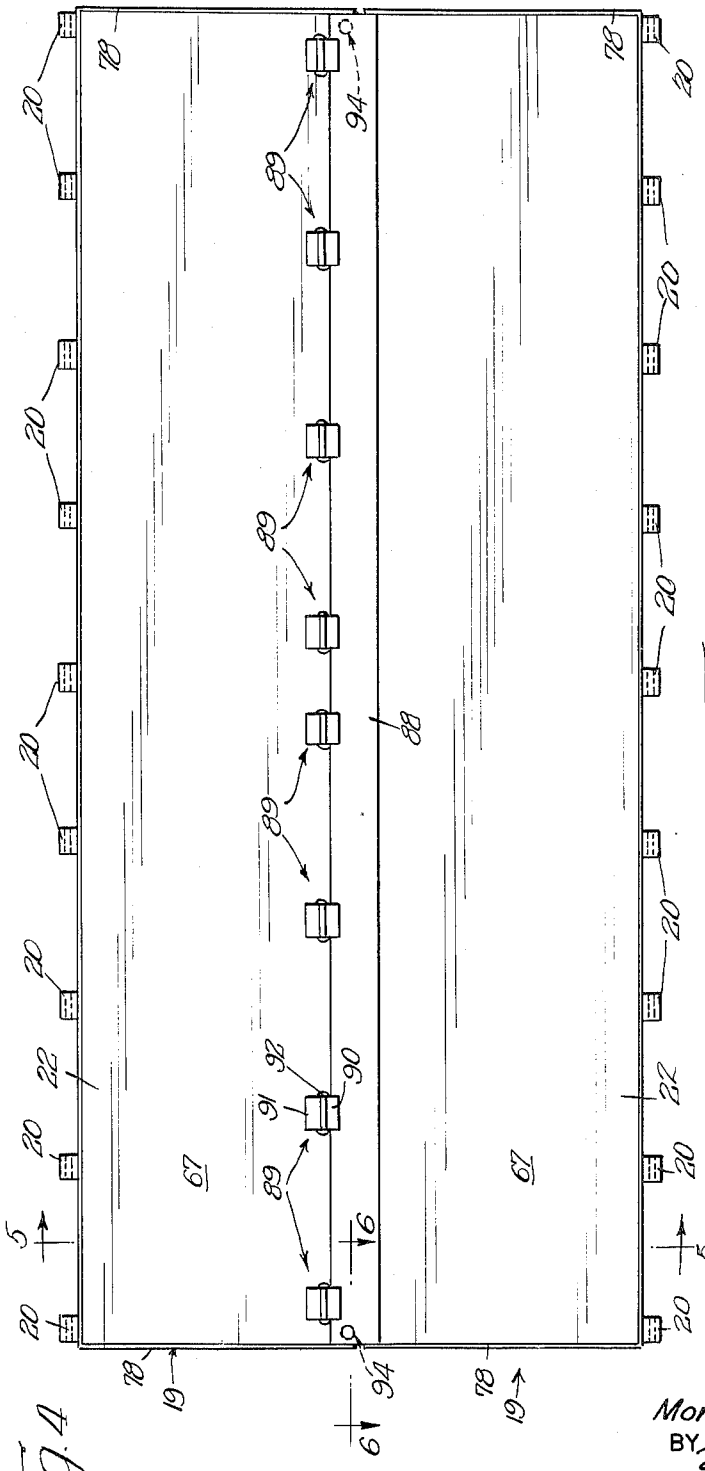


Fig. 4

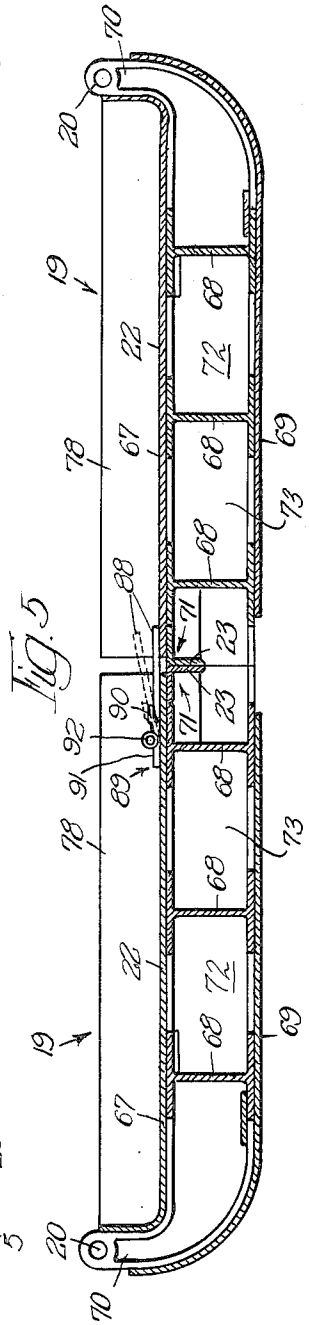


Fig. 5

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April 19, 1966 M. J. LINDSTROM 3,246,610

RAILWAY DUMP CAR WITH CLOSURE SEALING MEANS

Filed Dec. 3, 1962 5 Sheets-Sheet 5

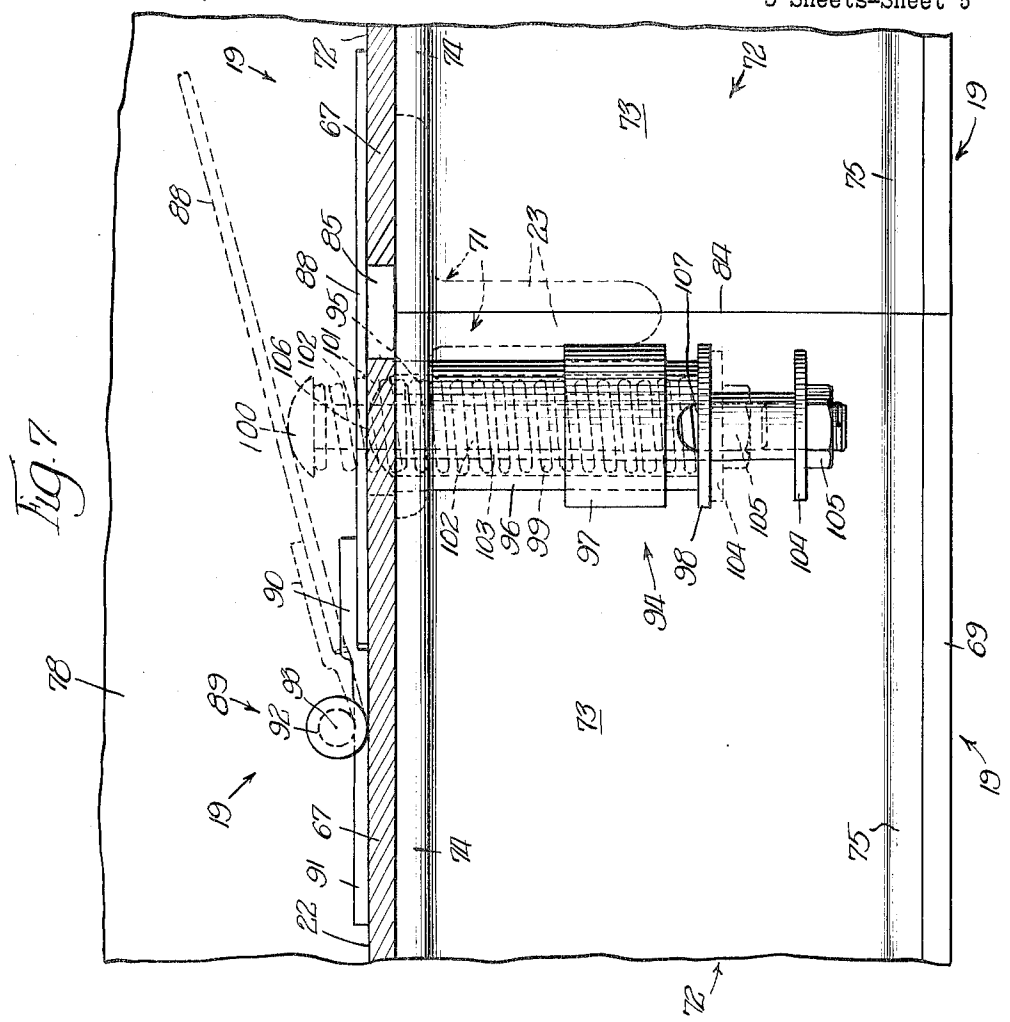


Fig. 7

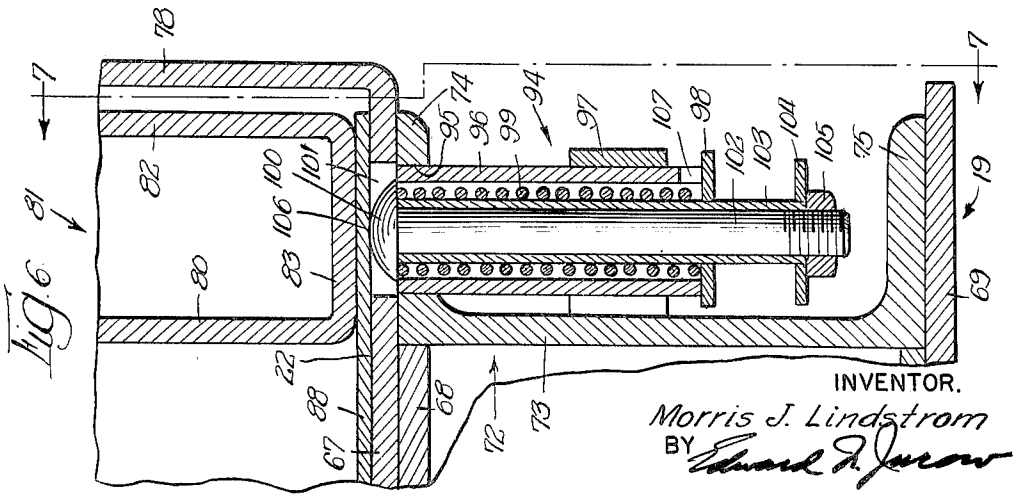


Fig. 6

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United States Patent Office 3,246,610 Patented Apr. 19, 1966

3,246,610

RAILWAY DUMP CAR WITH CLOSURE SEALING MEANS

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Filed Dec. 3, 1962, Ser. No. 241,945
10 Claims. (Cl. 105—250)

This invention relates, generally, to the construction of railway cars and it has particular relation to gravity load discharging cars provided with a floor formed by oppositely swinging doors which, in closed position, meet adjacent the longitudinal center of the car and are arranged to open to a substantial vertical position for discharge of lading. This invention is an improvement over the invention disclosed in application Serial No. 173,784, filed February 16, 1962, by Morris J. Lindstrom.

In the application above referred to ore car construction is disclosed which comprises a rectangular car body formed by side walls and end walls with the bottom being formed by a pair of bottom doors which are hinged along the lower portions of the side walls and are arranged to swing inwardly and to meet centrally between the side walls with the arrangement being such that, when the bottom doors are swung downwardly, the lading in the car body is discharged downwardly by gravity with a minimum of interference. It is desirable that the floor formed by the bottom doors be lading tight when they are in the closed position in order to prevent the escape of lading.

Accordingly, among the objects of this invention are: To provide for sealing the joint in the bottom of the car along the juxtaposed sides of the dumping doors which form the bottom of the car when they are in their closed position; to provide a sealing plate for this purpose which overlies the joint when the doors are closed; to hinge the sealing plate to the upper surface of one of the doors along an axis parallel to their juxtaposed edges or parallel to the axis of swinging movement of the door on which the sealing plate is mounted with the arrangement being such that the sealing plate is permitted to rotate about its axis as the doors swing from and to their closed position and to engage and maintain contact with the upper surface of the other door during the initial portion of the opening movement; to bias the sealing plate upwardly with respect to the upper surfaces of the doors; to overcome the biasing action applied to the sealing plate as the doors are swung to their fully closed position; to overcome the biasing action by causing the sealing plate to engage depending portions of the end walls as the doors are swung to fully closed position; to provide further means for overcoming the biasing action and causing the sealing plate to engage the upper surfaces of the bottom doors by tension means extending intermediate the ends of the body of the car and transversely between the lower portions of the side walls which tension means is engaged by the elevated sealing plate when the doors are swung to the fully closed position; and to provide the biasing means in the form of spring actuated bolts mounted on the ends of one of the doors and bearing against the underside of the respective end of the sealing plate.

In the drawings:

FIG. 1 is a top plan view of a railway car construction in which the present invention is embodied with the bottom discharge doors in their closed positions prior to filling of the car with lading, only portions of the end platforms of the car being shown.

FIG. 2 is a vertical sectional view taken generally along the line 2—2 of FIG. 1 after filling of the car with lading and showing only portions of the end platforms of the car and one wheel of each pair of wheels of the respective end truck.

FIG. 3 is a vertical sectional view taken generally along the line 3—3 of FIG. 1, with the doors being shown in their closed positions by broken lines and in the full open positions by full lines.

FIG. 4 is a top plan view of the bottom doors in detached relation from the remaining portion of the car and showing the sealing plate hinged to one of the doors.

FIG. 5 is a vertical sectional view taken generally along the line 5—5 of FIG. 4 and shows the sealing plate by full lines in the sealing position corresponding to the position that it occupies when the bottom doors are closed and showing by broken lines its elevated position when it is freed from restraint acting to hold it in the position shown by full lines.

FIG. 6 is a vertical sectional view, at an enlarged scale, taken generally along the line 6—6 of FIG. 4 and showing the details of construction of the elevating mechanism at one end of the door on which the sealing plate is hinged.

FIG. 7 is a vertical sectional view taken generally along the line 7—7 of FIG. 6 and showing by full lines the sealing plate in its sealing position and by broken lines the sealing plate in its elevated position with the elevating mechanism being correspondingly shown.

Since the car construction is relatively massive, it has not been possible to show in complete detail all of the various parts involved in it. Moreover, since the mechanism for moving the bottom doors between closed and open positions forms a part of the invention of the application above referred to, the operating mechanism will be described herein only with sufficient detail to provide a general understanding of the manner in which it operates with reference being had to the copending application for a more complete description.

Referring now particularly to FIG. 2 of the drawings, it will be observed that the reference character 10 designates the top surface of a rail on which wheels 11—11 that form parts of end trucks for an ore car, shown generally at 12, are adapted to roll. It will be understood that each end truck includes two pairs of wheel and axle assemblies with overlying end platforms which are not shown in complete detail since such an illustration is not considered to be required for an understanding of the present invention. The ore car 12 is particularly arranged and adapted to handle lading, such as copper ore concentrate, which is finely divided. The ore car 12 is intended to have a load capacity of the order of 100 tons and, consequently, it is arranged and constructed in order to readily and economically handle such a quantity of lading of the type desired.

The ore car 12 has a car body that is open at the top and bottom and is formed by side sills 13—13 which, as shown more clearly in FIGS. 1, 2 and 3 extend longitudinally of the car. Each side sill 13 is fabricated from a pair of rolled channel members the flanges of which are positioned in abutting relation and longitudinally welded in order to form a construction having a rectangular cross section. Depending from the outer sides of the side sills 13—13 are L-shaped side members 13'—13' which extend for limited distances from the ends to overlie the portions of the car 12 where the end platforms are located. Interconnecting the side sills 13—13 are transverse members 14—14 which, as shown in FIG. 2, are of a construction similar to the construction of the side sills 13—13. It will be understood that the transverse members 14—14 are suitably welded at their ends to the juxtaposed inner sides of the side sills 13—13 so that a rigid frame structure is provided extending longitudinally and transversely of the car 12.

The body of the ore car 12, as above pointed out, is open at the top and bottom and it is formed by side walls 15—15 which extend along the inner sides of the side sills 13—13. The side walls 15—15 are reinforced by vertically extending channel shaped side wall members 16. These reinforcing members 16 in suitable number are secured as by welding to the outer sides of the side walls 15—15. The car body is closed at the ends by end walls 17—17 which extend upwardly from the inner sides of the transverse members 14—14. They are reinforced by channel shaped transverse end wall members 18 which are shown more clearly in FIG. 2. The transverse reinforcing members 18 of suitable number are secured as by welding to the outer sides of the end walls 17—17. The construction just described, including the reinforced side walls 15—15 and end walls 17—17, provides a rectangular space for receiving the lading.

In order to close the bottom of the lading space provided by the side walls 15—15 and the end walls 17—17 which are suitably secured together along their juxtaposed edges, bottom doors 19—19 are provided. The bottom doors 19—19 are relatively massive in construction. For illustrative purposes it is pointed out that each of them is four feet three and three-fourths inches wide and twenty feet long and each has a weight of the order of 5,000 pounds. The bottom doors 19—19 are hinged at 20—20, FIG. 2, to the undersides of the side sills 13—13. Hinge pins having a diameter of one and one-half inches serve to support the bottom doors 19—19 on hinge butts, FIG. 2, which are suitably secured, as by welding, to the lower sides of the side sills 13—13. Preferably nine hinge butts 21 are provided for each bottom door 19.

In the closed position of the bottom doors 19—19 their upper surfaces 22—22, FIG. 3, form the bottom of the lading space. The bottom doors 19—19 have downturned distal edge portions 23—23 which are in mutual engagement along the longitudinal median of the ore car 12 and more particularly of the lading space defined by the side walls 15—15 and end walls 17—17.

In view of the relatively massive character of the bottom doors 19—19 and because it is desired that, when they are opened, the lading in the lading space be free to flow downwardly without obstruction, special attention is required in the provision of the necessary operating mechanism. In addition consideration is given to the arrangement of the operating mechanism at such location that there is no interference with the movement of the bottom doors 19—19 between closed and opened positions.

With these various requirements in mind there will now be described the mechanism employed for operating the bottom doors 19—19 and for holding them securely in their closed positions. Referring particularly to FIGS. 2 and 3 of the drawings, it will be observed that eyebolt brackets 26—26 are secured, as by welding, to the ends of the bottom doors 19—19 and that they extend endwise therefrom. There are two eyebolt brackets 26—26 for each door 19 and they are located adjacent their distal edges. Extending through each eyebolt bracket 26—26 for each door 19 are eyebolts 27—27, each being secured in place through the cooperation of a nut 28 and a jam nut 29. For illustrative purposes it is pointed out that the eyebolts 27—27 may have a diameter of three inches in order to be capable of transmitting the necessary stress incident to the operation of the bottom doors 19—19.

Since the linkage mechanism associated with each eyebolt bracket 26 is of identical construction, the description will proceed with reference to one of them, it being understood that it applies to all four linkage mechanisms. Pivotally connected to the eyebolt 27 at 30 by a pin having a diameter of the order of two inches is a bifurcated end 31 of a connecting link 32. The intermediate portion of the connecting link 32 is offset to provide an intermediate shoulder 33 the purpose of which will be

apparent presently. Pivotally connected at 34 to the other end of the connecting link 32 is a pair of flat bar links 35. For this purpose a two inch diameter pin is employed and the flat bar links 35 straddle the connecting link 32. At their other ends the flat bar links 35 straddle a flange 36 on a hub arm member 37 and they are pivotally connected to the flange 36 at 38 preferably by a two inch diameter pin.

Each hub member 37 is fast on a linkage shaft 41 which has a square section. It will be understood that four linkage shafts 41 are provided, one for each end of each of the doors 19—19. As shown in FIG. 1 each shaft 41 is mounted on bushings 42, there being three in number which, in turn, are mounted on bearings 43 and 44, there being one bearing 43 which is mounted on the juxtaposed transverse member 14 and the other two bearings 44 being mounted on the end platform of the car 12. As described in more detail in the application above referred to the intermediate shoulder 33 on each of the connecting links 32 is arranged to bear against a flat side of the respective linkage shaft 41 for the purpose of providing one of the mechanisms for locking the bottom doors 19—19 in their closed position.

Also fast on each of the linkage shafts 41 is a sprocket wheel 47 which, for illustrative purposes, is provided with twenty four teeth. A chain 48 is trained over each sprocket wheel 47 and also over a correspoding sprocket wheel 49, preferably having six teeth, which is fast on a side shaft 50 that has a square cross section. As shown in FIG. 1 there are two side shafts 50 and they are mounted outwardly of the respective side walls 15—15. Suitable bushings 51 are provided for the side shafts 50 for mounting them in bearings 52 which are suitably mounted on the side walls 15—15. Preferably there are five bushings 51 and five bearings 52 for each shaft 50. The side shafts 50 extend lengthwise of the car 12 and beyond the end walls 17—17 where they carry the sprocket wheels 49 as shown.

At the right end of each of the side shafts 50, as viewed in FIG. 1, there is provided a worm wheel 53 which is shown by broken lines in this figure and also in FIG. 3. Each worm wheel 53 is rotatably mounted with its side shaft 51 in a housing 54 that is suitably mounted on the car 12 and within which there is provided a worm gear 55, also shown by broken lines. It will be understood that the worm wheels 53 and worm gears 55 are of right and left configuration to the end that the worm gears 55 can be mounted for rotation with the ends of a transverse shaft 56 of square cross section which extends from one side to the other of the car 12 outwardly of one of the end walls 17 and overlying one of the end platforms. Intermediate the ends of the transverse shaft 56 there is a gear wheel 57 which is non-rotatably mounted and in driving engagement therewith is a pinion 58 on a drive shaft 59 of a prime mover in the form of a reversible air motor 60 which is mounted on a suitable support 61 on the car 12. It will be understood that other motor means can be employed but, for convenience, compressed air is employed and the reversible motor 60 is of a type to accommodate this source of energy. Connection to the reversible air motor 60 is provided by air lines 62—62 which extend from a control valve 63 mounted on the car 12. A supply line 64 serves to provide for connection to a suitable source of compressed air which can be connected to the control valve 63 when the car 12 is spotted in the unloading position. If desired, a storage tank of compressed air can be carried by the car 12 for operating the motor 60 without requiring that there be a connection to a separate source independent of the car 12. It will be understood that the control valve 63 is of conventional construction and that it can be operated to one position for causing the air motor 60 to rotate in one direction and that the control valve 63 can be operated to another position to cause the air

motor 60 to operate in the opposite direction. Intermediate these positions the control valve 63 is in an off position where no air pressure is supplied for operating the motor 60.

FIGS. 4 and 5 illustrate certain details of construction of the bottom doors 19—19. Here it will be observed that the upper surfaces 22—22 of these botom doors 19—19 are formed by top plates 67—67 which overlie a series of longitudinally extending I-beams 68. The lower flanges of the I-beams 68 have bottom plates 69—69 extending thereunder, it being understood that the various parts are secured together by a suitable means such as by welding. It will be recalled that the bottom doors 19—19 are hinged at 20 to the undersides of the side sills 13—13. For this purpose hinge brackets 70—70 are provided. As shown in FIG. 5, the hinge brackets 70—70 are generally L-shaped with the upstanding portions suitably apertured to accommodate hinge pins indicated at 20 in FIG. 2. The juxtaposed depending edge portions 23—23 are the downwardly extending flanges of angle members 71—71 with the arrangement being such that, when the doors 19—19 are in the closed position as shown in FIG. 5, the edge portions 23—23 are in juxtaposition. Extending along each end of each door and along the ends of the longitudinally extending I-beams 68 are channel end members 72—72 which are shown more clearly in FIGS. 6 and 7 of the drawings. Here it will be observed that each channel end member 72 includes a central web 73, a top flange 74 and a bottom flange 75 with the arrangement being such that the channel end members 72 open outwardly of the ends of the bottom doors 19—19. As shown in FIG. 2, the eyebolt brackets 26—26 are mounted in the respective channel members 72—72 and extend outwardly therefrom for receiving the eyebolts 27—27.

The bottom doors 19—19 are generally pan-shaped on three sides. At their ends upstanding flanges 78—78 are provided which constitute integral extensions of the top plates 67—67. As shown in FIG. 2 the upstanding flanges 78—78 overlie flanges 79—79 which are suitably secured to and depend from undersides of the transverse members 14—14. Along their lower edges the depending flanges 79—79 overlie and are secured to upstanding narrow flanges 80—80 which form parts of end wall extensions 81—81 that are generally J-shaped in cross section and include upstanding wide flanges 82—82 that are secured, as by welding, to the inner sides of the transverse members 14—14. Connecting bottom sections 83—83 are provided between the flanges 80—80 and 82—82 and they serve to engage the ends of a sealing plate, to be described, for moving it into engagement with the upper surfaces 22—22 of the bottom doors 19—19 when they are swung to the fully closed positions. In FIG. 7 there is shown how the juxtaposed ends of the channel end members 72—72 are related as indicated at 84 when the bottom doors 19—19 are in fully closed position. Here it will be observed that the top plates 67—67 are spaced apart as indicated at 85.

With a view to preventing the escape of finely divided lading, which is indicated at 87 in FIG. 2, through the space 85 between the top plates 67—67 and through the space at 84 between the sides of the bottom doors 19—19 a sealing plate 88 is provided. The sealing plate 88 may be formed of a length of one fourth inch thick steel plate and it extends from end-to-end of the bottom doors 19—19 in their closed position as shown in FIG. 4. A number of hinges 89 are provided for rotatably mounting one side of the sealing plate 88 to one of the bottom doors 19. It will be observed in FIG. 7 that each hinge 89 includes one leaf 90 which is secured, as by welding, in overlying relation to the upper surface along one side of the sealing plate 88 while another leaf 91 is secured, as by welding, to the upper surface 22 of the underlying top plate 67. A hinge pin 92 serves to interconnect the leaves 90 and 91 with the axis of rotation at 93 therethrough being parallel to the axis of rotation of the bottom doors 19—19 at 20—20 and also parallel to the juxtaposed edges of the bottom doors 19—19.

The reason for mounting the sealing plate 88 for rotation with respect to one of the bottom doors 19 is to permit the opening and closing movement of these bottom doors 19—19. In their closed position with the lading 87 overlying the upper surfaces 22—22 of the bottom doors 19—19 and the sealing plate 88, the latter is held in sealing position as shown by full lines in FIG. 7. As the bottom doors 19—19 begin to rotate downwardly to the open position, the sealing plate 88 rotates with respect to the bottom door 19 on which it is hinged while the distal edge slides over the upper surface 22 of the other bottom door 19. As the lading 87 is discharged downwardly, this closing force applied to the sealing plate 88 no longer is present. Moreover, it is desirable that it be held in an elevated position to which it is moved during the opening movement of the bottom doors 19—19 in order to permit the reclosure thereof.

In order to hold the sealing plate 88 in the elevated position spring operated means, shown generally at 94 in FIGS. 3, 4, 6 and 7, is provided. It will be observed here that the spring operated means 94 is mounted on the door 19 between the top and bottom flanges 74 and 75 of the channel end member 72 on which the sealing plate 88 is hinged. To accommodate this construction an opening 95 is provided in the top flange 74 for receiving the upper end of a tubular outer housing 96 which is supported near its lower end by a U-shaped housing support 97 that is secured, as by welding, to the central web 73 of the channel end member 72 and in turn is secured, as by welding, to the tubular outer housing 96. At its lower end the tubular outer housing 96 has secured thereto a spring seat 98 against which a coil compression spring 99 reacts. The coil compression spring 99 extends upwardly through the tubular outer housing 96 and reacts at its upper end against the underside of a head 100 which is movable through an opening 101 in the top plate 67. The head 100 is located as an integral construction on the upper end of a bolt 102 which extends downwardly through a tubular inner spring housing 103 which is telescoped with the coil compression spring 99. At its lower end the bolt 102 and inner spring housing 103 is provided with a stop washer or seat 104 that is held in place by a nut 105 threaded on the lower end of the bolt 102. The stop washer or seat 104 is arranged to engage the underside of the spring seat 98 to limit the upward movement of the bolt 102 and the head 100 at its upper end which engages the underside of the sealing plate 88 at 106. A drain opening 107 is provided at the lower end of the tubular outer housing 96 to permit the escape of water that might otherwise collect therein. It will be understood that the spring operated means 94, shown in FIGS. 6 and 7 of the drawings, is mounted on each end of the bottom door 19 on which the sealing plate 88 is hinged. The arrangement is such that, as the bottom doors 19—19 are swung to the open position and the lading 87 is discharged, the sealing plate 88 swings to the position shown by the broken lines in FIG. 7 as a result of its distal side sliding over the surface 22 of the other bottom door 19 and also as a result of the upward biasing action of the coil compression springs 99. The sealing plate 88 is held in the elevated position, shown by the broken lines in FIG. 7, during the completion of the opening movement of the bottom doors 19—19 and during the principal portion of their closing movement.

When the doors 19—19 are moved to the final closed position, the ends of the sealing plate 88 engage the connecting bottom sections 83—83 of the end wall extensions 81—81 with the result that, as the doors 19—19 are swung to their fully closed positions, further upward movement of the sealing plate 88 is prevented at its ends and the upper surfaces 22—22 of the bottom doors 19—19 continue to move upwardly until they engage the under-

side of the sealing plate 88 in the relationship shown by full lines in FIG. 7. In this final closing movement the coil compression spring 99 is compressed by the depression of the respective bolt 102 through the engagement of the respective head 100 at 106 by the underside of the respective end of the sealing plate 88.

In order to insure that the sealing plate 88 is returned to the sealing position throughout its entire length, one or more transverse tension members 108, FIG. 2, can be provided. Here it will be observed that the transverse tension member 108 extends between the lower portions of the side walls 15—15 and the inner sides of the side sills 13—13. Its ends are welded thereto as indicated at 109. The transverse tension member 108 is in the form of a vertically extending flat plate which may have a thickness of one half inch and a width of four to twelve inches. Its upper edge 110 is rounded in order to prevent lodgment of lading thereon while its lower edge 111 is flat to provide surface engagement with the upper side of the sealing plate 88 therebelow. In addition to insuring that the sealing plate 88 is in the sealing position when the bottom doors 19—19 are closed, the transverse tension member 108 also serves to prevent outward bowing of the side sills 13—13 and the side walls 15—15 as the result of the body of the ore car 12 being filled with the lading 87. The transverse tension member 108 is made as thin as is practical so as to provide a minimum of interference with the discharge of lading downwardly when the bottom doors 19—19 are opened. As pointed out, more than one transverse tension member 108 can be employed, as desired, depending upon the necessity for further resisting outward bowing of the side sills 13—13 and side walls 15—15 as well as for the necessity of further insuring that the sealing plate 88 occupies its sealing position when the bottom doors 19—19 are fully closed.

What is claimed as new is:

1. In a bottom discharging railway car, in combination:
   (a) a body formed by spaced apart vertical side walls and end walls;
   (b) a side sill extending along the lower portion of each side wall;
   (c) a transverse member extending along the lower portion of each end wall and joining said side sills to provide therewith a rigid rectangular frame;
   (d) a pair of doors each hinged along one side to one of said side sills and in closed position forming a generally flat bottom for said body with the other sides of said doors being disposed in juxtaposition intermediate said side walls;
   (e) means connected to said doors for swinging them simultaneously to and from their closed positions; and
   (f) an elongated door sealing plate corresponding in length to the longitudinal dimension of said doors and adapted to overlie said juxtaposed other sides of said doors in their closed positions to prevent the escape of lading therebetween, said sealing plate being rigid about axes longitudinal thereof and having one longitudinal edge attached to the upper surface of one of said doors in a manner permitting upward pivoting movement thereof about said one edge and relative to said one door.

2. The invention, as set forth in claim 1, wherein means cooperate with the door sealing plate for pivoting same upwardly and away from the upper surfaces of both doors during opening movement thereof and for holding said door sealing plate in said upwardly pivoted position until the doors are closed.

3. The invention, as set forth in claim 2, wherein means on said end walls cooperate with the door sealing plate for pivoting it downwardly from said upwardly pivoted position to its sealing position overlying said juxtaposed sides of said doors when the doors are swung into said closed position.

4. The invention, as set forth in claim 1, wherein said one longitudinal edge of the door sealing plate is pivotally attached to the upper surface of said one door by a series of longitudinally spaced hinges having co-linear axes of pivoting movement.

5. The invention, as set forth in claim 4, wherein means on said one door cooperate with the door sealing plate to bias same for pivoting movement about its hinge axes away from the surface of the one door on which it is mounted during the opening and closing movements of the doors.

6. The invention, as set forth in claim 5, wherein means along the lower portion of at least one end wall is engaged by the door sealing plate to cause to pivot toward the surface of the door on which it is mounted against the force of the biasing means while the doors are being swung to closed position.

7. The invention, as set forth in claim 5, wherein the biasing means comprises spring operated means at each end of the one door reacting upwardly against the underside of the respective end of the door sealing plate.

8. The invention, as set forth in claim 7, wherein each spring operated means includes:
   (a) a tubular housing secured to the respective end of the one door;
   (b) a bolt slidable endwise in said tubular housing and engaging at one end the underside of the door sealing plate;
   (c) a coil compression spring disposed between said tubular housing and said bolt and urging said bolt upwardly against said underside of said door sealing plate; and
   (d) stop means limiting the extent of movement of said bolt through said tubular housing and thereby the extent of pivoting movement of said sealing plate about its hinge axes under the influence of said spring.

9. The invention, as set forth in claim 8, wherein:
   (a) each door is provided at each end with a transversely extending outwardly opening channel member;
   (b) the tubular housing for each spring operated means is secured to the web of the respective channel member; and
   (c) each bolt extends through aligned openings in the upper flange of the respective channel member and in said one door to engage the underside of the door sealing plate.

10. The invention, as set forth in claim 5, wherein means extending transversely between the lower portions of the side walls is engaged by the door sealing plate to cause it to pivot toward the surface of the door on which it is mounted against the force of the biasing means while the doors are being swung to closed position.

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