Aug. 9, 1949. L. J. TILLMAN 2,478,608

FLAT BOTTOM GONDOLA CAR

Filed July 21, 1945 3 Sheets-Sheet 1

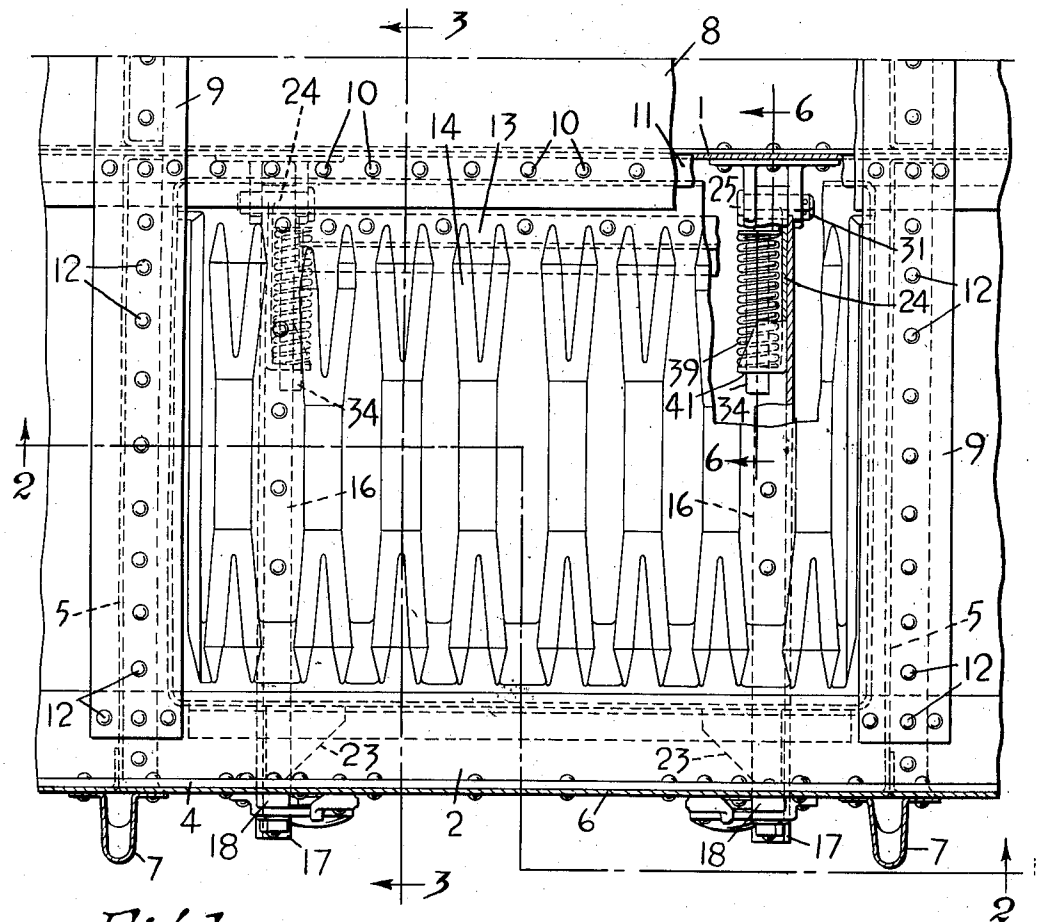


Fig. 1

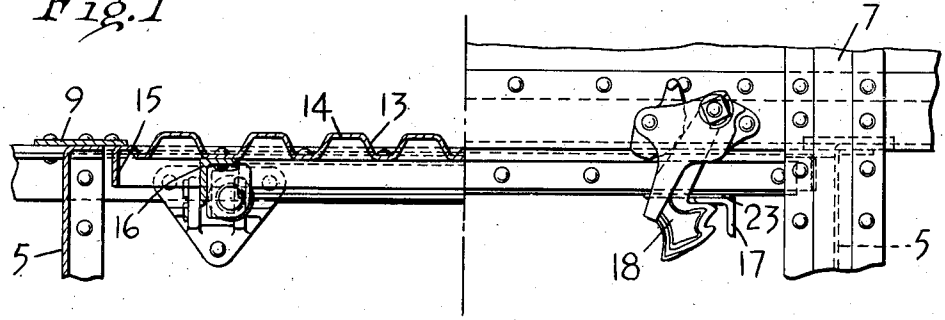


Fig. 2

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Aug. 9, 1949. L. J. TILLMAN 2,478,608

FLAT BOTTOM GONDOLA CAR

Filed July 21, 1945 3 Sheets-Sheet 2

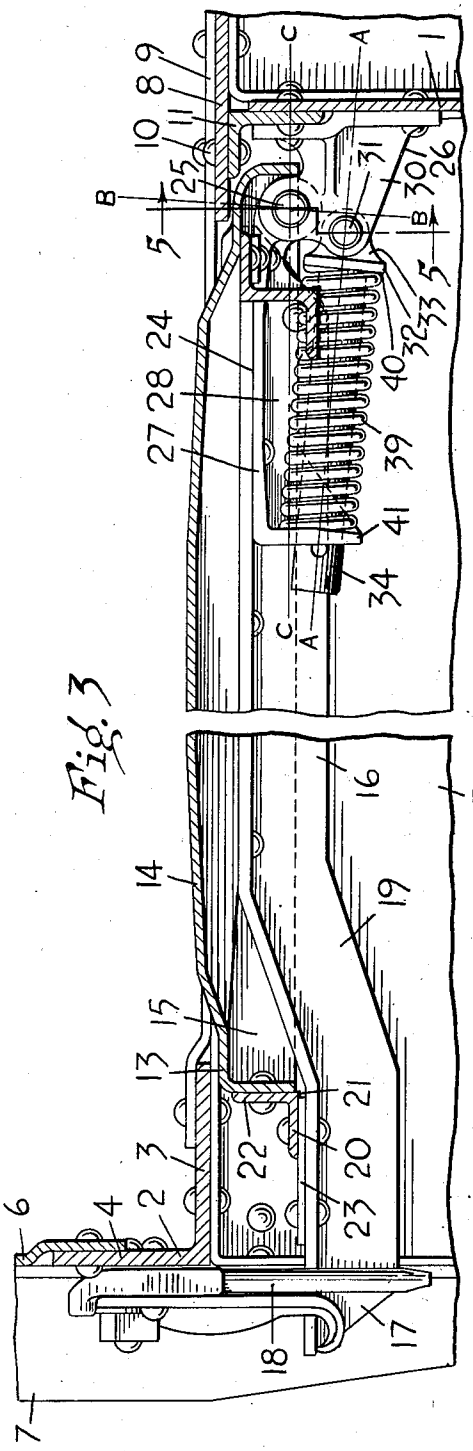


Fig. 3

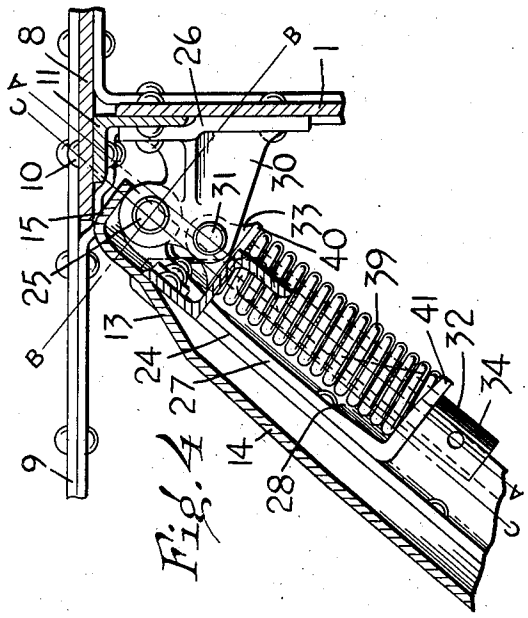


Fig. 4

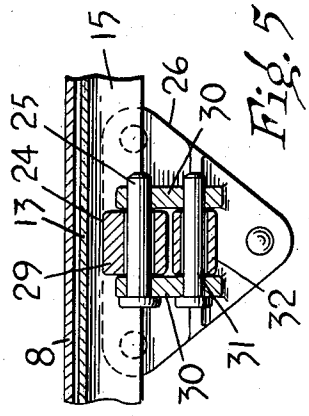


Fig. 5

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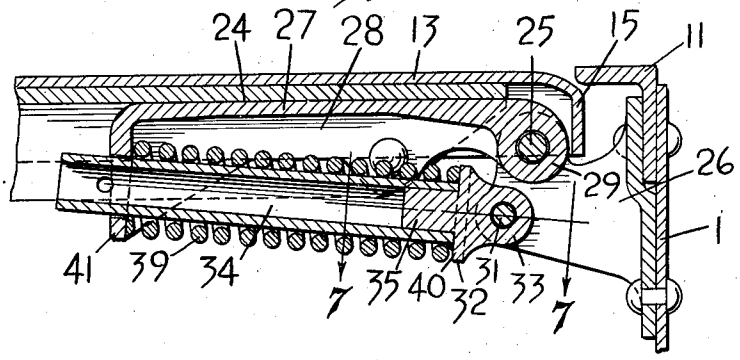
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Aug. 9, 1949. L. J. TILLMAN 2,478,608

FLAT BOTTOM GONDOLA CAR

Filed July 21, 1945 3 Sheets-Sheet 3

Fig. 6



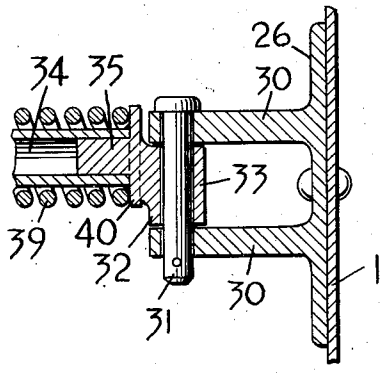


Fig. 7

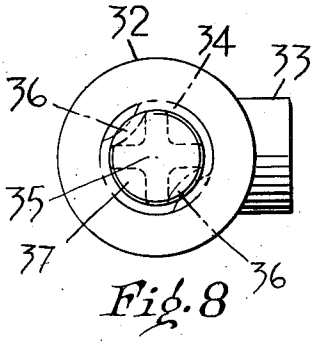
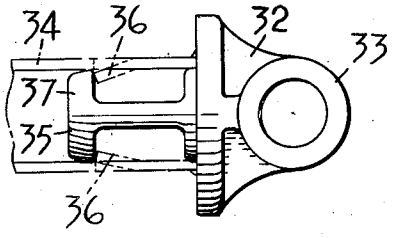


Fig. 8

Fig. 9



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UNITED STATES PATENT OFFICE

2,478,608

FLAT BOTTOM GONDOLA CAR

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Application July 21, 1945, Serial No. 606,311

13 Claims. (Cl. 105—244)

1

This invention relates to railway cars and more particularly to improvements in railway gondola cars having drop bottom doors.

The principal object of the invention is to provide the doors of such cars with spring means which tend to move the doors toward closed position.

A primary feature of the invention consists in providing a pivotally mounted member adjacent the hinge axis of the door having a spring which is engageable by means connected to and movable with the door for compressing the spring during opening movement of the door.

Another and important feature of the invention consists in providing a spring which is adapted to be compressed during opening movement of the door and which is so located and arranged with respect to the hinge axis of the door that the moment arm of the spring force acting on the door is not as great when the door is in open position as when it is in closed position or that the moment arm decreases during at least a part of the opening movement of the door as the compression of the spring increases.

Another feature of the invention consists in providing a member which is pivotally connected to the car body in spaced relation to the pivotal axis of the door and which has a portion disposed within a helical spring carried thereby, the member affording an abutment for the spring and the door having rigid means engageable with the spring for compressing it during opening movement thereof.

A further and more detailed feature of the invention consists in providing a spring device adapted to exert a force tending to move the door of a gondola car to closed position which includes a member rigid with the door for pivotally connecting it to the car body and for engaging the spring during opening movement of the door.

A still further feature of the invention consists in providing a spring device tending to move the door of a gondola car from open to closed position consisting of a member which carries an actuating spring and which is pivotally connected at one end to the car body and is slidably supported by the door at its other end.

Other and more specific features of the invention, residing in advantageous forms, combinations and relations of parts, will hereinafter appear and be pointed out in the claims.

In the drawings,

Figure 1 is a fragmentary plan view, partly in section, of a gondola car showing the invention associated therewith.

2

Figure 2 is a fragmentary side elevational view of the construction illustrated in Figure 1, the portion of the view at the left of the center thereof being in section on a line corresponding to line 2—2 of Figure 1.

Figure 3 is a transverse sectional view taken on line 3—3 of Figure 1.

Figure 4 is a fragmentary view similar to Figure 3 adjacent the hinged edge of the door, the door being shown in open position.

Figure 5 is a detail sectional view on line 5—5 of Figure 3.

Figure 6 is an enlarged detail sectional view on line 6—6 of Figure 1.

Figure 7 is a detail sectional view on line 7—7 of Figure 6.

Figure 8 is a transverse sectional view of the spring supporting member, omitting the spring.

Figure 9 is a side elevational view of the inner end of the spring supporting member.

For the purposes of illustrating the invention a gondola car of the all steel type has been illustrated but it will be understood that the invention is not limited in its application to cars of this type. Furthermore, since the construction of the car on one side of the longitudinal axis thereof is identical with the construction on the other side thereof, only one-half of the car structure is illustrated and as each door and the cooperating parts thereof are the same, only one door and adjoining portions of the car have been illustrated.

Referring more particularly to the drawings, 1 indicates one of the car center sills and 2 one of the side sills thereof, the latter advantageously being of angle shape having a substantially horizontal flange or leg 3 and a substantially vertical flange or leg 4. The sills of the car are connected by a plurality of suitably spaced cross bearers or diaphragms 5. The sides of the car are conveniently formed of a plurality of sheet metal plates 6 and side stakes 7 which may be of any suitable construction and are preferably secured to the outer faces of the side sheets.

The floor of the car may be conveniently formed by a longitudinally extending plate 8 overlying and projecting on opposite sides of the center sill and by transversely extending plates 9 which pass over the plate 8 and may extend continuously from one side of the car to the other. The plate 8 is preferably secured in place by rivets 10 which pass through angle members 11 rigid with the upper portion of the center sill

and the plates 9 may be advantageously secured by rivets 12 to the underlying cross bearer 5 and to the horizontal flanges 3 of the side sills in overlapping relation thereto.

Associated with each of the lading discharge openings of the car which are formed by these floor plate portions is a sheet metal door 13 which may be reinforced by corrugations 14 and downwardly extending marginal flanges 15. Secured to the under side of the door are a pair of stiffeners or arms 16 which extend continuously from adjacent the hinged edge of the door to the opposite edge thereof where they project outwardly, as indicated at 17, to provide arms to be engaged by suitable means, such as hooks 18, to support the door in closed position. The outer end of each stiffener inclines downwardly as indicated at 19 away from the outer face of the door to pass beneath the adjacent marginal flange 15 and the part of the stiffener which is spaced from the door may be rigidly secured to the horizontal flange 20 of an angle 21 which has a vertical flange 22 secured to the adjacent marginal flange of the door. Additional rigidity can be imparted to the projecting ends of the stiffeners by gusset plates 23 which are interposed between each stiffener and the horizontal flange 20 ot the angle 21 and are rigidly connected to each by a plurality of rivets.

Rigid with the inner edge of the door are a pair of hinge brackets 24, each of which is adapted to receive a pin 25 to hingedly or pivotally connect the door to a bracket 26 secured to the center sill 1. The bracket 24 may be conveniently located beneath an adjoining stiffener 16 having a flange 27 riveted to the horizontal leg of the stiffener and a flange 28 riveted to the vertical leg thereof. At its inner end, the bracket 24 terminates in a hub portion 29 which is interposed between laterally spaced walls 30 of the bracket 26 on the car for receiving the hinge pin 25.

Also interposed between the walls 30 and pivotally associated therewith by any suitable means, such as a pin 31, is the inner end of a member 32 which may advantageously consist of a hub part 33 and an elongated part 34 in the form of a pipe. The hub part has a stud 35 extending into the inner end of the pipe and, if desired, it may be cruciform in section so that surrounding portions of the pipe may be split and bent inwardly as indicated at 36 to engage the inner face of a head 37 of the stud and thus securely connect it thereto. The parts may be additionally connected by welding or, if preferrred, they may be connected by welding alone.

Encircling the pipe portion of member 32 is a helical spring 39 which is adapted to exert a force on the door tending to move it toward closed position and to be compressed during the greater part of the opening movement of the door. At its inner end the spring engages an abutment 40 which may conveniently be formed as an integral part of the hub 33. At its outer end the spring is engageable by means which is connected to and movable with the door.

In the present embodiment of the invention, the outer end of the spring is engageable by means 41 which depends from and is rigid with the door and which may advantageously be in the form of a flange or leg 41 integral with the bracket 24. The adjacent end of the pivoted member 32 carrying the spring is supported by the door so that the axis of the spring will remain substantially parallel with the plane of the door in all positions the door may occupy and this support may be conveniently provided by forming the depending flange 41 with an aperture through which the member may extend and is freely slidable with respect thereto.

The pivotal axis of the spring carrying member 32, that is, the point of reaction of the spring 39 on the car body, is positioned with respect to the hinge axis of the door so that the moment arm of the spring force about that axis decreases during at least a part of the opening movement of the door as the compression of the spring increases. Thus the force which the spring exerts on the door tending to close it when the door is in open position need not exceed, or only slightly, if that is desired, the force of gravity acting on the door which must be overcome to move the door towards closed position. Moreover, the spring can exert enough force on the door in any position of closure so that a single operator may handle it with ease. The spring, therefore, is able to exert a closing force on the door when the door is in closed position or in partially closed position as well as when the door is in open position.

In the embodiment of the invention here disclosed, the pivotal axis of member 32 is disposed adjacent the pivotal axis of the door, being located slightly below that axis and nearer the adjacent side of the car. The line of force which the spring exerts on the door is designated by the lines A—A in Figures 3 and 4 and a line passing through the hinge axis perpendicular to the line A—A is designated by the lines B—B. The distance on line B—B between the pivotal axis of the door and where it intersects line A—A represents the moment arm of the force which the spring exerts on the door tending to close it. From a comparison of Figures 3 and 4, it will be seen that this distance on the line B—B is considerably less in Figure 4 where the door is shown in open position than in Figure 3 where it is shown in closed position. A line C—C has been applied to Figures 3 and 4 which passes through the pivotal axis of the door and is parallel with the door itself and the difference in distance between these lines and lines A—A in the two figures helps to illustrate the difference in the moment arm of the spring.

The positioning of the pivotal axis of member 32 is such that, as the door approaches open position, the product of the spring force due to its compression by the door and the moment arm thereof about the pivotal axis of the door is less than the product of these two factors when the door is in closed position. Thus the spring may exert a greater force on the door when the door is closed than when it is open. This is desirable because the force of gravity tending to move the door open when it is in closed position is greater than when in open position, the doors of gondola cars, as is well known, being adapted to be normally disposed at about a 40° angle to the horizontal when the door is open. It will be observed that the upwardly facing angle between the line of force of the spring represented by the letter A—A in Figures 3 and 4 and a line connecting the pivotal axis of the door and the pivotal axis of the spring supporting member is an obtuse angle in all positions the door is adapted to occupy.

From the foregoing, it will be perceived that a simple and most reliable means has been devised for applying spring pressure to the drop bottom doors of gondola cars so that they may be easily moved by a single operator from open to closed position. Various modifications in details in the

embodiment of the invention here illustrated may, of course, be made without departing from the spirit and scope of the invention as defined in the appended claims.

What I claim is:

1. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed substantially horizontal position, said improvement consisting of a helical spring disposed beneath the door and operatively interposed between the door and the car body, a member pivotally mounted on the car body below the hinge axis of the door means carried by the door for slidably supporting said member and spring in a plane substantially parallel with the door in all positions of closure it may assume, and means rigid with the door and movable therewith for compressing the spring during at least a portion of the opening movement thereof, the moment arm of the force of the spring about the hinge axis of the door decreasing as the compression on the spring increases.

2. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a member pivotally mounted on the car body beneath said door and disposed substantially parallel with the plane of the door, a helical spring mounted on said member adapted to exert a force tending to move the door toward closed position, means rigid with the door for slidably supporting the free end of said member, and means operable by the door for compressing the spring for at least a part of the opening movement of the door, the pivotal axis of said member being located adjacent the hinge axis of the door and the moment arm of the force of the spring about the hinge axis of the door decreasing as the door nears fully open position.

3. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a helical spring disposed beneath the door, a member pivotally connected to the car body adjacent to and below the hinge axis of the door affording an abutment for one end of the spring, said member having a portion extending within the spring and projecting beyond the other end thereof, and means rigid with the door for slidably supporting the projecting end of said pivotally mounted member, said means supporting said member and encircling spring substantially parallel with the plane of the door, and being engageable with the spring for compressing it during the greater part of the opening movement of the door, the location of the pivotal axis of said member with respect to the hinge axis of the door being such that the moment arm of the force of the spring about the hinge axis decreases as the door nears fully open position.

4. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a helical spring disposed beneath the door adapted to exert a force tending to move the door toward closed position, a member pivotally connected to the car body adjacent to and below the hinge axis of the door having a portion extending within the helices of the spring and provided with an abutment for the inner end of the spring, said member projecting beyond the outer end of the spring, means connected to the door and movable therewith for slidably supporting said pivoted member substantially parallel with the door, and a bracket carried by the door engageable with the outer end of the spring for compressing it during the greater part of the opening movement of the door, the moment arm of the force of the spring about the hinge axis of the door decreasing as the door is moved to open position.

5. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a helical spring beneath the door adapted to exert a closing force tending to move the door toward closed position, a member pivotally connected adjacent its inner end to the car body near the hinge axis of the door providing an abutment for the spring, said member having a portion extending forwardly within the helices of the spring and the outer end of said member projecting beyond the spring, and means carried by the door slidably supporting the outer end of said member to maintain the member in substantially parallel relation with the door in all positions the door may occupy, said means being engageable with the spring for compressing it during opening movement of the door, the moment arm of the force of the spring about the hinge axis of the door decreasing as the door is moved to open position.

6. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a helical spring beneath the door adapted to exert a force tending to move the door toward closed position, means pivotally connected to the car body affording an abutment for the spring having a portion extending axially thereof, and a bracket rigid with the door having a hub portion affording means whereby the door may be pivotally connected to the car body and having a portion offset from the door for engaging and compressing the spring during the greater part of its movement from closed to open position, the pivotal point of said means being adjacent to and below the hinge axis of the door and the moment arm of the force abut the hinge axis decreasing as the door approaches fully open position.

7. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a helical spring disposed beneath the door with its longitudinal axis substantially parallel with the plane thereof, a member for supporting the spring having its inner end pivotally connected to the car body and its outer end projecting beyond the spring, means rigid with the door slidably supporting the outer end of said member, the pivotal axis of said member being adjacent to and below the hinge axis of the door, said means being cooperable with said spring for compressing it during the greatest part of movement of the door from closed to open position, the moment arm of the force of the spring about the hinge axis of the door decreasing as the door moves to open position.

8. The improvement in railway cars of the type

having a hingedly mounted door adapted to be disposed in horizontal position to close a lading discharge opening of the car and having means for supporting the door in closed position, said improvement consisting of a bracket on the car body below the door to which the door is hingedly connected, an elongated member pivotally connected at its inner end to said bracket beneath the door and adjacent the hinge axis thereof, means connected to and movable with the door for slidably supporting the outer end of said member, a spring encircling said member adapted to exert a force on the door tending to move it toward closed position, and means movable with the door for compressing the spring during the major part of its movement to open position, the intersection of the line of force of the spring and the line connecting the hinge axis of the door with the point of reaction of the spring force on the car body forming an upwardly facing obtuse angle which increases as the door approaches open position.

9. The improvement in railway gondola cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof whose hinge axis extends longitudinally of the car and having means for supporting the door in closed position, said improvement consisting of a helical spring operatively interposed between the door and the car body adapted to exert a force tending to move the door toward closed position, a member having a pivotal axis extending longitudinally of the car mounted on the car body for supporting said spring, the outer end of said member projecting beyond the outer end of the spring, the longitudinal axis of said spring being disposed substantially parallel with the plane of the door in all positions the door may assume and the pivotal axis of said member being disposed below and adjacent to the hinge axis of the door, and means connected to and movable with the door slidably supporting the outer end of said member and for compressing the spring during the greater part of the movement of the door from closed to open position, the moment arm of the force of the spring about the hinge axis of the door decreasing as the door approaches fully open position.

10. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a bracket secured to the car body below the door, a bracket secured to the under-side of the door hingedly connecting the door to said bracket on the car body, a member pivotally connected adjacent its inner end to said bracket on the car body and slidably connected to the door adjacent its outer end, a spring carried by said member beneath the door adapted to exert a force tending to move the door toward closed position, and means rigid with the door for compressing the spring during the greater portion of the opening movement of the door, the moment arm of the force of said spring decreasing as the compression of the spring increases.

11. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a hinge bracket on the under-side of the door having a hub portion, a bracket rigid with the car body having laterally spaced portions between which said hub portion is disposed and to which it is hingedly connected, a member pivotally connected at its inner end to said bracket on the car having an encircling helical spring, and means rigid with said hinge bracket slidably supporting the outer end of said member for compressing said spring during the major portion of the opening movement of the door.

12. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a bracket rigid with the car body having laterally spaced wall portions, a hinge bracket rigid with the door having a hub portion interposed between said wall portions and pivotally connected thereto, said bracket on the door having a portion rigidly connected to the under side of the door and having an additional portion depending from the door, a member pivotally mounted adjacent one end thereof on said bracket on the car and slidably supported adjacent the other end thereof by said depending portion, and a helical spring encircling said member adapted to be compressed during opening movement of the door.

13. The improvement in railway cars of the type having a hingedly mounted door adapted to close a lading discharge opening thereof and having means for supporting the door in closed position, said improvement consisting of a bracket on the door hingedly connecting the door to the car, a member beneath the door pivotally connected to the car body adjacent the hinge axis of the door, and a helical spring encircling said member adapted to exert a force tending to move the door toward closed position, said bracket having a portion extending downwardly from the door for slidably supporting the free end of said member, said portion being cooperable with the spring for compressing it during movement of the door from closed to open position, the pivotal axis of said member being positioned with respect to the hinge axis of the door so that the moment arm of the force of the spring about the hinge axis decreases during opening movement of the door.

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