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RAILWAY CAR DROP DOOR

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The invention relates to a railway dump car having a "door" forming a part of the car for retaining the load therein which door is provided with hinges adjacent one of its edges and is capable of being "dropped" or swung open so that the load in discharging slides or passes over the upper surface of the door. Any means of raising the door to the closed position and any means for locking and releasing the door may be employed with my device. A door for this purpose must be very strong and durable because:

First, it is a part of the floor of the car and as such must sustain the load as well as the impact blow of the load when the car is in motion. Second, the car is frequently loaded from chutes or tipples from a height of ten feet or more, causing the load to be dropped directly upon the doors. Third, clamshell buckets are frequently used to unload such cars and it is not uncommon for these buckets to rest upon and drag over the door. Fourth, when the door suddenly comes to rest after being dropped, it is not only subjected to a severe shock but it must sustain the severe impact thrust of the load which of course follows the door. Fifth, as the load is theoretically equally distributed, the door must be strong over its entire area and must be capable of transmitting the resulting stresses to the car body without much deflection and no substantial distortion. Any bending of the door or dropping of the corners would cause a leak of the lading, especially of such fine material as sand, chats, etc. Any bending or warping might interfere with the complete closing and locking of the door.

As it costs as much to haul a ton of car as it does to haul a ton of paying freight, it is imperative that the car and any part thereof be as light as possible. Furthermore, the total weight of the car and freight is determined by the strength of certain standard axles, so that the lighter the car the greater amount of freight a given car will be allowed to carry.

An object is to form a metallic door with integral corrugations or ribs which impart to it a certain amount of strength and rigidity to resist loads imposed thereon and to so form the middle portions of the corrugations or ribs as to provide a certain amount of resiliency to enable the door to deflect and return to its normal position without appreciable amount of permanent distortion.

Another object is to form and arrange a plurality of corrugations in a metallic door so as to obtain a desired proportion between strength, rigidity and resiliency.

Another object is to obtain this result with the least amount of raw material and to provide a finished article of the least possible weight consistent with strength requirements.

Another object is to obtain the desired strength, rigidity and resiliency by forming a hopper door of a metallic plate with integral corrugations or ribs which taper in width toward their opposite ends and other preferably alternate corrugations or ribs which project in the opposite direction therefrom and which increase in width toward their opposite ends, the middle portions of the first mentioned corrugations being formed to provide a certain amount of resiliency to enable the plate to deflect and return to its normal position without appreciable permanent distortion.

Another object is to merge the adjacent portions of the oppositely projecting corrugations into each other so as to provide, in effect, a plurality of corrugations having a depth equal to the total depth of the oppositely projecting corrugations.

Another object is to provide such a corrugated metallic door which can be formed by pressing it (when heated, if necessary) between dies which move toward each other in one direction only.

The advantages of my door are applicable to any door of a freight car, such as drop bottom general service cars (used in the drawings), hopper cars, swinging side doors or hopper bottom coal cars, etc.

In the drawings:

Fig. 1 shows a portion of a railway car with my device applied thereon.

Figs. 2 and 3 are sections on line 2—2 and line 3—3 respectively of Fig. 1.

Figs. 4 and 5 are sections on line 4—4 and line 5—5 respectively of Fig. 1 with the car parts omitted.

Figs. 6, 7 and 8 are sections similar to Figs. 3, 4 and 5 but show the major corrugations with an arcuate configuration.

To illustrate one adaptation of my device, I have shown a so-called "general service" drop bottom gondola car wherein the major
portion of the floor consists of drop doors. The door openings are surrounded by the center construction, side wall and cross diaphragms. In normal or closed position the door completely closes this opening and in fact is a trifle larger on all sides than the opening so as to provide a lap joint between the door and the car frame members. The doors are hinged to the center construction and are supported adjacent the side wall by the raising or locking mechanism. Any convenient stop may be used to limit the downward movement of the door.

The plate is formed with integral corrugations or ribs 2 (called embossments) and corrugations or ribs 3 (called depressions) projecting alternately in opposite directions (upwardly and downwardly) from the original plane of the plate and preferably having their sides 4 merging into each other so as to provide, in effect, a plurality of parallel corrugations having a depth equal to the total depth of the oppositely projecting corrugations, each embossment having its middle portion divided by a secondary rib 11 to form a plurality of sinuous minor corrugations 20, which are spaced apart distances equal to their respective widths and the embossment 2 is also equal in width to the minor corrugations and is of sinuous configuration. The embossments 2, depressions 3 and minor corrugations 20 all merge together to form a sinuous construction so as to provide a relatively resilient structure adjacent the middle portion of the door (see Figs. 3 and 6) to allow it to deflect under load without permanent distortion. A plurality of the minor corrugations 20 merge together adjacent the edges of the door to form a lesser number of narrower corrugations 22 which are spaced apart distances equal to their respective widths and the embossments 2 increase in width proportionately to the decrease in width of the depressions, thus forming a configuration (see Figs. 3 and 8) symmetrical in cross section about a line midway between the outermost portions of these depressions so that this line is the neutral axis of the section. Such a section is relatively rigid as compared with the section of the sinuous configuration described above. The ends of the depressions merge into the plane of the plate by means of terminal portions 29 of any desired formation.

By such an arrangement a corrugated metallic door is provided which is relatively rigid adjacent the ends portions of the depressions and embossments and relatively resilient adjacent the middle portions of the depressions and embossments. I have used the terms “embossments” and “depressions” in the specification and claims to avoid confusion and differentiate between the corrugations projecting in the opposite direction thereto, but otherwise I contemplate no difference in the meaning of the terms.

In the construction illustrated the embossments 2 have a constant width and depth for a space 6 equi-distant on each side of the middle of the plate and then increase in width (and preferably decrease in depth) until they merge into the original plane 75 of the plate.

The depressions 3 are positioned alternately between the embossments 2 and preferably have a constant width and depth for a space 6 equi-distant on each side of the middle of the plate and then preferably maintain a constant depth but increase in width toward their opposite ends proportionately to the increase in width of the embossments so that the adjacent sides 4—5 of the embossments and depressions are parallel, and in the preferred form, these sides merge into each other for substantially the entire length of the embossments.

The depressions 3 have integral ribs 11 formed in them which project in opposite directions therefrom and are preferably equal in depth thereto adjacent the middle of the depressions and preferably equi-distant on each side of their medial line. These ribs preferably terminate within the depression. The embossments and depressions are equal in width adjacent their ends.

Figs. 3, 4 and 5 show the depressions with flat apices 23 and the portions (24) of the plates between the depressions also being flat; Figs. 6, 7 and 8 are similar to Figs. 3, 4 and 5, respectively, and show the depressions with arcuate apices 27 and the portions of the plate (28) between the depressions also being arcuate.

The embossments and depressions may be of equal depth or one group may be deeper than the other group to suit conditions. In the form illustrated the embossments are shallower than the depressions.

By thus forming a metallic plate I provide a plurality of corrugations or beams which cooperate to form a very rigid structure adjacent the sides of the plate capable of absorbing considerable stress without much deflection and which also form a resilient structure adjacent the middle of the corrugations so that when the plate deflects under extreme load it rebounds or returns to its normal position without appreciable permanent distortion.

This is a continuation in part of my application Serial No. 131,940, filed August 27, 1926, wherein I have disclosed and claimed broadly the particular formation of a metallic plate and specifically the use of such a structure as a wall for a railway car, and in my co-pending application Serial No. 216,962, filed September 1, 1927, (also a continu
ation in part of my application Serial No. 131,940, filed August 27, 1926.) I have specifically disclosed and claimed the use of such a structure as a side door for a railway car.

The accompanying drawings illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, as it is obvious that various modifications thereof within the scope of the claims will occur to persons skilled in the art.

I claim:

1. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width toward their ends and terminating in the plate adjacent opposite edges of the door and a plurality of depressions decreasing in width toward their ends and terminating in the plate adjacent opposite edges of the door, said embossments and depressions projecting in the opposite directions from the plane of the plate, the middle portion of the depressions being divided to form ribs, said embossments, ribs and divided portions of the depressions all being the same width adjacent their medial line.

2. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width toward their ends and terminating in the plate adjacent opposite edges of the door and a plurality of depressions decreasing in width toward their ends and terminating in the plate adjacent opposite edges of the door, said embossments and depressions projecting in the opposite directions from the plane of the plate, the middle portion of the depressions being divided to form ribs, said embossments, ribs and divided portions of the depressions all being the same width and of constant width equidistant on opposite sides of the medial line.

3. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width toward their ends and terminating in the plate adjacent opposite edges of the door and a plurality of depressions decreasing in width toward their ends and terminating in the plate adjacent opposite edges of the door, said embossments and depressions projecting in the opposite directions from the plane of the plate, the middle portion of the depressions being divided to form ribs, with the sides of the embossments merging into the sides of the depressions.

4. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width toward their ends and terminating in the plate adjacent opposite edges of the door and a plurality of depressions decreasing in width toward their ends and terminating in the plate adjacent opposite edges of the door, said embossments and depressions being the same width adjacent opposite edges of the door.

5. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width toward their ends and terminating in the plate adjacent opposite edges of the door and a plurality of depressions decreasing in width toward their ends and terminating in the plate adjacent opposite edges of the door, said embossments and depressions projecting in the opposite directions from the plane of the plate, the middle portion of the depressions being divided to form ribs, said embossments, ribs and divided portions of the depressions all being the same width adjacent their medial line.

6. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width toward their ends and terminating in the plate adjacent opposite edges of the door and a plurality of depressions decreasing in width toward their ends and terminating in the plate adjacent opposite edges of the door, said embossments and depressions being the same width adjacent opposite edges of the door.
ing, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width and decreasing in depth toward their ends and terminating in the plane adjacent opposite edges of the door and a plurality of depressions decreasing in width toward their ends and terminating in the plane adjacent opposite edges of the door, said embossments and depressions projecting in the opposite directions from the plane of the plate, the middle portion of the depressions being divided to form ribs.

9. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width toward their ends and terminating in the plate adjacent opposite edges of the door and a plurality of depressions of constant depth the major portion of their length and decreasing in width toward their ends and terminating in the plate adjacent opposite edges of the door, said embossments and depressions projecting in the opposite directions from the plane of the plate, the middle portion of the depressions being divided to form ribs.

10. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width toward their ends and terminating in the plane adjacent opposite edges of the door and a plurality of depressions positioned alternately therebetween of constant depth the major portion of their length and decreasing in width toward their ends and terminating in the plane adjacent opposite edges of the door, said embossments and depressions projecting in the opposite directions from the plane of the plate, the middle portion of the depressions being divided to form ribs.

11. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate provided with a plurality of embossments increasing in width toward their ends and terminating in the plate adjacent opposite edges of the door and a plurality of depressions positioned alternately therebetween of constant depth the major portion of their length and decreasing in width toward their ends and terminating in the plate adjacent opposite edges of the door, said embossments and depressions projecting in the opposite directions from the plane of the plate, the middle portion of the depressions being divided to form ribs, said embossments, ribs and divided portions of the depressions all being the same width adjacent their medial line, said embossments and depressions being the same width adjacent opposite edges of the door with the sides of the embossments merging into the sides of the depressions for substantially the entire length of these elements.

12. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate formed with a plurality of corrugations projecting in opposite directions from the original plane of the plate, some of which have their middle portions divided so as to provide a relatively rigid structure adjacent the opposite edges of the door and a relatively resilient structure adjacent the middle of the door.

13. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate formed with a plurality of corrugations projecting in opposite directions from the original plane of the plate, some of which have their middle portions divided so as to provide a relatively rigid structure adjacent the opposite edges of the door which gradually becomes a relatively resilient structure adjacent the middle of the door.

14. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate formed with a plurality of corrugations projecting in opposite directions from the original plane of the plate which are relatively shallow adjacent their end portions, some of which have their middle portions divided to form a greater number of relatively deep corrugations adjacent their middle portions so as to provide a relatively rigid structure adjacent the opposite edges of the door and a relatively resilient structure adjacent the middle of the door.

15. In a railway car having a door opening, a door hinged adjacent one edge thereof and supported at the opposite edge thereof, said door comprising a metallic plate formed with a plurality of corrugations projecting in opposite directions from the original plane of the plate which are relatively shallow and relatively wide adjacent their end portions, some of which have their middle portions divided to form a greater number of relatively deep and relatively narrow corrugations adjacent their middle portions so as to provide a relatively rigid structure adjacent the opposite edges of the door and a relatively resilient structure adjacent the middle of the door.