Aug. 21, 1928. 1,681,815

A. E. SMALL

DROP DOOR FOR RAILWAY CARS

Filed Dec. 23, 1926

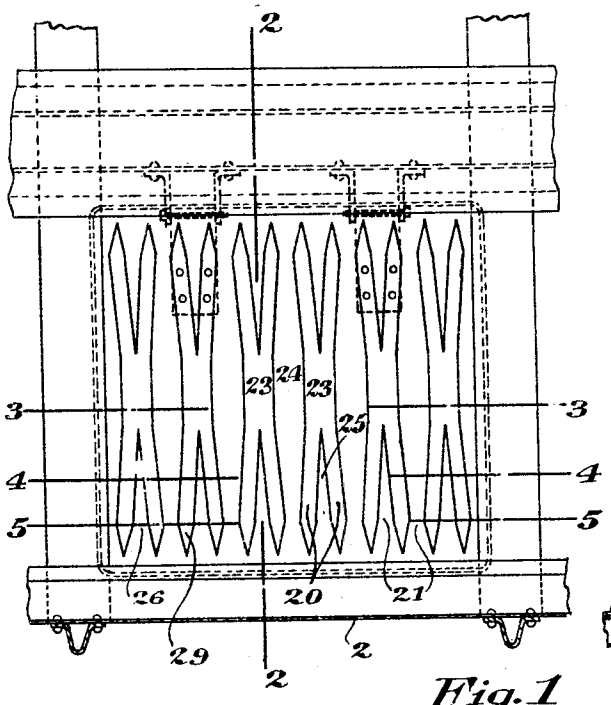


Fig. 1

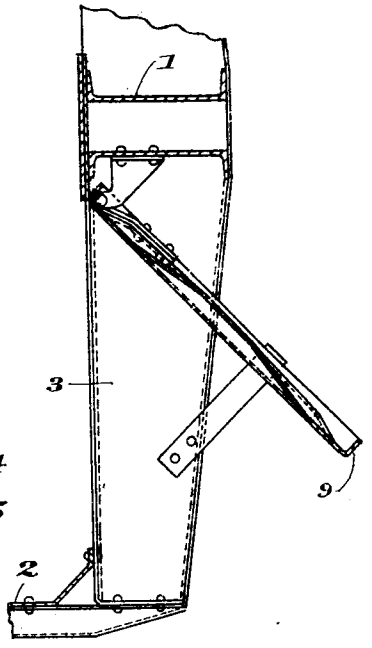


Fig. 2

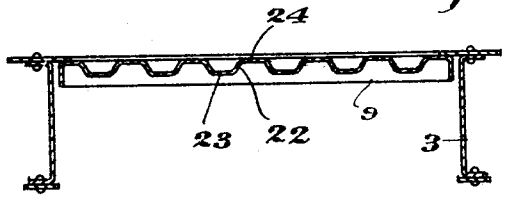


Fig. 3

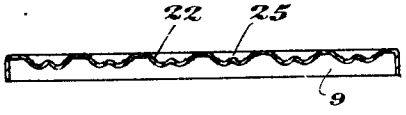


Fig. 4

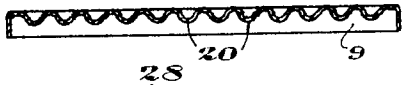


Fig. 5

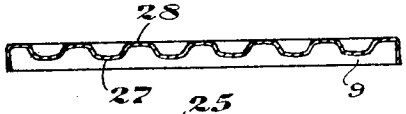


Fig. 6

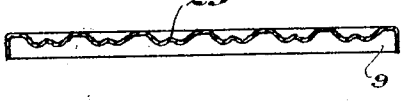


Fig. 7

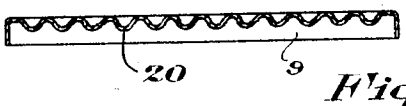


Fig. 8

Inventor
Arthur E. Small
Victor E. Sisson
Attorney

Patented Aug. 21, 1928. 1,681,815

UNITED STATES PATENT OFFICE.

ARTHUR E. SMALL, OF CHICAGO, ILLINOIS, ASSIGNOR TO UNION METAL PRODUCTS COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

DROP DOOR FOR RAILWAY CARS.

Application filed December 23, 1926. Serial No. 156,703.

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, clam shell buckets are frequently used to unload such cars and it is not uncommon for these buckets to rest upon and drag over the doors. 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 drooping 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 ends 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 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 3—3 respectively of Fig. 1.

Figs. 4 and 5 are sections on line 4—4 and 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 1, side wall 2 and cross diaphragms 3. 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.

Figs. 1 to 5 inclusive show the preferred form wherein the body plate of the door is provided with a plurality of parallel embossments, each embossment comprising a plurality of relatively shallow sinuous minor corrugations 20 formed therein which are spaced apart distances equal to their respec-

tive widths and the portion 21 of the plate between adjacent minor corrugations is also sinuous so that these minor corrugations merge together to form a contiguous sinuous configuration symmeterial in cross section about a line midway between the outermost portions of these minor corrugations so that this line is the neutral axis of the section. Such a section is very resilient and has a spring like action under loads, and, furthermore, produces a very strong section for the amount of metal used. A plurality (two or more) of such minor corrugations 20 merge together adjacent the middle of the plate (or middle of the embossment comprising the minor and major corrugations) to form a lesser number of corrugations 22 with flat apices 23 which are spaced apart distances equal to their respective widths and the part 24 of the door between these major corrugations 22 is also flat, thus forming a configuration symmetrical in cross section about a line midway between the outermost portions of these major corrugations so that this line is the neutral axis of the section. Such a section is stronger and relatively rigid as compared with the section of the sinuous minor corrugations because more metal is positioned away from the neutral axis and the increased depth also increases the strength of the beam. The ends of the minor corrugations merge into the plane of the door 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 middle portion of the embossments and relatively resilient adjacent the opposite end portions of the embossments. The secondary oppositely projecting rib or corrugation 25 formed by the merging of the two adjacent minor corrugations 20 is equal in width to the adjacent minor corrugations at 26 and decreases in width as the minor corrugations merge together to form the major corrugation 22. These secondary oppositely projecting ribs 25 also preferably decrease in depth so that any concentrated stretch of metal is eliminated where the minor corrugations merge together.

I have designed my invention for use in steel doors so that when the section modulus of any section (normal to the corrugations) is multiplied by a constant fibre stress the result equals the bending moment of that section for either a load concentrated at the middle of the beam-corrugations or for a load equally distributed over the beam-corrugations, thus showing that I have not sacrificed any required strength at the ends of the beams to obtain resiliency; in other words, by my construction I obtain a very strong beam which is also resilient. The major corrugations are preferably wider than the minor corrugations.

As the embossment increases in depth toward its middle portion, this secondary rib preferably decreases in depth proportionately so that the lengths of the center lines of the metal of all cross sections of the embossment are equal to each other.

These shallower and deeper corrugations may be positioned and dimensioned so that the length of the center line of the metal of a cross section of the shallower corrugations (see Fig. 5) is the same as the length of the center line of the metal of a cross section of the deeper corrugations (see Fig. 3) and, furthermore, the corrugated plate may be so formed that the length of the center line of the metal of any cross section (for instance, as per Fig. 4) is equal to the length of the center line of the metal of any other cross section, that is, between the terminal portions. This is a material manufacturing advantage as it more evenly distributes the draw and stretch of the metal due to pressing the corrugations in the door.

Figs. 3, 4 and 5 show the major corrugations 22 with flat apices 23 and the portions (24) of the plate between the major corrugations also being flat. Figs. 6, 7 and 8 are similar to Figs. 3, 4 and 5, respectively, and show the major corrugations with arcuate apices 27 and the portions of the plate (28) between the major corrugations also being arcuate.

It is understood that the embossments or corrugations may extend normally like those illustrated in the drawings, or even diagonally, and still come within the scope of the invention and, furthermore, while I have described and claimed a single plate, it is understood that the door may be made of a plurality of united plates and still come within the scope of the invention.

The marginal portion (or portions) may be provided with flanges 9 so as to further stiffen the sides of the door against deflection under load and to stiffen the entire door against buckling or distortion.

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 corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider corrugations.

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 corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider and deeper corrugations.

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 corrugations spaced apart distances substantially equal to their width with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of corrugations spaced apart distances substantially equal to their width.

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 corrugations spaced apart distances substantially equal to their width with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider corrugations spaced apart distances substantially equal to their width.

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 corrugations spaced apart distances substantially equal to their width with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider and deeper corrugations spaced apart distances substantially equal to their width.

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 corrugations symmetrical in cross section about a line midway between the outermost portions of the corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of corrugations symmetrical in cross section about a line midway between the outermost portions of the corrugations.

7. 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 corrugations symmetrical in cross section about a line midway between the outermost portions of the corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider corrugations symmetrical in cross section about a line midway between the outermost portions of the corrugations.

8. 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 corrugations symmetrical in cross section about a line midway between the outermost portions of the corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider and deeper corrugations symmetrical in cross section about a line midway between the outermost portions of the corrugations.

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 corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of deeper corrugations, the length of the center line of the metal of a cross section of the shallower corrugations being substantially equal to the length of the center line of the metal of a cross section of the deeper corrugations.

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 corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider and deeper corrugations, the length of the center line of the metal of a cross section of the shallower corrugations being substantially equal to the length of the center line of the metal of a cross section of the deeper corrugations.

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 corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of

the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of corrugations which are of constant cross section for a short distance at the center of the plate.

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 provided with a plurality of corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider corrugations which are of constant cross section for a short distance at the center of the plate.

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 provided with a plurality of corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider and deeper corrugations which are of constant cross section for a short distance at the center of the plate.

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 provided with a plurality of sinuous and contiguous corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of corrugations with substantially flat apices.

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 provided with a plurality of sinuous and contiguous corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider corrugations with substantially flat apices.

16. 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 sinuous and contiguous corrugations with their opposite ends terminating into the plate adjacent the opposite marginal portions of the door, said corrugations merging together adjacent the middle of the plate to form a lesser number of wider and deeper corrugations with substantially flat apices.

ARTHUR E. SMALL.