Dec. 6, 1955 K. J. TOBIN ET AL 2,725,826

FREIGHT LOADING APPARATUS

Original Filed Sept. 25, 1948 6 Sheets-Sheet 1

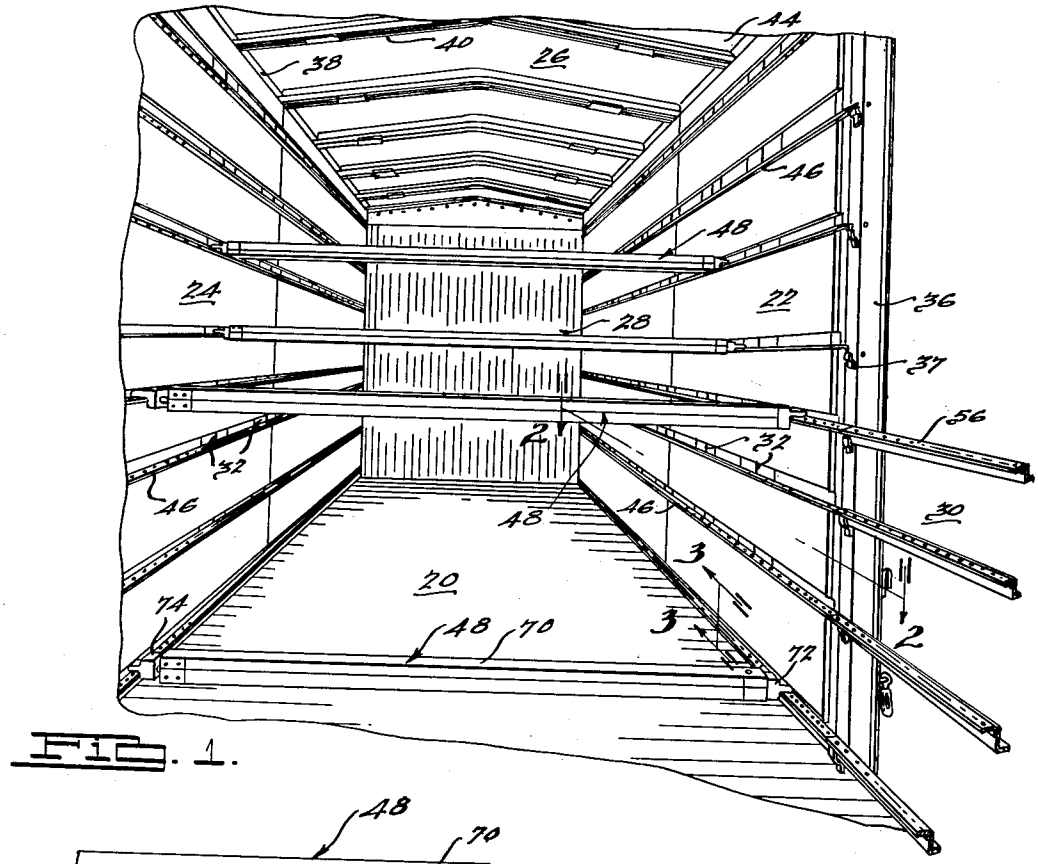


FIG. 1.

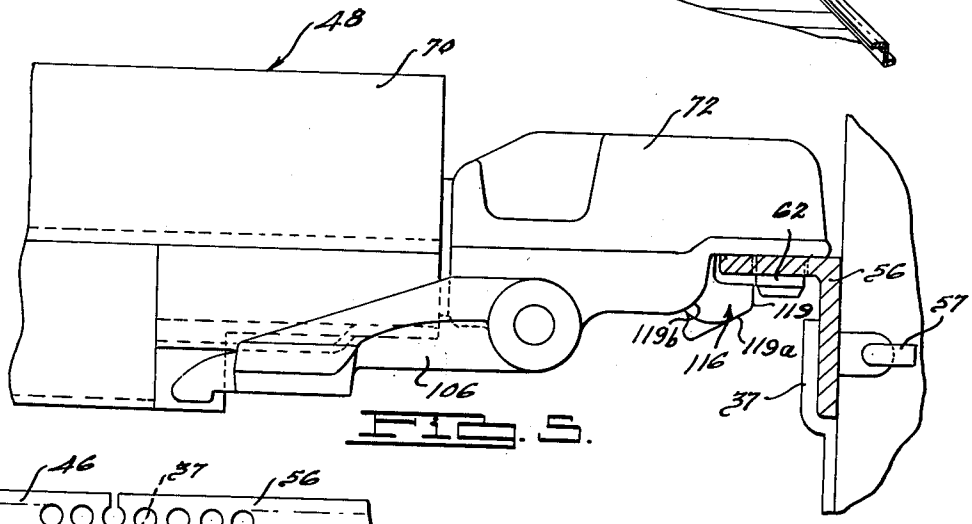


FIG. 5.

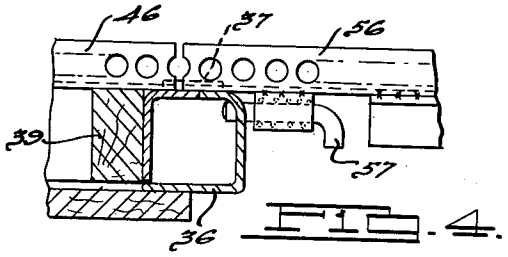


FIG. 4.

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Dec. 6, 1955 K. J. TOBIN ET AL 2,725,826

FREIGHT LOADING APPARATUS

Original Filed Sept. 25, 1948 6 Sheets-Sheet 2

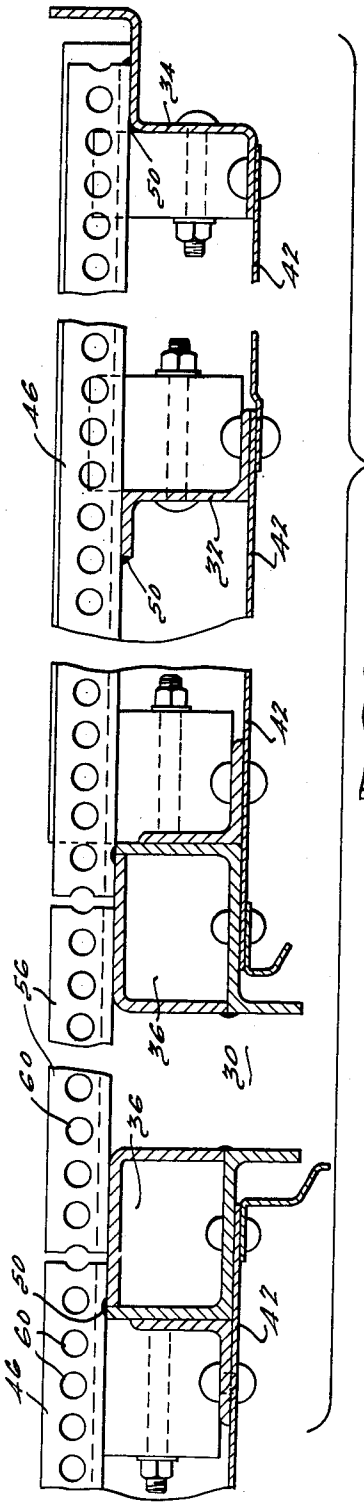
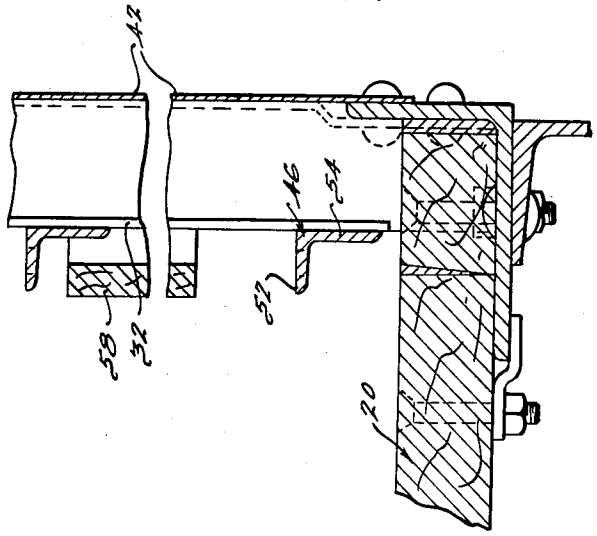


Fig. 3.

Fig. 4.



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Dec. 6, 1955 K. J. TOBIN ET AL 2,725,826

FREIGHT LOADING APPARATUS

Original Filed Sept. 25, 1948 6 Sheets-Sheet 3

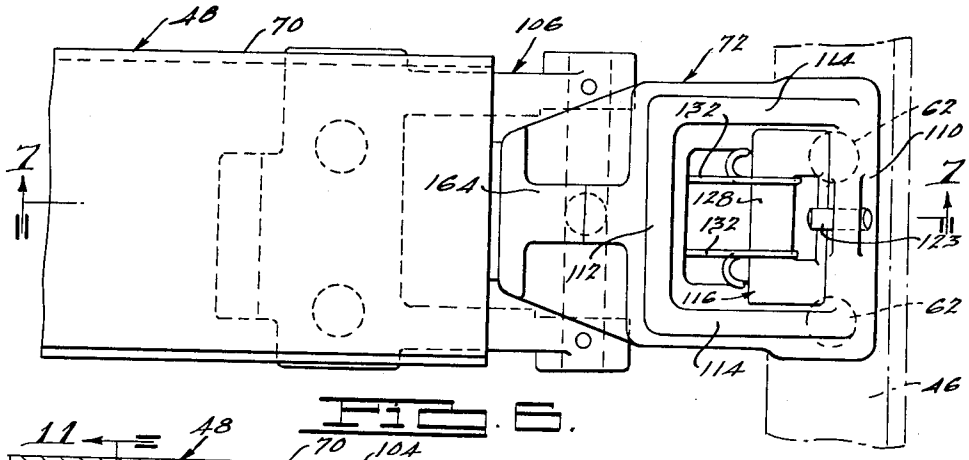


FIG. 6.

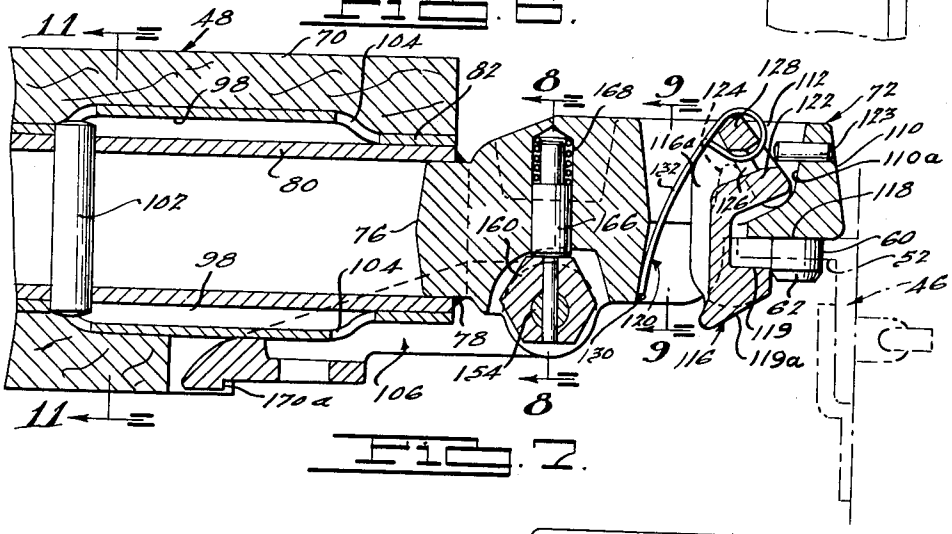


FIG. 7.

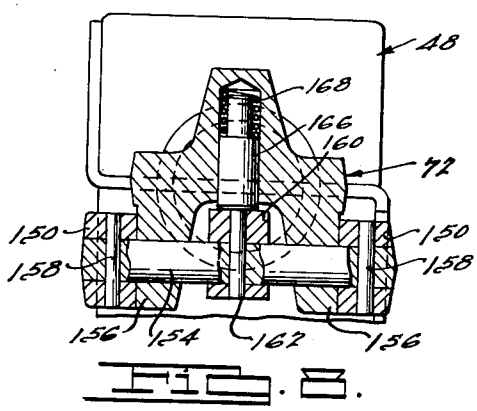


FIG. 8.

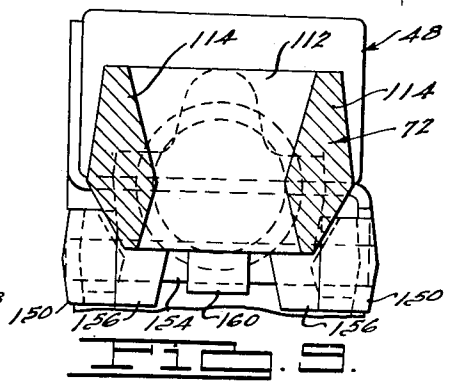


FIG. 9.

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Dec. 6, 1955 K. J. TOBIN ET AL 2,725,826

FREIGHT LOADING APPARATUS

Original Filed Sept. 25, 1948 6 Sheets-Sheet 4

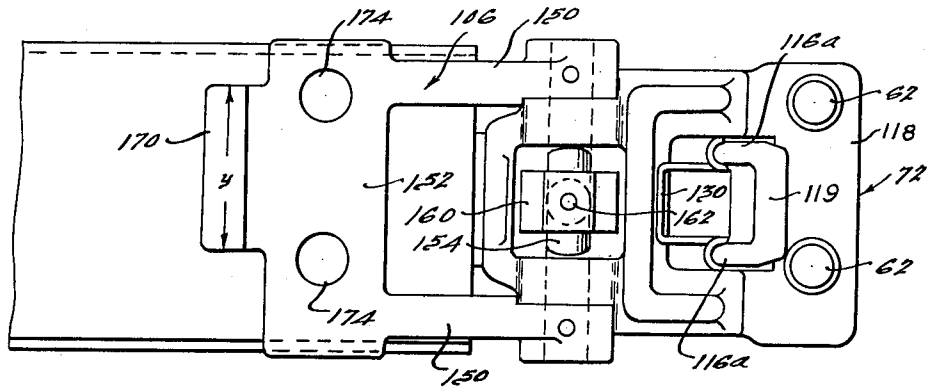


FIG. 10.

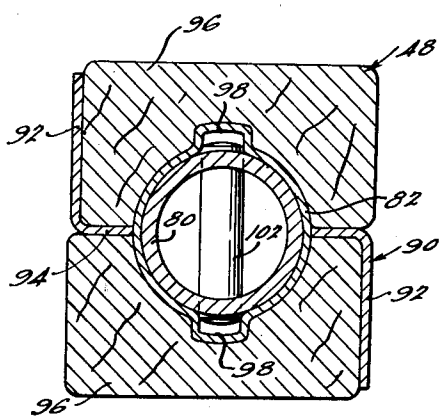


FIG. 11.

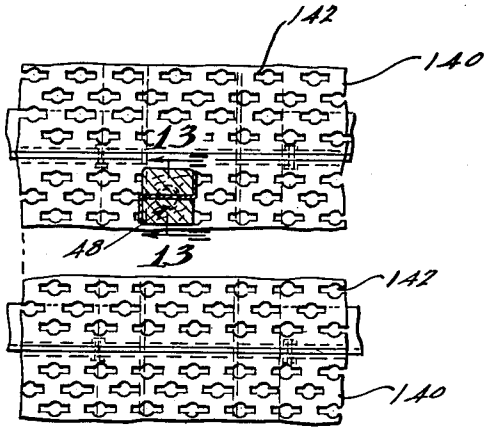


FIG. 12.

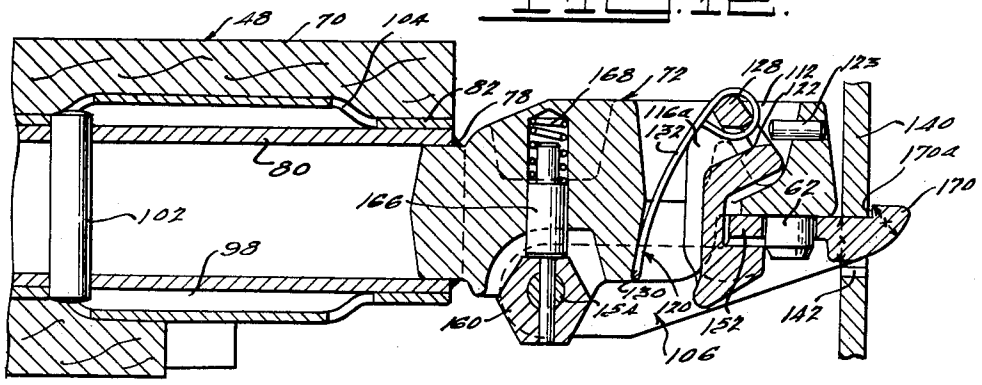


FIG. 13.

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Dec. 6, 1955 K. J. TOBIN ET AL 2,725,826

FREIGHT LOADING APPARATUS

Original Filed Sept. 25, 1948 6 Sheets-Sheet 5

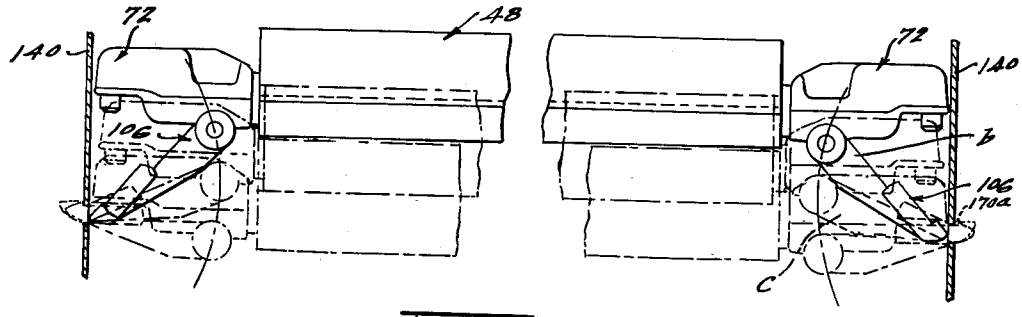


Fig. 14.

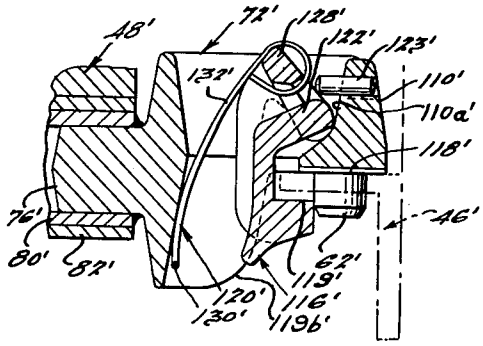


Fig. 15.

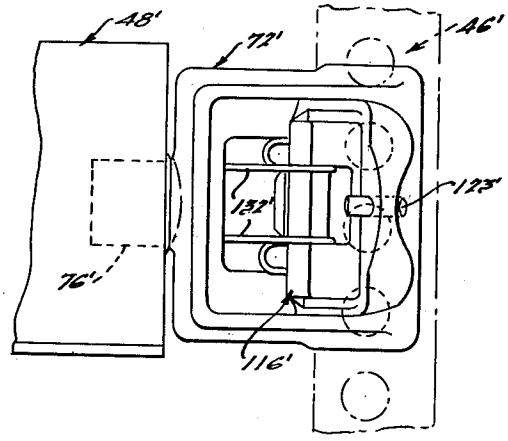


Fig. 16.

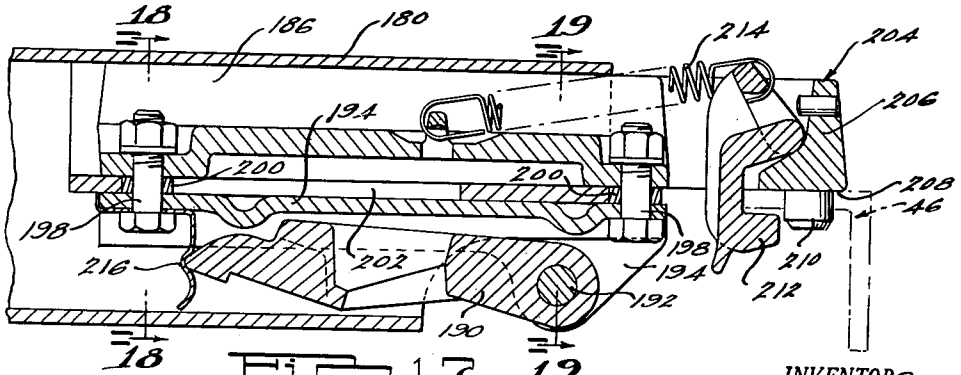


Fig. 17.

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Dec. 6, 1955 K. J. TOBIN ET AL 2,725,826

FREIGHT LOADING APPARATUS

Original Filed Sept. 25, 1948 6 Sheets-Sheet 6

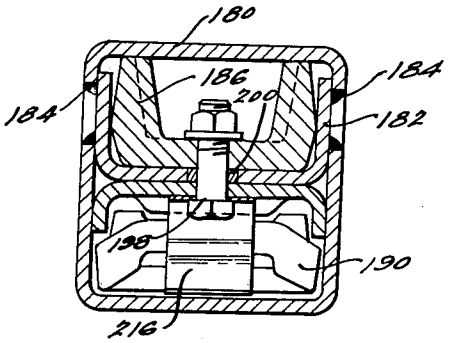


Fig. 18.

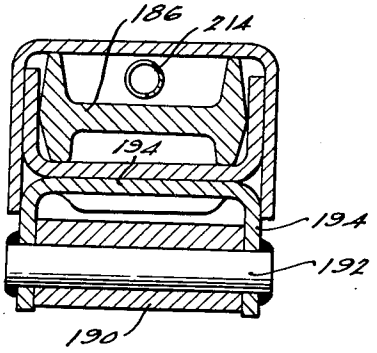


Fig. 19.

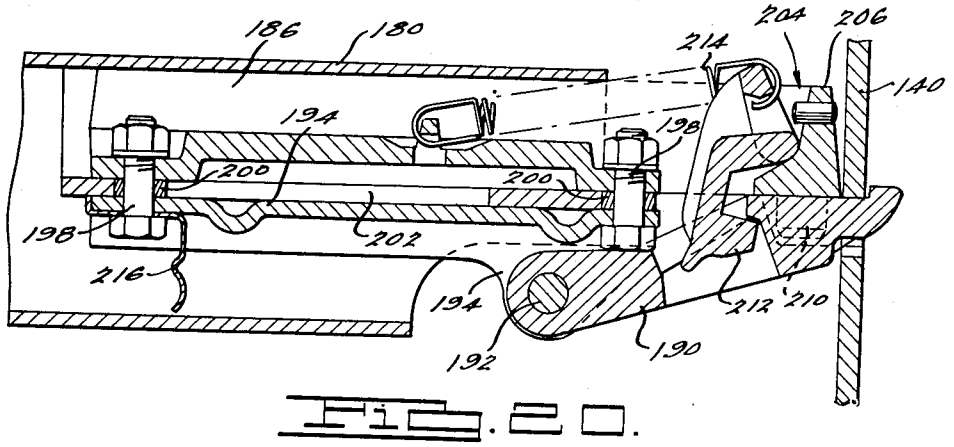


Fig. 20.

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United States Patent Office 2,725,826 Patented Dec. 6, 1955

2,725,826

FREIGHT LOADING APPARATUS

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Original application September 25, 1948, Serial No. 51,272, now Patent No. 2,497,683, dated February 14, 1950. Divided and this application October 6, 1949, Serial No. 119,942

8 Claims. (Cl. 105—369)

The present application is a division of applicants' co-pending application, Serial No. 51,272, filed September 25, 1948, now Patent No. 2,497,683.

The present invention relates to improved loading apparatus, which is readily adjustable and widely adaptable to hold freight articles of different types in vehicles or storage spaces, and more particularly to improved equipment of this nature which is built into or combined with a vehicle, such as a railway freight car, to hold (that is, for example, to brace, support, or carry, space, wedge, or to provide shelves, partitions or bins for) a wide variety of packages or parts during shipment.

The principal object of this invention is to provide apparatus or equipment of the above generally indicated type, which is combined into an otherwise conventional freight car structure, in an improved manner, so as to strengthen and reinforce the same, and yet which is of minimum weight and cost, consistent with the sturdiness required of railway loading apparatus; to provide such equipment of the belt line type, comprising horizontally extending side rails combined with the car posts to produce very strong lattice-like wall structures for the car; and to provide such arrangements embodying improved removable and adjustable doorway features.

Further objects of the present invention are to provide an organization of the above generally indicated type, further characterized by the provision of improved, adjustable and removable cross bars, extending between the side rails, and having improved connections with side rails; to provide such structures wherein the bars embody pitch-splitting features which increase the fineness of adjustment of the system; to provide such structures characterized by the provision of improved latching-type jaw arrangements.

Further objects of the present invention are to provide improved cross bar structures per se, as aforesaid, for use in the above as well as other freight loading organizations; and to provide bar structures which are readily convertible so that a single bar may be used in any of a plurality of different freight loading organizations.

With the above as well as other and more detailed objects in view, which appear in the following description and in the appended claims, preferred but illustrative embodiments of the invention are shown in the accompanying drawings; throughout the several views of which corresponding reference characters are used to designate corresponding parts and in which:

Figure 1 is a perspective view of the interior of a freight car equipped with the present loading apparatus;

Fig. 2 is a broken view in horizontal section, illustrating a preferred structural relation between the belt line side rails and the upright side posts of the car, and taken along the line **2—2** of Fig. 1;

Fig. 3 is a fragmentary view in vertical section, taken along the line **3—3** of Fig. 1, and further illustrating a preferred connection between the side rails and the upright side posts of the car;

Fig. 4 is a fragmentary view in horizontal section,

showing certain details of the present improved doorway arrangement;

Fig. 5 is a fragmentary view in side elevation illustrating further details of the doorway arrangement and further showing an end portion of the present improved convertible cross bar;

Fig. 6 is a fragmentary plan view, of the structure shown in Fig. 5;

Fig. 7 is a view in vertical section, taken along the line **7—7** of Fig. 6;

Fig. 8 is a view in vertical section, taken along the line **8—8** of Fig. 7;

Fig. 9 is a view in vertical section, taken along the line **9—9** of Fig. 7;

Fig. 10 is a bottom view of the structure shown in Fig. 6;

Fig. 11 is a view in vertical section, taken along the line **11—11** of Fig. 7;

Fig. 12 is a fragmentary view illustrating one of several alternative freight loading organizations with which the improved convertible cross bar of the present invention may be used;

Fig. 13 is a fragmentary view in vertical section, showing the cross bar of Fig. 5 in condition for use with a wall structure of the type shown in Fig. 12;

Fig. 14 is a somewhat diagrammatic view illustrating the several successive stages involved in applying the cross bar of Fig. 13 to a wall structure of the general type shown in Fig. 12;

Fig. 15 is a fragmentary view in longitudinal vertical section of a simplified form of cross bar;

Fig. 16 is a fragmentary plan view of the bar of Fig. 15;

Fig. 17 is a fragmentary view in vertical section, showing a modified construction of convertible cross bar;

Figs. 18 and 19 are, respectively, views in transverse vertical section, taken along the lines **18—18** and **19—19** of Fig. 17; and,

Fig. 20 is a view of the bar shown in Fig. 17, but converted for use with and applied to a wall structure of the general type shown in Fig. 12;

It will be appreciated from a complete understanding of the present invention that the improvements thereof may be embodied in widely differing forms, that certain of the elements or subcombinations found therein may be utilized independently of each other and of the combination as a whole, and that the present convertible bar, though illustrated in connection with only several known alternative forms of general loading structures, may, within the spirit of the invention, be utilized with others. Accordingly, the disclosure herein of specific forms of the invention is to be regarded in an illustrative and not in a limiting sense.

Referring first to Figures 1 through 5, the illustrated railway freight car is, except in respect to the hereinafter described freight loading elements, of generally conventional construction. Generally speaking, it comprises a usual floor structure **20**, side walls **22** and **24**, a roof structure **26**, and end walls **28**, one of which is shown in Fig. 1. Although the wall **24** is illustrated as extending uninterruptedly from and to the end of the car, and the wall **22** is illustrated as being provided with a door opening **30**, it will be appreciated that in many instances, both side walls may be provided with door openings.

The structural elements which provide a frame for and support the floor structure **20** form no part of the present invention and are not illustrated herein. The framing structure for the side and end walls of the car primarily comprise the series of longitudinally spaced vertically extending upright intermediate posts **32**, corner posts **34**, and door posts **36**. The side wall posts are

shown in Figure 1, it being understood that the intermediate posts for the end wall **28**, if used, are concealed behind the usual wooden liner. The roof structure is defined generally by laterally spaced upper rails **38**, and interconnecting rafters **40**. The side walls and the roof are, of course, sheathed as indicated generally at **42** and **44**.

In accordance with the illustrated embodiment of the present invention, the loading organization is of the belt line type, the basic elements of this loading organization being a series of horizontally disposed, longiutdinally extending, vertically spaced, side rails **46**, arranged at respectively opposite sides of the car, in vertically aligned relation, and a series of adjustable and removable cross bars **48**. Important features of the present invention have to do with the structure of the side rails **46** per se and their combination with the upright side posts, so as to form integrated and strong, but nevertheless light weight, lattice-like side wall structures for the car. More particularly, each latticed side wall structure is made up of integrally interconnected upright posts **32—34—36** (which extend between and are rigidly connected to the floor and roof structures **20—38**) and the series of vertically spaced side rails **46**. As most clearly appears in Figs. 2 and 3, each individual side rail extends uninterruptedly from corner post to corner post of the corresponding wall except where interrupted by the previously mentioned door openings **30**. As pointed out above, in the illustrated embodiment, the door opening **30** is provided at only one side and it will be understood, accordingly, that if a view corresponding to Figure 2 be based upon the wall **24**, it will duplicate Figure 2, except that the door opening **30** and the door posts **36** would be lacking. Each individual side rail **46** is rigidly secured to each of its corresponding side, corner, and door posts **32—34—36**. As shown, these rigid connections are effected by welding, the weld points being indicated at **50**. It will be understood, of course, that if desired, each individual side rail may be made of an initially continuous length of material or a succession of initially separate lengths. The welded joints between the posts and the side rail portions, of course, integrates these side rail portions.

The side rails **46** resist bending both transversely of and vertically of the car. More particularly, in the illustrated form, the side rails **46** are of angle iron form, having the horizontally extending shelf forming flanges **52**, and the vertical flanges **54**. As hereinafter described, the door opening **30** may be and preferably is provided with a series of removable side rails **56**, which duplicate the rails **46**, and are removably connected to the door posts **36**.

It will be noticed that the side rails **46** lie immediately inwardly of the car with respect to the posts **32—34—36**, and that the flanges **52** face inwardly of the car. In the preferred practice of the invention, intermediate buffer panels **58**, are secured to the side walls, in the space between adjacent pairs of side rails **46**. Preferably, and as illustrated, the inner surface of these buffer panels project into the car slightly farther than do the flanges **52**. Thus, the buffer panels primarily define the inner wall surfaces and these wall surfaces are free of any freight engaging protuberances, which might otherwise injure freight, either during loading or unloading, or in transit.

It will be appreciated that the major freight-imposed loads, to which a freight car is subjected during transit, are horizontal and lengthwise of the car, these loads being imposed primarily under abrupt starting or stopping conditions. In the present structure, these freight imposed loads are uniformly distributed between all of the upright wall posts, this distribution being effected by the rigid connections between these posts and the side rails. These interconnecting and reinforcing side rails, being provided with the vertically and horizontally extending strength portions (in this case, flanges **52** and **54**) are able to withstand substantial loads, both in tension and compression and thus strongly resist buckling in directions either transversely or vertically of the car. Independently, of their function as supports for the cross members **48**, accordingly, the present side rails **46** materially strengthen the freight car structure as a whole.

Each door post **36** carries a set of clips **37** which removably receive the vertical flanges of the door rails **56**, and support them so that the horizontal flanges thereof are aligned with and constitute continuations of the fixed rails **46**. Each door rail **56** may be and preferably is provided with a pair of retractable, spring biased locking pins **57**, disposed to be received in apertures provided therefor in the posts **36**.

As shown, the posts **36** carry wooden nailing strips **39**, which may serve as nailing surfaces to permit a conventional grain door to be fixed in place across the doorway. In applying such a door, the ends thereof may, of course, be notched to accommodate those portions of rails **46** which project over the strips **39**.

Coming now to the relation between the side rails **46** and the cross bars **48**, the rails are provided with separate holding means, which are distributed in uniformly spaced relation along the length of the rails, so that the cross bars can be applied thereto at any desired point along the length of the car. At the same time, the side rails are of a form which enables them to support the cross bars while they are being moved from one adjusted position lengthwise of the car to another position. This feature materially reduces the work of installing the bars, since it is only necessary for the workman to initially position a cross bar on the rail and thereafter shove it to a desired position. In the preferred and illustrated practice of the invention, these holding means take the form of punched openings **60**, and the corresponding holding means provided on the cross bars take the form of slightly tapered pins **62**, each end of each cross bar being preferably provided with a pair of these pins **62**, the spacing between which is a multiple of (in this case twice), the spacing between adjacent holes **60**. Pins **62** have a working fit in holes **60**.

Coming now to a preferred construction of cross bar, and referring particularly to Figures 1, and 5 through 10, each individual crossbar **48** comprises an intermediate freight engaging body portion **70**, and a pair of identical end heads **72** and **74**. In order to enable the bar to accommodate itself to varying car widths (which variations may be due either to original manufacturing variations, or to weaving of the car or the like), and in accordance with the invention broadly claimed in Nampa Patent 2,679,214 assigned to the assignee hereof, the heads **72** and **74** are telescopically related to the body **70** of the bar. The telescopic relation may, if desired, be employed in connection with only one of the heads **72** and **74**, in which event the non-telescopic head may be rigidly secured to the body **70**. Only the heads **72** are shown in the more detailed figures, Figures 5 through 10.

As herein illustrated, each head **72** is a forging, one end **76** whereof is rigidly secured, as by welding as indicated at **78**, to a cylinderical sleeve **80**. Sleeve **80** is slidably received in an outer sleeve **82** which in turn is rigidly connected to the body of the bar. As best seen in Figure 11, the body of the bar is primarily defined by a reinforcing Z-bar **90**, having vertically extending flanges **92** and a web **94**. Buffer bars **96** are rigidly secured in place on either side of the web **94** and serve to define relatively soft freight-engaging surfaces all the way around the bar.

The outer sleeve **82** may be and preferably is formed from an initially plane sheet of material which is first acted upon to define the axially extending grooves **98**, and is thereafter rolled up into cylindrical form and introduced into a notch provided therefor in the web **94**. The meeting edges of the sleeve **82** receive the web **94** between them, and the web-to-sleeve connections are

completed by welding (not shown). The sleeve **82** thus defines a cylindrical bore to receive the sleeve **80** and also defines the guide grooves **98**. Sleeve **80** carries a drive pin **102** which limits the telescoping movement between the parts. Assembly of the parts is completed by introducing sleeve **80** into sleeve **82** a short distance, and thereafter inserting the drive pin **102** through each of the oppositely disposed but aligned apertures **104** in sleeve **82**, this operation being performed, of course, while the hereinafter described adapter arm **106** is swung out of interfering relation.

Viewed in plan, each head **72** defines an opening which is roughly rectangular, having a forward wall **110**, a rear wall **112**, and laterally spaced side walls **114**. The opening defined by these walls receives the hereinafter described spring-biased, locking member or latch **116**. The generally flat under side **118** of the forward wall **110**, is disposed to directly bear upon the horizontal flange **52** of the corresponding side rail **46**, and is provided with the two previously mentioned holding pins **62**.

The previously identified latch **116**, the nose **118** whereof underlies the flange **52** of the associated rail, is loosely journaled in the head **72**, and is biased to a latching position by a spring **120** and also by gravity as can be readily seen in Fig. 7. More particularly, the latch is generally hook-shaped, as viewed in Fig. 13, and comprises the nose **119** and the bearing portion **122**. Portions **119** and **122** are interconnected by laterally spaced legs **116***a*. The bearing portion **122** is loosely journaled in a bearing defined by the inner surface **110***a* of the front wall **110**, and a pair of laterally spaced lugs **124** which project inwardly from the side walls **114**. A drive pin **123** blocks removal of the latch from the bearing **110—124**.

Laterally spaced arms **126** project upwardly and rearwardly from the ends of the bearing portion **122**, and are bridged at their outer ends by a connecting portion **128**. Spring **120** is illustrated as being formed from a continuous length of spring wire bent upon itself to define a bight **130**, which bears against the rear wall **112**, and has spaced upwardly extending legs **132**. These legs **132** extend over, around, and under the connecting portion **128** and the extreme ends thereof are hooked behind the leg portions **116***a*. From the foregoing, it will be appreciated that the latch **116** may readily be swung in a clockwise direction as viewed in Figure 7, from the holding position shown therein, to a position in which it does not interfere with a movement of the pins **62** into or out of the openings **60**. The spring **120** only lightly opposes such a clockwise rotative force applied to the latch **116**. On the other hand, the latch positively resists vertical forces applied to the bar **70**, tending to lift it away from the rails. This is because of the hook-like character of the latch.

In applying a bar between the rails **46**, the latches **116** associated with the heads thereof are, of course, swung to inactive position, and the bar is thereupon laid upon the shelves or flanges **52**. Because of the free telescopic connection, the heads **72** may readily be moved to a position in which, though the bar is supported by the rails **46**, the spacing between the pins **62** at one end of the bar and those at the other end of the bar differs from the lateral spacing between the holes **60** in the rails **46** at opposite sides of the car. Under these conditions, while supported on the rails by its two pins **62**, the cross bar **48** may readily be slid along the rails **46** until the desired position of adjustment is reached, after which the telescopic connection may be adjusted slightly, enabling the sets of pins **62** to drop into their respective holes **60**. In this use, the provision of two or more pins such as **62** prevents rolling over of the bar while thus supported. Thereafter, the latches **116** may be released, at which time they assume the latching position under the influence of gravity and of their biasing springs **120**.

Alternatively, the bar **48** may be laid upon the rails **46**, with the latches **116** in active position, in which event the under sides **119***a* of the noses **119** rest upon the rails and support the bar during sliding and adjusting movement lengthwise of the car. When the desired position of adjustment is reached, the latches **116** may be retracted or the bar pushed or pulled down, allowing the bar to drop into a selected locked position. Both the surface **119***a* and the inclined surfaces **119***b* on the head **72** will, if resting on rail flange **52**, tend to cam the head inwardly in a direction tending to cause the pins **62** to drop in holes **60**.

It will be apparent that the general use and the flexibility of the present freight bracing or loading apparatus and its abiilty to support freight against longitudinal displacement in the car, support freight in tiers or decks, and subdivide it into various compartments are essentially or generally the same as that disclosed in the copending application, now Patent 2,679,214 issued May 25, 1945 of the present applicant Nampa, and hence this common mode of general operation and its advantages need not be repeated here.

In freight loading systems of the general type disclosed, i. e., in which a freight engaging member, such as a cross bar or its retaining means, is held in a selected adjusted position along the car side walls by a positive type of securing means such as interengaging teeth or the engagement of one or more pins or projections in holes or recesses carried by the car side walls, a coarse or relatively wide pitch or spacing of these positive type securing means along the side wall members is desirable to achieve simplicity, lower cost, and in some respects, greater sturdiness. In many and perhaps in most types of loads, only a relatively coarse pitch spacing or fineness of adjustment is required. However, in certain types of freight loads a finer pitch or adjustment is desirable. Hence, there is a need for a pitch splitting arrangement or a means to subdivide the normal pitch spacing when necessary which is of low cost, retains the simplicity and sturdiness of the original system, and which does not introduce any additional movable elements or extra connections or engaging surfaces. Such arrangements are provided by the present invention in which it will be apparent that while the preferred utility of the pitch reducing arrangement is in the adjustments longitudinally of the car yet its use in other adjustments such as vertical, is within the broader purview of this invention as is the utilization of the present principles of pitch splitting in connection with securing means other than pins or projections received in holes and in connection with members other than the present securing means or pins **62** engaged simultaneously.

Coming now to the pitch splitting feature of the present invention, it will be noticed that though the pins **62** are approximately symmetrically arranged with respect to the longitudinal axis of the bar for a substantially symmetrical loading of the bar, but considered as a pair they are non-symmetrical by one-quarter of the spacing between adjacent rail holes **60**, the offset being in the same direction at both ends of the bar. Accordingly, considering two particular pairs of holes **60** at opposite sides of the car, the position of the bar body, lengthwise of the car, can be varied one-half of the pitch or spacing of adjacent holes **60** by turning it end for end to thus in effect add or subtract the one-quarter pitch offset. This pitch splitting feature, of course, has the effect of halving the pitch or hole spacing or, stated otherwise, has the effect of increasing, in this instance, doubling the number of adjusted positions which could otherwise be obtained with a given number of holes **60**.

Although the pins **62** are in slightly non-symmetrical relation with respect to the axis of the bar, it is to be noted that these pins are relatievly widely separated and so have a broad bearing on the rail **46** and give a high degree of end restraint. Accordingly, the various types of loads applied to the bar have little or no tendency to

cock it or rock it about its axis. Even though this broad bearing is provided also, it is to be noted that the entire structure of each head **72—74** lies within the confines of the bar body. Thus, the bar heads never interfere with freight articles which may extend, toward the car wall, beyond the ends of the bar body **70**. Injury to freight articles by the heads is thus effectively prevented.

As thus far described, the bars **48** are raised to cooperate with side wall structures of the previously described type wherein the supporting rails are provided with pin receiving apertures. As previously pointed out, an important feature of the present invention resides in arranging the bars **48** so that they can readily be converted for use with other types of supporting structures. United States Patents Nos. 2,091,869, granted August 31, 1937, to McCurdy, and 2,030,773, granted February 11, 1936, to Thomas, are illustrative of a commonly encountered such alternative type of bar supporting structure.

In these arrangements, the car walls are either partly or entirely covered with apertured structures, either fixedly or adjustably positioned, and the apertures in which are adapted to receive retractable pin arrangements carried at the ends of the bar. Figure 12 illustrates fragmentarily a portion of a car wall structure, arranged in accordance with said Thomas patent. In this figure, a metallic lining **140** is provided, which lining is provided with horizontally extending rows of spaced keyhole-like apertures **142**, these rows being spaced vertically and the apertures in alternate rows being vertically arranged in staggered relation to give an adjustment between the pitch of one row by moving the bar down or up one row. Such a wall structure is shown in Figures 13 and 14. There is and has been a decided need in the freight loading industry for a, so to speak, universal bar, which can be utilized in cars provided with any of a variety of side supporting structures. This need is well filled by the bar of the present invention.

Further, in the cross bars now usually employed with perforated wall types of cars as exemplified by the above-mentioned McCurdy and Thomas patents, there is no anti-pull-out retaining means. Such anti-pull-out means as have been proposed are believed to have been impractical. Hence these bars now commonly used with such perforated wall cars do pull out permitting the bars to drop during adjustment or in transfer due to inaccuracies or to changes in the car widths due to weaving or bulging of the car side walls. Thus there is also a need for a practical and efficient anti-pull-out means which is easy to use and substantially fool-proof. This need applies, not only to, so-called, universal bars but to other types including bars designed or intended for use only in the perforated wall type cars. This need is also met by the present invention and the present arrangement of the retaining member with its anti-pull-out portion on a swinging support (as embodied in adapter **106**) may be employed to advantage in bars designed only for perforated wall type cars.

More particularly, and referring now particularly to Figures 7 through 10 and 13 and 14, each of the heads **72** (and, of course, the heads **74**) is provided with one of the previously but briefly referred to adapters **106**. Each adapter **106** is, as viewed in Figure 10, of general U-shaped form, having laterally spaced legs **150** and a connecting bight or bridge **152**, the thickness of which is approximately that of the flange **52** of the previously described rails **46**. The outer ends of the legs **150** are apertured to receive a pivot pin **154**, which is rotatably journaled in bearing openings provided therefor in bosses **156** which project downwardly from the previously identified rear wall **112**. Drive pins **158** hold the shaft **154** and the adapter **106** in assembled relation to each other and to the bosses **156**.

In accordance with the present invention, means are provided to releasably, but fairly positively, hold the adapter in the retracted out of the way position of Figure 7, and to lightly bias it to the preliminary or cocked positions indicated at *b* and *c* in Figure 14, and the active position shown in Figure 13. In the illustrated embodiment, this detent holding relation is achieved by providing the shaft **154** with a hexagonal cam **160**, held in place by a drive pin **162**. Only four sides of the cam **160** are active, the six sided relation being preferred to enable the same cam to be used in connection with heads at either end of the bar.

A reinforcing rib **164** extends rearwardly from the rear wall **112** and is bored from the under side to receive a holding pin **166** and a biasing spring **168**. In the position shown in Figure 7 the pin **166**, of course, bears upon the highest one of the flats on cam **160** and yieldingly holds the adapter **106** in the illustrated position. Similarly, the pin **166** bears in succession against the next two flats to yieldingly hold the adapter **106** in, respectively, the positions marked *b* and *c* in Figure 14. Finally, the pin **166** bears against the flat opposite to the one shown in Figure 7, to yieldingly hold the adapter in the active position of Figure 13.

In the active position of Figure 13, the engaging or retaining portion or the offset nose **170** of the adapter extends through a corresponding opening **142** in the wall panel **140**, and a portion of the nose lies behind and in holding or anti-pull-out relation to the wall panel **140**. In this position, also, the pins **62** on head **72** project (with a working fit) through openings **174** provided therefor in the adapter bridge **152**, and the upper surface of the adapter bridge bears directly against the previously identified flat under side **118** of the front wall **110** of the head **72**. The openings **174** are slightly elongated to permit entry of the pins **62** during the swinging movement of adapter **106**. With this relation, it will be appreciated that the vertical loads applied to the bar are transmitted directly from the adapter bridge and head engaging surfaces and are not required to be transmitted, in any large part, through the pivotal connection between the head and the adapter. Similarly, loads applied to the bar longitudinally of the freight car, are transmitted directly from the pins **62** to the adapter **106**, thereby in a large part, if not entirely, eliminating these loads from the pivotal connection between the adapter and the head.

The nose **170** is offset laterally from the bar axis to provide the aforesaid pitch-splitting feature. As before, the offset is a sub-multiple of the spacing between two adjacent holes **142** in vertically spaced and adjacent rows. This arrangement is preferred here in view of the pitch reduction permitted by lowering or raising the bar one row in the alternately offset rows of these perforated wall cars.

In applying a bar **48** to a wall structure of the type shown in Figure 12, the action is substantially as illustrated in Figure 14. In this figure, in the uppermost position, the heads **72** are telescoped outwardly to a point where they are immediately adjacent, or may in fact engage, the wall panels **140**, and the adapters **106** are swung downwardly to points where the noses **170** are just ready to enter a corresponding pair of apertures **142**. If now the bar is lowered slightly the adapters may be swung out, advancing the noses **170** through the apertures **142** and bringing the shoulders **170***a* behind and in holding relation to the panel **140**.

While the adapters may be arranged to swing into locking or engaging position as the bar is raised, yet the presently disclosed arrangement is preferred since in use it is easier to lower the bar permitting the adapters to swing into engaging position.

Thereafter the bar may be lowered into place, during which movement the adapters swing about their pivot pins **154**. During the course of this movement, these pins **154**, of course, follow an arcuate path, such action being permitted by the telescopic connection or connections between the heads **72**. This arcuate path is shown

in somewhat exaggerated fashion in Figure 14, position *c* being approximately at the upper limits of the telescopic adjusting movement.

It will be noticed that when the bar is in place, the noses **170** substantially entirely fill the openings **142** leaving only the small semi-circular enlargements at the tops and bottoms. If desired, of course, the noses **170** may be provided with ridges to fill these semi-circular spaces.

The full use of the entire horizontal and vertical surfaces of the openings **142** materially increases the load bearing capacity of the panels **140**, as will be understood. This full use is permitted by the configuration of the noses **170**, it being noticed that the dimensions indicated at X in Figure 13 are just slightly less than the vertical heights of the aperture **142**. The width of the noses **170** indicated at Y in Figure 10 is, of course, just slightly less than the length of each opening **142**. The just-mentioned differences need be, of course, only large enough to allow for reasonable manufacturing tolerances. Similar considerations make it preferable to allow for a small gap between the shoulder *a* and the panel **140**, when the parts occupy the position of Figure 13.

It will be appreciated from the foregoing that the connections between the adapters **106** and the side panels **140** are such that the bars, after being installed as aforesaid, cannot be removed except by a reversal of the action described with respect to Figure 14. The noses **170** by lying behind the panels **140**, positively prevent any tendency of the wall spacing to change in transit, due to weaving or other causes, causing the adapter to pull out of the holes, and drop the bars. This is a difficulty frequently encountered with conventional cross bars.

Moreover, the aforesaid connections between the adapters **106** and the openings **142** establishes what will be recognized as an end-restraint connection between the bars **48** and the side wall structure. This end restraint connection, of course, materially increases the beam loading capacity of the organization, since beam loads, instead of being borne entirely by the bar structure, are distributed to the wall structures. This same advantage of end-restraint is, of course, achieved with the bar when used as shown in Figure 5, and is provided by the closely fitting pins **62** and apertures **60**.

The simplified embodiment of Figures 15–16 is like that of Figure 7 except that it does not include the adapter **106** and so is not convertible. Similar reference characters indicate corresponding parts and it is thought that no further description of Figures 15–16 is needed.

Figures 17 through 19 illustrate a modified bar construction, arranged for use with side rails such as **46**, and Figure 20 shows the same bar converted for use with a wall panel structure such as is shown in Figure 12.

Referring particularly to Figures 17, 18, and 19, the body **180** of the bar is of generally boxlike form. Near each end, the body **180** is provided with an insert in the form of a channel member **182**, the flanges of which are welded to the bar body as indicated at **184**. In this instance, the head comprises an elongated H-shaped forging **186**, the rear portion of which is of channel shape and is slidably received in and guided by the previously mentioned channel **182**.

The adapter **190** is pivotally connected, by a pin **192**, to a generally downwardly presenting channel-shaped member **194**, which is slidably received in the bar body, and the web of which lies in surface engagement with the web of the fixed channel **182**. Bolts **198** interconnect the forging **186** and the lower member **194**. Washers **200** are carried by these bolts, and are approximately the thickness of the web of the channel **182**. One of these washers and its corresponding bolt ride in a longitudinal slot **202** provided in the web of the channel **182**. The other washer, in the position shown in Figure 15, abuts the end of the web of the member **182**. With this relation, it will be appreciated that telescopic movement between the head structure **204** and the bar body **180** is permitted. As before, this sort of a telescopic connection may be and preferably is utilized at both ends of the bar. If it is to be utilized at only one end, the head structure may be locked in place relative to the channel **182**.

The outer end of the head **204** defines a wall **206**, having a flat under side **208**, and pins **210**, which cooperates with an associated side rail **46** in the previously described manner. Additionally, the head **204** may be provided with a latch **212**, biased to active position by a tension spring **214**.

In further accordance with the present invention, the adapter **190**, normally held in the retracted position by a holding spring **214**, may be swung to the position of Figure 18 for cooperation in the previously described manner with wall panel **140**. In this instance, also, when in the active position, loads are transmitted directly between the adapter **190** and the nose **206** of the head **204**, thus largely relieving the pivot **190** of such loads.

Although only several embodiments are disclosed in detail in this specification taken with the drawings, it is to be understood that various modifications and other forms of the invention may be employed within the scope of the appended claims.

What is claimed is:

1. A box car having side walls with side door openings therein and having vertical posts defining said door openings, freight holding equipment including vertically spaced, longitudinally extending supporting members secured to and extending along and inwardly from the car side walls and nearly up to said door openings, said members having engaging means spaced therealong, removable door opening bridging supporting members to extend between the ends of said first supporting members at said door openings and also having engaging means spaced therealong in line with the engaging means on said supporting members, clips forming upwardly opening recesses secured on the side faces of said door posts inwardly of the car at levels corresponding to said first supporting members, and means on said removable supporting members adjacent each end thereof to be received in the openings formed by said clips.

2. The structure defined by claim 1 in which said posts have holes in their door opening defining faces at levels corresponding to said first supporting members and said removable supporting members have movable bolts engaged in said holes.

3. As an article of manufacture, a freight holding cross bar adapted to be removably rested on and slid along to adjusted position on and there engaged with selected spaced vertical openings in a horizontally extending shelf-like portion of one of a plurality of vertically spaced and longitudinally extending structural members along opposite inner sides of a freight car, said bar having a head at each end, at least one of said heads being mounted for limited free, axial telescopic motion relative to said bar, each head having two downwardly projecting pins spaced apart longitudinally of the car to engage in selected ones of said openings, said bar, when telescoped so that said pins do not coincide with said openings being slidable along with its two pin ends resting on said shelf-like portion to prevent rotating of said bar about its axis as it is moved to adjusted position, and its pins aligned with selected openings by a telescopic motion.

4. A box car having side walls including inside, longitudinally spaced, vertical posts including end posts and door opening defining posts, members each formed by structural sections having a shelf-like portion with a smooth upper surface extending horizontally and transversely inwardly of the car and having longitudinally spaced holes therealong and spanning and rigidly secured to all of said posts along each side of the car from its ends to its door openings in vertically aligned relation to distribute freight imposed loads between said posts and forming a permanent and stiffening lattice-like structure

with said car wall posts, a plurality of removable and adjustable freight bracing cross bars extending between, resting on, and secured at each of their ends to said first mentioned members by two downwardly extending pins spaced longitudinally of the car to form cross-member-stiffening, non-pivotal end connections in which bending of the first mentioned members is resisted by their transverse portions, and each of said cross bars having a limited, free, axial telescopic connection intermediate its ends whereby said bars may be telescoped so that the lower ends of its two pins are spaced laterally from said holes to prevent dropping of said pins as said bar is slid along to selected position with its weight slidably carried on its pin ends and then telescopically adjusted to drop both of said pins in selected holes.

5. In a freight car or the like having a side wall including vertical frame members, at least one horizontally-extending support member having a horizontal flange along the length thereof extending transversely of the side wall, said flange having holes therein to receive projections on cross bars, said holes in their entirety being spaced inwardly of the side edges of said flange, said support member having a vertical flange engaging said vertical frame members, and means on the vertical frame members providing sockets to detachably receive and removably secure said support member to a plurality of said verticals for manual removal at will.

6. In a freight car or the like having opposite side walls including vertical frame members, a series of vertically spaced horizontally extending support members of substantial length on each side wall and each comprising an angle bar including a vertical flange and a horizontal flange, each of said vertical flanges being engaged with and secured in welded joints to a plurality of said vertical frame members so that said support members and said vertical members form a rigid lattice-like structural framework for the car, said support members on opposite walls being horizontally aligned and each having said horizontal flange along the length thereof extending transversely of its respective side wall, said horizontal flanges having holes therein contained totally between the side edges of the flange and spaced substantially uniformly from each other along the length of the member, a freely telescopic cross bar extending across the freight car and having at each end as a part thereof at least one vertically extending pin fitted in one of said holes in the support member in that side wall and also having a horizontal bearing surface resting on the horizontal flange of said member.

7. The invention set forth in claim 6 wherein each end of said cross bar has two of said vertical pins of substantially the same size and spaced from each other in a direction transverse to the length of the cross bar, said spacing between said pins being greater than and a multiple of the spacing between pairs of holes on the support members.

8. The invention set forth in claim 6 wherein said cross bar has attaching means at each end including said pin which provides a non-pivotal connection with said support members in said holes and provides fixed end restraint, for said cross bar.

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