May 25, 1954 S. M. NAMPA 2,679,214

FREIGHT LOADING

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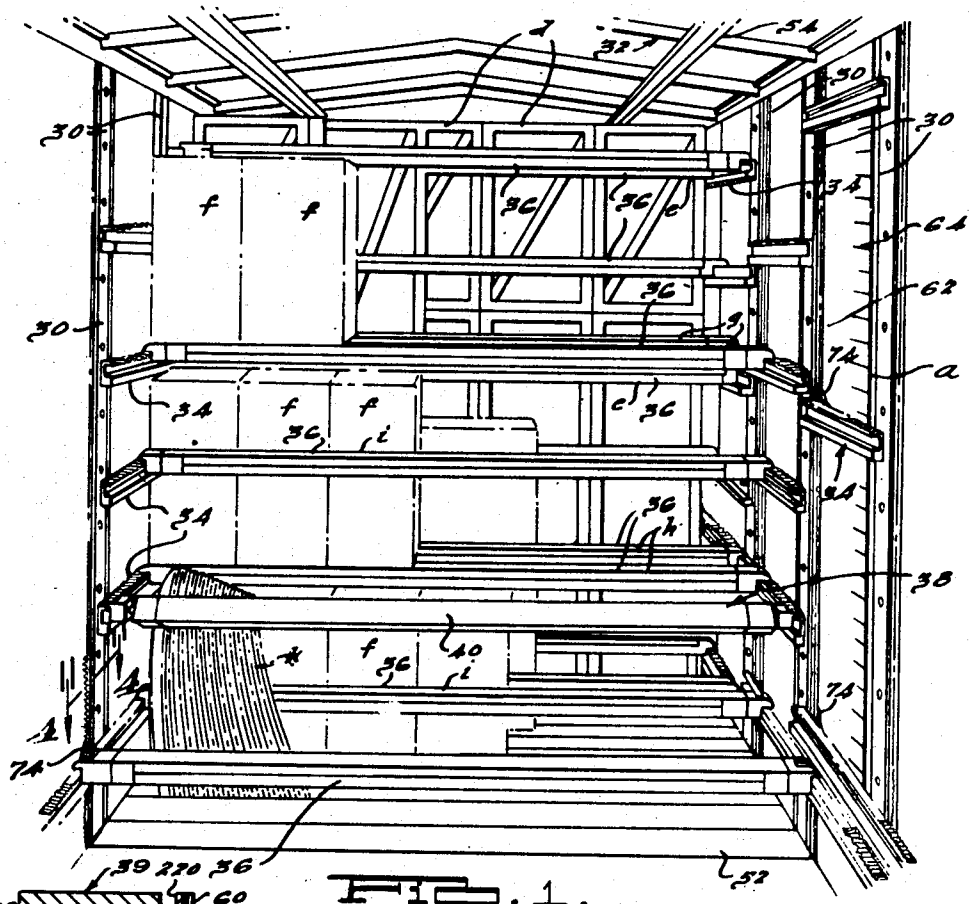


FIG. 1.

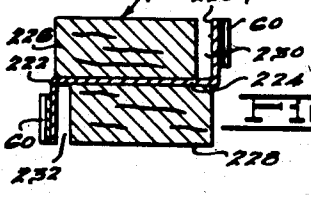


FIG. 2A.

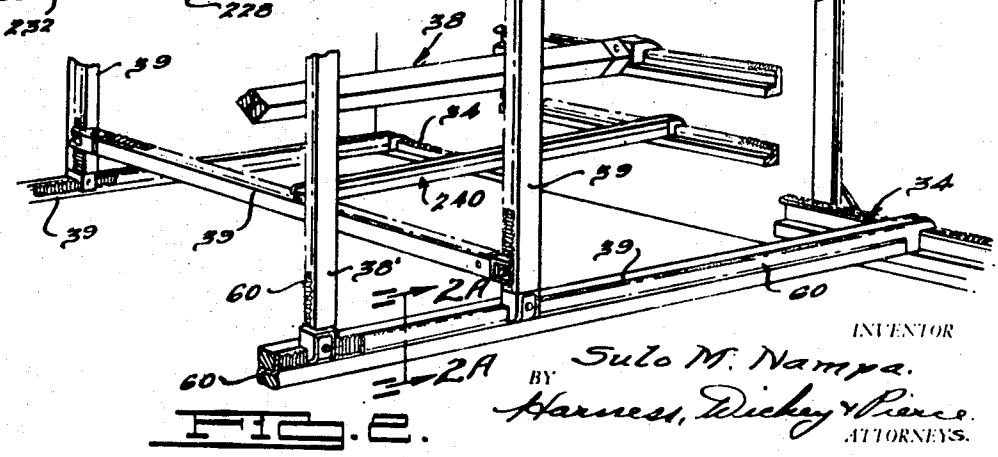


FIG. 2.

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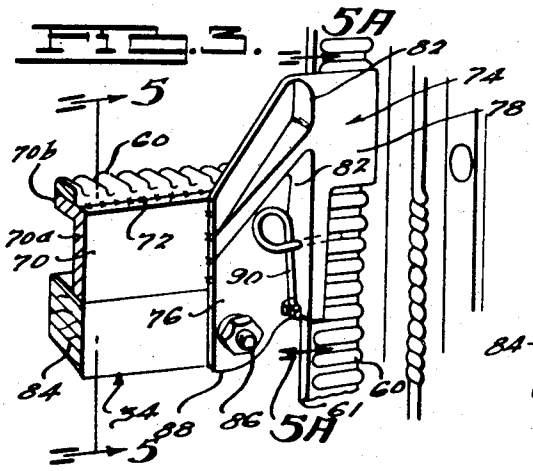


FIG. 3.

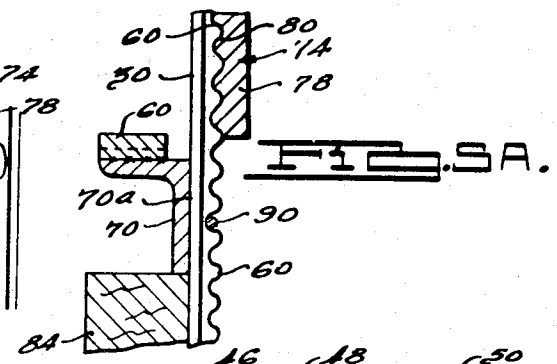


FIG. 5A.

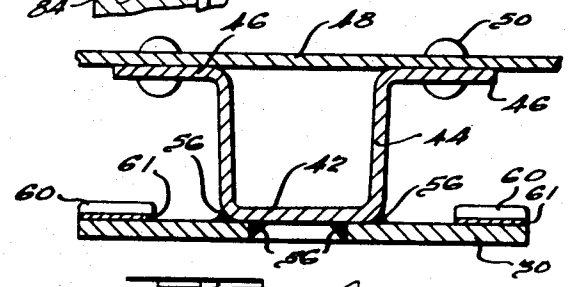


FIG. 4.

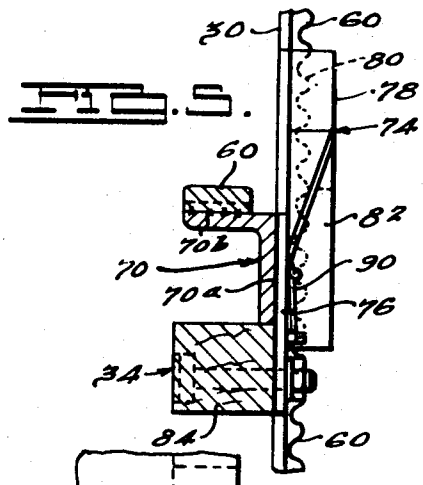


FIG. 5.

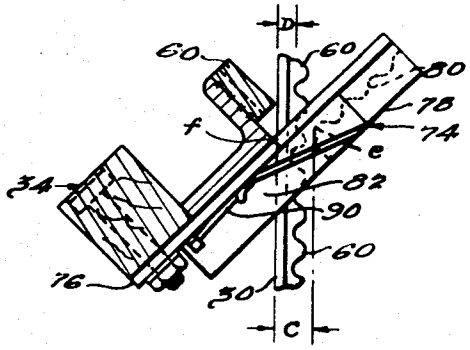


FIG. 6.

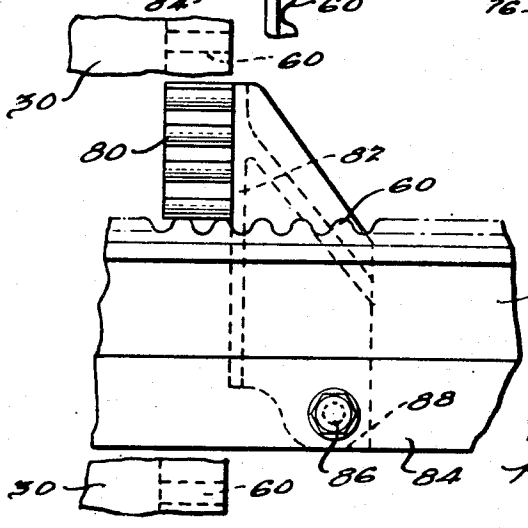


FIG. 7.

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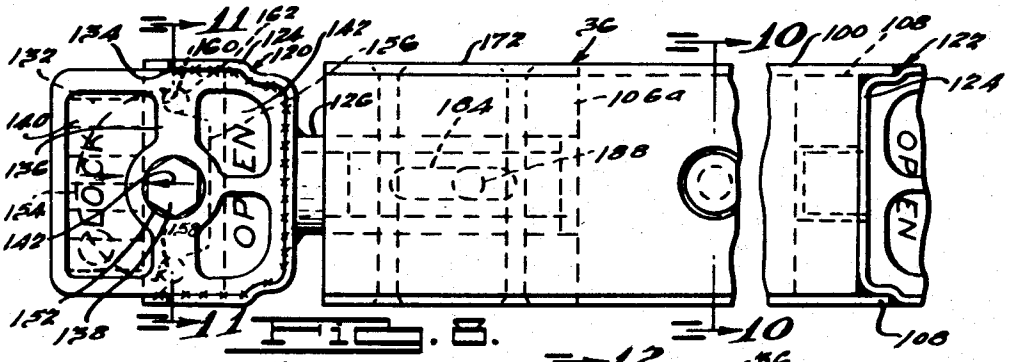


Fig. 8.

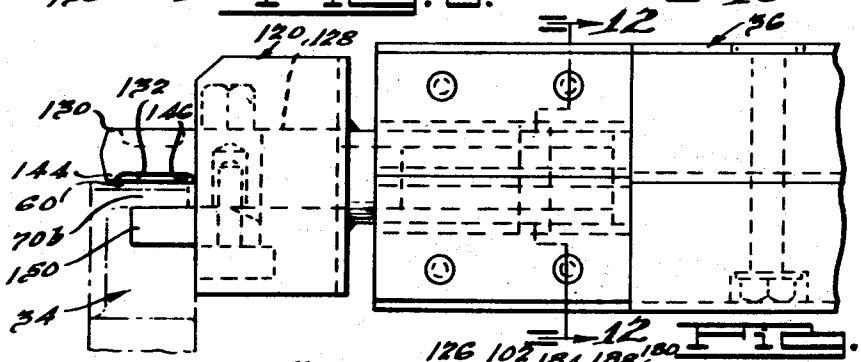


Fig. 9.

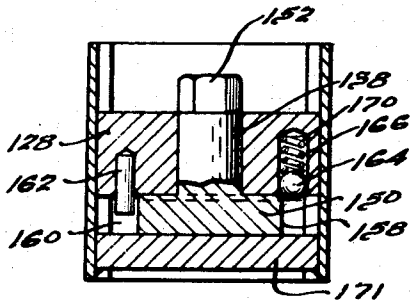


Fig. 11.

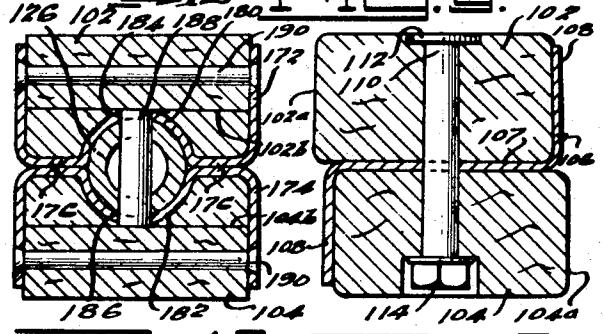


Fig. 12. Fig. 10.

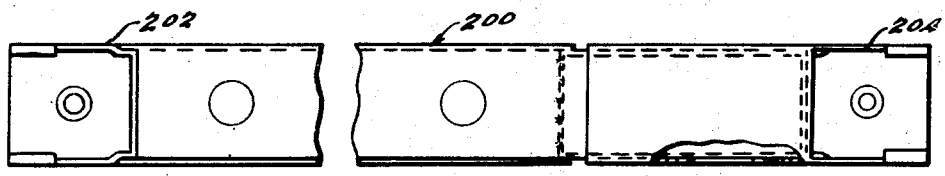


Fig. 13.

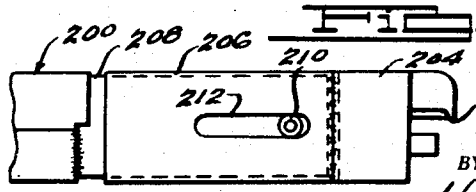


Fig. 14.

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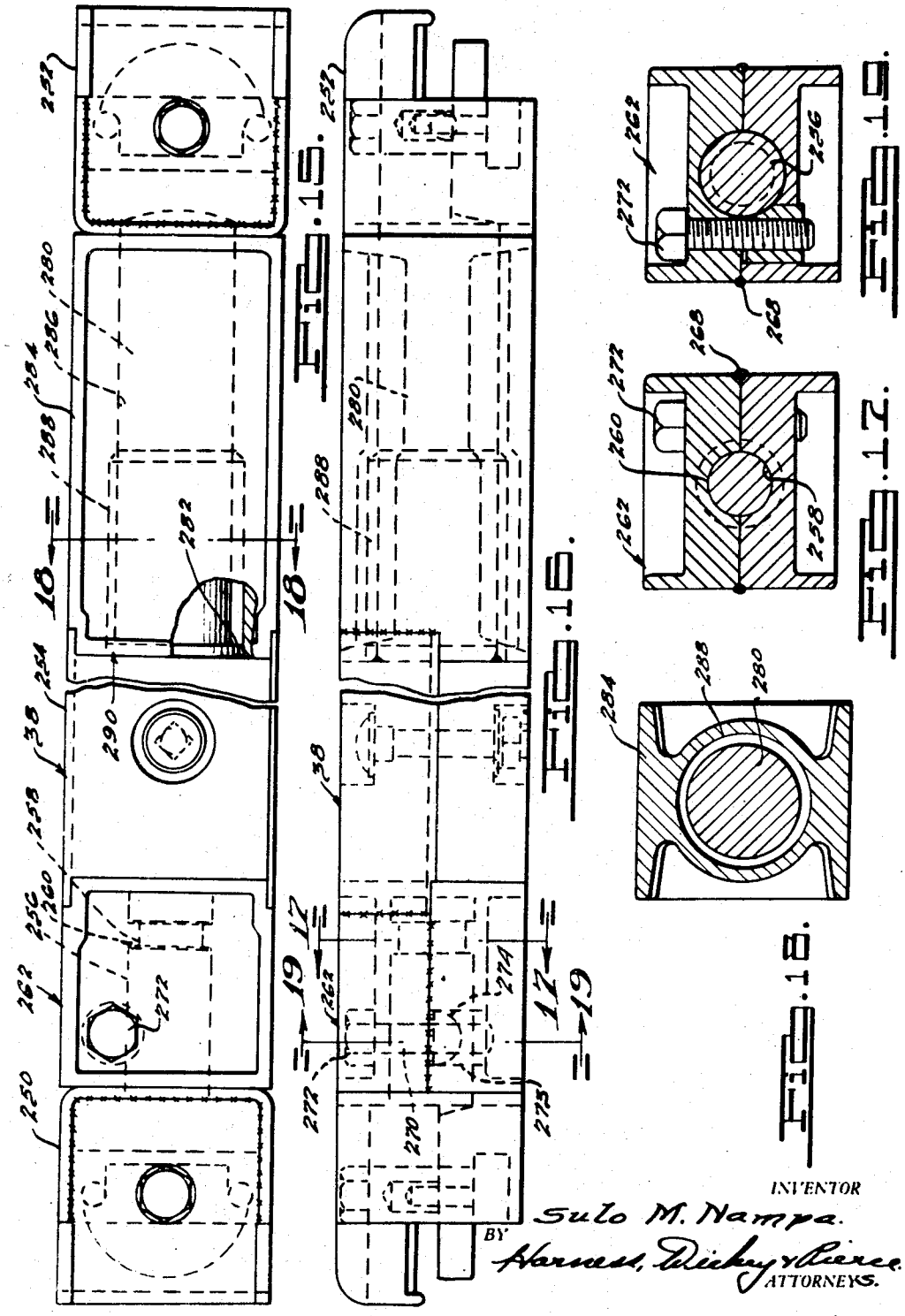


Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

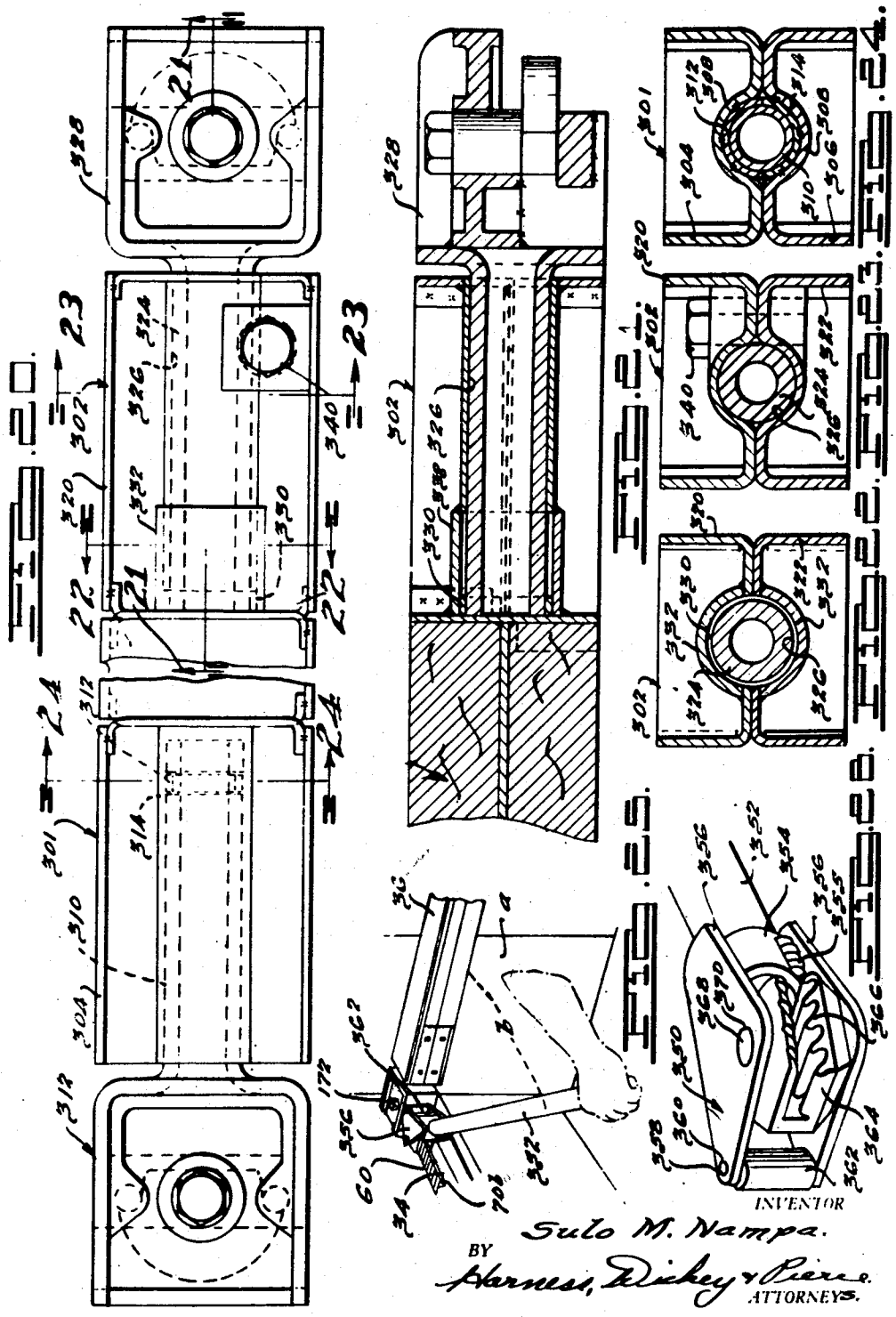
Fig. 19.

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2,679,214

UNITED STATES PATENT OFFICE

2,679,214

FREIGHT LOADING

Sulo Michael Nampa, Detroit, Mich., assignor to Evans Products Company, Plymouth, Mich., a corporation of Delaware

Application October 14, 1949, Serial No. 121,424

33 Claims. (Cl. 105—369)

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This application is a continuation-in-part of applicant's copending application, Serial No. 469,719, filed December 21, 1942 (now abandoned) as a continuation-in-part of application Serial No. 434,357, filed March 12, 1942, now abandoned but replaced by continuation application Serial No. 740,330, filed April 9, 1947, now Patent No. 2,519,846.

The present invention relates to improved loading apparatus for holding freight articles of different types in vehicles or storage spaces, and more particularly, to improved equipment of this nature having certain parts which are built into or combined with a vehicle, such as a railway freight car, or other storage space, and having certain other parts which are adjustably and variously cooperable with the built-in parts, the several parts of the equipment cooperating to hold (that is, for example, to brace, support or carry, space, wedge, or provide shelves, partitions, or bins for) a wide variety of freight articles.

Applicant's above-identified parent application discloses and claims certain features of a loading organization which, as specifically disclosed, comprises two series of upright supporting members arranged at the respectively opposite sides of, and permanently secured to, a freight car; wall members which are adjustably and removably supported by the uprights; and cross members which are disposed to be supported at their ends by wall members at the opposite sides of the car, so that the cross members extend across the car. The cross members may be used to form or to support bulkheads, to form or support decking arrangements, to support cooperating upright and horizontal members utilized to subdivide the storage space longitudinally, as well as for a variety of other purposes, all as set forth with greater particularity in the parent application.

The inventive features to be claimed in this application are in a generic sense applicable to a wide variety of different freight loading arrangements, but in a more restricted sense and as to at least certain of their aspects, they have particular utility when embodied in freight loading arrangements of the general type described above. In certain of their aspects, also, these inventive features provide improved combinations of freight loading elements, and in certain of their other aspects they provide improved freight loading elements per se.

With the above as well as other considerations in view, the principal objects of the present invention are to provide improved freight loading

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arrangements which are simple in construction, sturdy, low in cost and in weight, and reliable and efficient in operation; to provide improved loading elements for use in such arrangements; to provide such arrangements embodying as an element a holding member which is of adjustable length and/or which has at least a portion which is rotatably adjustable about the longitudinal axis of the member; to provide such arrangements wherein the holding member comprises end portions engageable with cooperating supporting means and has an intermediate or holding portion which is rotatable relative to the end portions; to provide such arrangements wherein one or both of the end portions is adjustable relative to the intermediate portion, so as to enable the length of the member to be adjusted; to provide such arrangements wherein the engaging portions of the members are provided with toothlike projections which mutually interlock to secure the members together and which readily permit adjustments and permit a very close spacing between different adjusted positions; and to provide improved forms of cross bars or members which are of high strength, have cushioning or buffer surfaces, are of adjustable length to take care of variations in car width, and are rotatable or tiltable to permit angular positioning of their flat faces to brace freight surfaces at such angles.

Other and more detailed objects of the invention appear in the following description and in the appended claims.

In the drawings, which show preferred but illustrative embodiments of the invention, and throughout the several views of which corresponding reference characters are used to designate corresponding parts:

Figure 1 is a general view in perspective of a freight holding ararngement embodying the invention and which is built into one end of an otherwise conventional freight car structure;

Fig. 2 is a fragmentary view in perspective of a different arrangement, further illustrating the adaptability of the invention;

Fig. 2A is a view in section, taken along the line 2A—2A of Fig. 2;

Fig. 3 is a fragmentary view in perspective illustrating the connection between a wall member and a cooperating vertical supporting member;

Fig. 4 is a view in horizontal section, taken along the line 4—4 of Fig. 1;

Fig. 5 is a view in side elevation of the structure

shown in Fig. 3 and taken along the line 5—5 thereof;

Fig. 5A is a sectional view, taken along the line 5A—5A of Fig. 3;

Fig. 6 is a view based upon Fig. 5, but showing the preferred method of applying or removing the wall members to or from the upright supporting members;

Fig. 7 is a view in elevation of a wall member;

Fig. 8 is a plan view of a cross member embodying the invention;

Fig. 9 is a view in side elevation of the structure of Fig. 8;

Figs. 10 and 11 are views in vertical transverse section taken, respectively, along the lines 10—10 and 11—11 of Fig. 8;

Fig. 12 is a view in vertical transverse section, taken along the line 12—12 of Fig. 9;

Figs. 13 and 14 are views, respectively, in plan and in side elevation of a modified construction of cross member;

Figs. 15 and 16 are views, respectively, in plan and in side elevation of a further modified construction of cross member which embodies the telescopic feature of the members shown in Figs. 8 through 14, and further embodies the hereinafter described rotatable feature;

Figs. 17, 18 and 19 are views in vertical transverse section taken, respectively, along the lines 17—17, 18—18 and 19—19 of Figs. 15 and 16, lines 17—17 and 19—19 appearing on Fig. 16 and line 18—18 appearing on Fig. 15;

Fig. 20 is a view in plan of a further modified construction of cross member;

Figs. 21 through 24 are views in section, taken, respectively, along the lines 21—21, 22—22, 23—23, and 24—24 of Fig. 20; and

Figs. 25 and 26 are perspective views illustrating the construction and manner of use of a wedging tool which is preferably used in connection with the invention.

As aforesaid, it will be appreciated from a complete understanding of the inventive features to be claimed in this application, that in a generic sense they may be embodied in or used with a wide variety of freight holding systems, and these features may partake of various different constructions. The disclosure of these features in particular forms, and as embodied in or used with particular types of loading apparatus, is consequently to be regarded in an illustrative and not in a limiting sense.

Referring first to Fig. 1, the illustrated arrangement comprises generally corresponding series of upright supporting members 30 arranged in aligned relationship at the opposite sides of a freight car 32; a series of wall members 34 which are disposed at opposite sides of the car and are adjustably supported by and between adjacent pairs of uprights 30; a series of cross members 36, the length whereof is adjustable, as described below; and a cross member 38, the length whereof is adjustable, but which also comprises a rotatable mid or freight-engaging section 40. It will be understood that, if desired, both ends of the freight car may be equipped as indicated for the one end in Fig. 1 and that, in fact, in usual practice both ends would be so equipped. A description of the equipment for one end of the car is thus thought to be sufficient.

As described in the parent application, the uprights 30 may themselves constitute the vertical members of the car structure. Preferably and as shown, however, particularly in Fig. 4, the uprights 30 are relatively wide plate-like members, which are secured to the inner faces 42 of the corresponding car uprights 44. As shown in Fig. 4, these uprights 44 are of usual outwardly presenting channel form, having outwardly turned flanges 46 to which the outer paneling 48 of the car is secured, as by means of rivets 50. It will be understood that the uprights 44 may be conventionally secured to the floor and roof structures 52 and 54 of the car. The uprights 30 are illustrated as being welded, as indicated at 56, to the associated car uprights 44, and it will be understood that the welded joints may extend continuously or interruptedly throughout the full length of the uprights 30. It is to be noted that it is preferred to use uprights 30 of relatively heavy metal, so that these uprights, in addition to affording a support for the cooperating freight loading elements, also serve to reinforce and strengthen the car structure as a whole.

As shown, the uprights 30 extend from the floor of the car entirely to the roof structure, although it will be understood that for certain classes of loading, in which the unit weight of the freight is too large to permit loading of the car entirely to the roof, the uprights 30 may be extended only part way from the floor to the ceiling.

For cooperation with the hereinafter described wall members 34, each upright 30 is provided on its outer face with two vertical rows of evenly spaced, toothlike projections 60, the crowns and roots whereof are preferably of rounded form and which projections 60, consequently, are of rack-like form. This construction affords, as described below, a very efficient, adjustable connection between the wall members and the uprights, which allows a very close spacing, for example, one-half inch, between adjusted positions. Teeth 60 may be variously applied to the uprights 30, and are illustrated as formed separately therefrom on convenient lengths 61, which are secured, as by welding, to the uprights.

It will be understood that preparatory to the installation of the uprights 30, it is preferred to remove the usual wood paneling or lining of the car, which lining normally affords a buffer surface for the freight. In order to provide such a buffer surface, it is preferred to maintain the inner surfaces of the uprights 30 free of projecting portions, and it is further preferred to secure panels, such as 62, to the car walls, in the spaces between the uprights 30, the inner faces of the panels 62 being substantially flush with, but projecting slightly inwardly of, the surfaces of the uprights 30. The panels 62 may be formed of wood or other like material and, desirably, may be provided with graduations or markings 64 so as to facilitate the location of the wall members, at opposite sides of the car, at the same elevation. In order to accommodate the cross members 34, a space designated *a* in Fig. 1 is left between the opposed edges of each upright 30 and the adjacent panel 62. Various means for securing the panels 62 to the car structure are described in the parent application and need not be described here.

Referring particularly to Figs. 1, 3, 5, 5A and 7, the wall members 34 are illustrated as comprising generally an angle member 70, the longer flange 70*a* whereof is arranged vertically and the shorter flange 70*b* is arranged horizontally. The shorter flange 70*b* is provided on its upper surface with a series of tooth-like projections 60, which are similar in form to the previously mentioned projections 60 and which may, in fact, be identical therewith. As shown in Fig. 3, the

projections 60 are formed separately from the angle member 70 and are secured thereto as by welding at the points 72. It will be appreciated that the use of a plurality of such teeth 80 is advantageous since the load may thus be divided between them. This allows the use of relatively small, closely spaced teeth, and consequently provides a very close spacing between successive adjusted positions of the members, such as 36 and 38, which are supported by the wall members 34. The length of each member 34 is substantially equal to the center-line distance between adjacent uprights 30. Thus, the members 34 in successive bays may be vertically aligned with each other and the teeth 60 thereon form a continuous series of teeth over which a cooperating cross member, as 36, may be moved, as described below. It will be noted from Fig. 7 that the teeth 60 are so proportioned that, allowing for a slight spacing between the ends of successive wall members 34, the end tooth on one member 34 is spaced from the end tooth on the adjacent bar by substantially the same distance as the spacing between adjacent teeth 60 on the individual members. This allows the just-mentioned continuous movement of a cross member 36, for example, from one wall member 34 to the next succeeding one.

Each end of each angle member 70 is provided with a forged or otherwise formed bracket 74, having a base portion 76, which abuts and is secured to the outer face (considered from the inside of the car) of the corresponding angle member 70. Each bracket 74 also has an upper and outwardly offset portion 78, the inner and vertical face whereof is provided with a series of tooth-like projections 80, which are complemental to the previously described tooth-like projections 60 on the upright.

The bracket 74 also comprises a wall or web 82 which extends between the base 76 and the toothed portion 78. When the wall member 34 is located between adjacent uprights 30, the walls or webs 82 at the respective ends of the member lie near enough to the opposed edges of the uprights 30 and limit the movement of the wall member 34 longitudinally of the car, but are sufficiently spaced therefrom to allow the endwise tilting discussed below.

Preferably and as illustrated, each cross member 34 is provided at its underside with a buffer bar 84, made of wood, for example, and which is secured to the angle member 70 by means of studs 86 passed through the buffer and through the base 76 of each bracket 74. As most clearly appears in Fig. 5, the buffers 84 extend inwardly of the car a distance slightly in excess of the distance represented by the flanges 70b. The buffers 84 present a relatively large surface to the freight and prevent the same from being injured by being pushed against the toothed flanges.

The wall members 34 are shown in Figs. 1, 3 and 5 in the applied or connected positions, in which the outer faces of the flanges 70a thereof bear against the inner faces of the corresponding uprights 30, and in which the tooth-like projections 80 are interlocked with a corresponding number of the teeth 60 on the outer faces of the uprights 30. The center of mass of each wall member 34 is positioned to the left, as viewed in Fig. 5, of the junction between the bearing areas 70a and the uprights 30. Consequently, even while in an unloaded condition, the weight of each wall member 34 urges it in a counterclockwise direction, about its longitudinal axis, as viewed in Fig. 5, and serves to hold the mating tooth-like projections 80 and 60 in properly interlocked relation to each other. If desired, a biasing spring, such as 90, may be provided at each end of each member 34, so as to positively urge the member in the just-mentioned interlocking direction. It will be understood, too, that when a vertically downward load is applied to each cross member 34, such load acts to augment the just-mentioned interlocking tendency and holds the tooth-like projections in solid interlocking relationship.

In order to adjust the members 34 vertically, it is only necessary to rock them, about their longitudinal axis, in a clockwise direction from the locked position shown in Fig. 5 to the adjusting position shown in Fig. 6. This movement spaces the associated upright 30 and the teeth 60 carried thereby between the points *f* and *e* (Fig. 6) on the member 34, and it is to be noted that the spacing between the latter two points is slightly in excess of the combined thickness of the member 30 and the teeth 60. Consequently, when the member 34 is so rocked, it may be freely moved vertically upwardly or downwardly to any desired position of adjustment along the uprights 30. If, during the course of such an adjusting movement, the member 30 is released, the natural tendency thereof to rotate counterclockwise, as viewed in Fig. 5, causes it to again assume a locked position, even though the operator fails to rock it back to the vertical position of Fig. 5.

In order to remove the wall members 34, it is only necessary to rock them, as described above, and to thereafter tilt them, so as to elevate one end to a position above the other end. This tilting movement brings the horizontal distance between the bracket portions 78 to a value less than the vertical spacing between the opposed edges of the adjacent uprights 30, and enables the wall member 34 to be freely withdrawn through the slots between the uprights and the buffer panels 62. It is noted that the width of these slots, indicated at *a* in Fig. 1, is sufficient to accommodate this movement. A reverse movement enables the members 34 to be applied to the uprights 30, as will be understood.

In practice, a relatively large number of the wall members 34 are preferably provided so that each bay (the area between adjacent uprights 30) at each side of the car may be provided with several wall members. Since the individual wall members 34 are independently adjustable, any desired distribution of the wall members along the sides of the car may be provided. In certain cases, the staggered relation shown in most instances in Fig. 1 is utilized. In other instances, as where it is desired to furnish a car with platforming or decking, it is desirable to have a plurality of wall members, positioned in successive bays, at the same elevation so as to provide, in effect, a single wall member greater in length than the width of any one bay.

One of the cross bars 36 is shown in detail in Figs. 8 through 12. The intermediate portion 100 of the main length of the bar is preferably formed of wood so as to present a satisfactory buffer surface to the freight articles engaged thereby and while such intermediate portion may, if desired, be formed of a single piece of wood, it is preferred to form it of two similar strips 102 and 104, which it will be noted are continuous and extend throughout substantially the entire length of the bar. Also it will be noted that the use of one-piece or continuous wooden members, of ap-

preciable cross-section, are simpler and give greater beam strength per unit weight than would be provided by several pieces connected end to end, or by metal pieces interrupted by telescopic and/or swivel fittings. These wooden strips 102 and 104 are stiffened and separated by a steel Z-bar 106, which, as will be understood, may be rolled or otherwise formed into shape. Member 106 has a web portion 107 and oppositely disposed side flanges 108, which extend toward, but not quite to, the edges of the strips 102 and 104. Thus, there are two complete faces of the bar 36 in which there is no exposed metal to injure freight. As to the other two faces, the metal flanges 108 are either flush with or are slightly behind the wooden surfaces 104a and 102a. Members 102, 104 and 106 are secured together by carriage bolts 110 having heads 112 and nuts 114 recessed or countersunk in suitable recesses in the wooden members. The respectively opposite ends of the bar 36 are provided with heads or jaws 120 and 122, which may be and preferably are identical to each other except in the hereinafter mentioned respects which enable the head 120 to move telescopically into or out of the body of the bar so as to enable the length of the bar to be adjusted.

The head or holding unit 120 comprises a generally U-shaped steel member 124. The base portion of member 124 has a tubular stub shaft 126 secured thereto as by welding. A relatively heavy member 128, which may be a steel casting but is preferably a forging, and which is provided on the underside of its outwardly projecting portion 130 with a series of tooth-like projections 132, is secured within the U-shaped member 124, as by welding along the line indicated at 134 in Fig. 8.

The member 128 is provided with a stiffening rib 136 which extends across its top surface and is provided with an enlarged central bore which receives the post 138. The recessed areas 140 and 142 at either side of the rib 136 may be provided with suitable indicia, such as the arrow and the words "Lock" and "Open," to indicate locking and unlocking positions for the arrow 142 on the top of the post 138. The underside of member 128 is substantially flat except for the previously mentioned outwardly projecting portion which carries the downwardly presenting tooth-like projections 132. Any suitable number of teeth 132 may be utilized, seven being illustrated in Fig. 8. It will be understood, of course, that these teeth are complemental in form to the teeth 60 on the upper surfaces of the wall members 34, so as to enable them to mesh therewith. The outer ends of the several teeth 132 are joined together by a rib-like member 144 which, consequently, closes the outer ends of the grooves between the several teeth 132. The rib 144 is thus effective to interlock with the ends of the several teeth 60 which mesh with the teeth 132 and prevent axial movement of the head 120 to the right relative to the member 34, as viewed in Figs. 8 and 9. The other ends of the grooves between successive teeth 132 are closed by the adjacent body portion of the member 128, as is indicated at 146, which body portion, consequently, serves to prevent or limit movement of the head 120 to the left relative to the member 34.

It will be appreciated that in view of the rounded character of the teeth 60 and 132, the cross members 36 may, after having been seated upon the cooperating oppositely disposed members 34, be pushed lengthwise of the members 34, during which movement the cross bar 36 moves vertically sufficiently to enable the crests of the teeth 132 to ride over the crests of the teeth 60.

In order to prevent vertical dislodgement of the bar 36, there is provided a rotary latch 150, which is either formed integrally with or is fixed to the lower end of the previously mentioned post 138, and the upper end whereof is formed as a hex nut 152, for engagement by a suitable wrench. The latch 150 may also be a forging. The periphery of the body of the latch 150 is shaped, as shown in Fig. 8, to have an arcuate portion 154 and a flat portion 156. The portions 154 and 156 are joined together by curved portions which define two recesses 158 and 160 for cooperation, respectively, with a stop pin 162 and a detent 164. The stop pin 162 is fitted into the member 128 and projects downwardly for cooperation with the just-mentioned surfaces. The detent 164 comprises a ball which is received in a pocket 166 in the member 128 and is urged to the position shown by a spring 170. The parts are shown in Figs. 8, 9 and 10 in the locked position, in which the rounded locking portion having the surface 154 is disposed below and in substantially abutting relation to the underside of the flange 70b on the cooperating wall member 34. In this position, the pin 162 engages the surface 160 and prevents further rotation of the latch member 150 in a clockwise direction, as viewed in Fig. 8. In this position, also, the detent 164 engages the surface 158 and yieldably resists rotation of the latch member 150 in a counterclockwise or unlocking direction. It will be understood, however, that by rotating the nut 152 in a counterclockwise direction, the latch 150 is correspondingly rotated, during which rotation the detent 164 rides along the upper surface. 180° of such rotation brings the latch 150 to the unlocked position in which the pin 162 cooperates with the surface 158 to prevent further such rotation, and in which the detent cooperates with the surface 160 to yieldably hold the latch 150 in the unlocked position. This unlocking movement brings the member 150 out from under the flange 70b on the wall member 34 and enables the corerspondning end of the bar 36 to be freely lifted away from the wall member.

After the latch 150 and the above described cooperating elements are assembled in place relative to the member 128, a supporting plate 171 is welded or otherwise secured to the legs of the U-shaped member 124.

In order to enable the cross bar 36 to be freely adjustable in length, so as to accommodate variations in the width of the car, the previously mentioned tubular post 126 is telescopically received within a fitting comprising two relatively short channel members 172 and 174, which are secured together, as by welding at the points 176, in back-to-back relation. The wood strips 102 and 104 are extended beyond the corresponding end 106a of the Z-bar 106. A leg of the channel member 172 thus abuts the end of one flange 108 of the Z-bar and the opposite legs of the other channel member 174 thus abuts the end of the other flange 108 of the Z-bar. These abutting joints may be completed by welding or otherwise, as will be understood, and, as shown, through-rods 190 may be passed through the strips 102 and 104 and through the flanges of the members 172 and 174 to secure these parts together.

The webs of the channel members 172 and 174 are provided with semicircular portions 180 and

182, which together define a cylindrical sleeve to receive the tubular post 126 and to accommodate this sleeve, the outer ends of the wooden strips 102 and 104 are cut away to afford a recess having the upper and lower surfaces 102b and 104b. In order to limit the degree to which the post 126 may move relative to the sleeve, and in this instance to also prevent rotation of the head 120 relative to the cross bar 36, the arcuate portions 180 and 182 are slotted, as indicated at 184 and 186, to receive the corresponding ends of a cross pin 188, which is fitted in the tubular post 126.

The opposite or right-hand head 122 of the cross bar 36 may and preferably does embody the same construction described with reference to the left-hand head 120, with the exception that the right-hand head 122 is not provided with the tubular post 126. Instead, the U-shaped member 124 of the head 122 is directly welded to the extended end portions of the flanges 108 of the Z-bar 106, so that the head 122 is rigidly connected to the body of the bar 36 and all adjustments in length of the bar 36 are afforded by the slidable (in this case, freely slidable) but nonrotative connection between the head 120 and the body of the bar.

The modified cross bar, shown in Figs. 13 and 14, and designated as a whole as 200, is in many instances identical with that described above in connection with the bar 36. The intermediate portion of the bar 200 is constructed as described above and the sectional view, Fig. 10, is thus applicable to Figs. 13 and 14. The head 202 at the left-hand end of the bar may and preferably does correspond exactly to the head 122 and is similarly secured to the body of the bar 200. The right-hand head 204 corresponds to the head 120 and may be and preferably is identical thereto with the exception that instead of being provided with a tubular post 126, the head 204 is provided with an axially extending rectangular sleeve 206, which slidably fits over the correspondingly shaped extreme right-hand end portion 208 of the bar 200. The portion 208 is provided at its respectively opposite sides with projecting buttons 210, which are slidably received in slots 212 cut into the respectively opposite side walls of the sleeve 206.

As appears from Fig. 2, the special cross bars 39 duplicate the above described cross bars 36 (although they may be constructed, fundamentally, as described in connection with the bar 200) except that the bars 39 (see Fig. 7) have teeth 60 along all or substantially all of the exposed flanges 200 and 222 of the associated Z-bar 224. The teeth 60 may be secured to these flanges in the previously described manner or in any other suitable way, as described with greater particularity in the parent application Serial No. 740,330, now Patent 2,519,846. The wooden buffer strips 226 and 228 may be and preferably are like those described above, with the exception that one edge of each thereof is cut away to define the slots 230 and 232, which slots are deep enough, as will be understood, to receive the rotary latches 150, associated with the above described cross bars, and which latches, consequently, cooperate with the surfaces of the flanges 220 and 222 opposite to the teeth 60, to hold the teeth 132 on the above described cross bars in interlocked relation to the teeth 60 on the special cross bars 39.

Fig. 2 also illustrates another special bar 240, which may duplicate any of the previously described cross bar constructions, with the exception that it is of materially shorter length and it may be used, for example, to extend between a longitudinal partition and the side wall of the car.

As will be appreciated from Fig. 2, the special cross bars 39 may be utilized, for example, in forming bins, central partitions and the like. More particularly, it will be noted that two of the bars 39 are extended between pairs of associated wall members 34 spaced longitudinally of the car. An additional pair of bars 39 is vertically secured to the just-mentioned horizontal, transversely extending bars 39, it being understood that the upper ends of the vertical bars 39 may be secured to corresponding transversely extending bars 39 in the manner indicated for the lower ends thereof. The vertical bars 39 thus define the ends of a partition and as many horizontally disposed, longitudinally extending bars may be secured thereto as is desired. One such last-mentioned bar 39 is shown in Fig. 2.

The special bar 38 shown generally in Figs. 1 and 2, and in detail in Figs. 15 through 19, may be constructed in accordance with the description of any of bars 36, 39, 200 and 240, except that it also includes a rotary or tilting feature which is achieved by building into the bar an axially extending pin received in the sleeve to provide an axial pivot. These two elements, the pin and the sleeve, are secured between the heads 250 and 252 of the bar and the intermediate portions of the bar, and include suitable stop means to prevent the bar from coming apart axially.

More particularly, as shown in Figs. 15 through 19, the intermediate portion 254 of the bar may be and preferably is constructed as described in connection with Figs. 8 through 12. The left-hand head 250 may be and preferably is constructed as described in connection with the head 120 (Fig. 8) with the exception that the rearwardly extending post 256, associated therewith, is provided with an annular groove or depression 258 which receives a rib 260 provided in the cooperating socket 262. The socket 262 is illustrated as comprising two similarly arranged forging portions 264 and 266, secured together in back-to-back relation. The opposed faces of the portions 264 and 266 are provided with semi-circular grooves (provided with corresponding portions of the rib 260), which cooperate to define a recess to receive the post 256. It will be understood that, in assembly, the head 250 is positioned adjacent one of the portions 264 and 266, with the post 256 properly seated in the groove therein, after which the other portion is fitted over the post, enabling the operation to be completed by securing the portions 264 and 266 together as by welding along the joints 268.

With the construction as thus far described, it will be appreciated that the head 250 is freely rotatable, about the axis of the post 256, relative to the bar 38. A further feature of the invention resides in the provision of means whereby the head 250 may be locked in selected positions of adjustment. In the more generic aaspects of the invention various locking means may be utilized and the terms "lock" and "locking" are herein used in a generic sense as referring to various means for securing, holding or otherwise retaining the parts in selected positions. As shown, the locking is accomplished by providing the upper socket portion 264 with an opening 270 suited to freely receive the shank of a stud 272, and by providing the lower socket portion 266 with an enlarged opening 272, which receives a

locking cam 274, which cam may be and preferably is arranged to be vertically slidable within the opening 272, but is not rotatable therein. The bore 272 opens into the cylindrical sleeve which receives the post 256, and it will be understood that by turning the stud 272, the cam 274 may be drawn upwardly into solid engagement with the surface of the post 256, whereby to clamp or lock the post 256 between the cam 274 and the sleeve-like surface on the upper socket portion 264. The post-engaging face of the cam 274 is complemental to the portion of the post engaged thereby.

The socket 262 may be and preferably is secured to the body of the bar 38 in the manner described for the connection between the socket members 172 and 174 and the body 100 of the bar 36 (Fig. 8).

The right-hand head 252 may be and preferably is constructed as described in connection with the head 250, with the exception that the post 280 associated therewith is of greater length and is provided at its extreme left-hand end with an annular rib or enlargement 282. The post 280 and the rib 282 are received in a socket 284, which may be and preferably is formed of a single forging. The socket 284 is provided with a bore 286, which snugly but slidably receives the body of the post 280 and is also provided with an enlarged counterbore 288, which snugly but slidably accommodates the annular rib 282. A limit to the inward movement of the head 252 relative to the body of the cross bar 38 is afforded, of course, by the abutting engagement between the back of the head 252 and the right-hand end of the socket 284. Similarly, a limit to the lengthening movement of the bar is afforded by the engagement between the annular rib 282 and the right-hand end of the counterbore 288. It will be understood that the head 252 and the socket 284 may be assembled together by first passing the post 280 axially through the socket and by thereafter securing the rib 282 to the post 280 by welding along the joint 290. After the members 252 and 284 are thus assembled together, the socket 284 may be secured to the body of the bar 38 in the manner described in connection with the socket 262.

The modified construction of rotatable cross bar 300, shown in Figs. 20 through 24, may and preferably does duplicate the construction of the bar 38 in many respects. In Figs. 20 through 24, however, the socket members 301 and 302 are formed of stampings instead of being formed of forgings. More particularly, the socket 301 is formed of a pair of channel-shaped stampings 304 and 306, suitably secured, as by welding, to each other in back-to-back relation. The webs of these stampings are provided with semi-circular grooved portions 308, which together define a cylindrical sleeve to slidably receive the post 310 associated with the head 312. As in the previous instance, the post 310 is provided with an annular recess 312, which receives ribs 314 provided in the grooves 308. If desired, the ribs 314 may be pressed from the bodies of the stampings 304 and 306, although, as shown, separate ribs 314 are welded in place within the semi-circular grooves. The head 312 is thus freely rotatable relative to the socket 300, but is not adjustable axially thereof.

The socket 302 is also formed of a pair of opposed channel members 320 and 322, which are provided with grooved portions 324, which define a sleeve which slidably receives the body 326 of the post associated with the head 328. The extreme end of the post 328 is, as before, provided with an annular rib or enlargement 330, which is slidably and rotatably received in the enlarged cylindrical sleeve-like portion defined by the deeper grooved portions 332.

In this instance, the locking member 340 is shown as being applied between the body of the cross bar and that one of the heads which is both rotatably and axially adjustable. The locking means may be similar to that described above and, consequently, has not been shown in detail.

It will be noticed that with the construction of Fig. 15, the locking of the unit in a selected or rocked position does not interfere with the free adjustability of the length of the bar. This relationship is advantageous in many instances, since it enables the bar to be fitted to various different car widths, and further enables the bar to automatically change in length to accommodate slight variations in car width which occur in transit. On the other hand, it is in certain instances advantageous to utilize the cross bars to give crosswise reinforcement to the car so as to prevent changes in car width which would normally tend to occur in transit or during shunting operations. In such cases, the construction of Figs. 20 through 24 is particularly advantageous, since when the bar has once been located at a desired point along the car and has also been rocked to the desired degree, the locking action fixes not only the rocked position, but also the length of the bar, and enables it to reinforce the car, as aforesaid. It will be appreciated that this locking feature may also be utilized to advantage in constructions which, while having the feature of adjustability as to length, do not necessarily embody the rockable feature.

It will be appreciated that the above described rotatable features may also be embodied in the special types of bars shown in Fig. 2, in which figure the bar 38' is provided along its length with the teeth 60 in the manner described in connection with the bars 39.

Before proceeding to a summary of the operating characteristics of the herein disclosed embodiment of the invention, attention is directed to the wedging tool shown in Figs. 24 and 25, and which may be conveniently used to advance the cross bars along their associated supporting members, such as the wall members 34, so as to enable the wedging of the freight articles in place.

Referring particularly to Figs. 25 and 26, the wedging or leverage tool shown in use in Fig. 25, and in more detail in Fig. 26, is designated as a whole by the numeral 350 and comprises a suitable handle 352 suitably secured into a short sleeve 354 which is secured, as by welding at 355, to the side or main frame plates 356. These relatively heavy stiff plates are rigidly spaced apart by these welds and by pin 358 which is secured into holes 360 in each plate and also serves as a pivot for the freely rotatable sliding roller sleeve 362. The forged steel jaw member 364 is generally U-shaped with opposing faces and with two opposed sets of identical curved teeth 366, which are just like and mesh with teeth 60. As will be seen, this one tool with its two opposed sets of teeth can be used on the right or left-hand sides of the car. The space between the two sets of teeth 366 corresponds to the thickness of upper or shorter leg of the angle 70 plus the thickness of rack 60, or the equivalent member. The member 366 is freely pivotally mounted in, and also secured between, plates 356 by pins 368 in holes 370.

The manner of using the wedging tool 350 is shown in Fig. 25. In this view, a cross bar 36 is supported at its left-hand end upon a previously described wall member 34, and it will be understood that the opposite end thereof may be similarly supported. One face of the cross bar 36 lies against the face of a freight article, and it will be understood that before resorting to the wedging tool 350 the bar 36 may have been manually moved to a position in which it freely abuts the freight article. With the parts thus preliminarily positioned, the wedging tool 350 may be applied to the wall member 34 by fitting the jaw 364 thereof over the toothed portions of the wall member 34. This brings one series of teeth 166 into meshing engagement with the teeth 60 and brings the other series of teeth into abutting relation, or immediately adjacent, the underside of the flange 70b on which the teeth 60 are supported. Preparatory to this operation, the jaw 364 is rotated relative to the handle 352 so that, when the jaw is applied, as aforesaid, the handle 352 is spaced at a relatively wide angle *b* from the cross bar 36, and the roller 362 is in abutting engagement with the bar 36. Thereafter the handle 352 may be forced in a counterclockwise direction, as viewed in Fig. 25, which action causes the roller 362 to roll along the face of the bar 36 from its initial point of engagement to a point nearer the end thereof. During and by virtue of this movement, the bar 36 is forced toward the freight article *a*, causing a take-up of any space between it and adjacent articles, or between it and the end of the car or an associated bulkhead. If one such advancing movement of the handle is not sufficient to take up all of the space, it will be appreciated that the tool may be removed and re-applied to the wall member 34 at a point further therealong. In most cases the user will fined it convenient to retain the tool in its wedging position until after the locking member 150, associated with the bar 36, has been turned into the locking position by rotating the nut 172.

It will be appreciated that the particular materials of construction, dimensions, weights and other factors pertinent to the design of the individual elements of the above-described arrangement are determined by and may be varied in accordance with the particular requirements of the installation in which they are to be used. Illustrative such proportionings are described in the parent application.

By way of a general description of the mode of operation of the arrangement, it will be recognized that in Fig. 1 a series of crated articles *d* are stacked one upon the other in the space adjacent one end of the car and these articles are held in place by a series of vertically spaced bars 36, bearing the additional reference character *e*, and the ends whereof are supported upon corresponding wall members 34. These bars 36 thus afford the equivalent of a bulkhead to secure the articles *d* in place. Next to the bulkhead thus provided, a row of freight articles *f* is arranged, which may be of the type not suited to be stacked directly one upon the other. In this case, the top articles *f* are supported upon a deck defined by a pair of cross bars 36, which bear the additional reference character *g*. The intermediate articles *f* are similarly supported by a deck defined by the cross members 36, having the additional reference character *h*, and the bottom row of such articles rests on the floor, as will be understood. As shown, bulkhead support for the bottom and the intermediate articles *f* is afforded by the cross bars 36 bearing the additional reference character *i*, and similar bulkheading may be provided for the upper tier of articles *f*.

In front of the freight articles *f*, a stack of articles *k* is shown which are irregular in shape and may be, for example, metal stampings or the like. It is assumed in the figure that the surfaces of this stack *k*, which is adjacent the bulkhead defined by the cross bar bearing the main reference character 36 and the supplemental reference character *i*, may suitably be wedged against such cross bar. The same is true of the lower front edge of the stack *k*, which is wedgingly engaged by the cross bar having the main reference character 36 and the supplemental reference character *m*. As shown, however, the upper front surface of the stack *k* is tilted and this tilted surface is engaged by the rotatable bar 38, which, as described above, may be rocked to any desired position so as to accommodate the flat face thereof to the freight surface engaged thereby.

In using the arrangement, as will be understood, a series of the wall members 34 may be applied in the previously described manner and at appropriate vertical intervals to accommodate the cross bars 36 which form the bulkhead for the stacked freight articles *d*. These cross bars 36 may be readily and manually lifted to a point at which their respective ends rest upon the associated wall members, with the latches 150 thereof in the retracted position. Thereafter, the bars may be manually pushed lengthwise of the wall members, so as to cause them to abut the faces of the freight articles *d*. With certain classes of freight articles, sufficient tightness may be attained manually in view of the relative fineness of the adjustment afforded by the closely spaced, relatively small coacting teeth 60 and 132. In other cases, it may be desirable to use the wedging tool 350 in the previously desired manner, after which the latches 150 may be turned into the locked position. Similar comments apply to the application and adjustment of the remaining wall members 34 and cross members 36 in Fig. 1. Similar comments also apply to the application of the rotatable bar 38 in Fig. 1, with the qualification that after this bar has been moved into place and the central body portion 40 thereof rocked to the desired position, it is preferred to lock such body portion in the rocked position.

It will be appreciated that similar comments apply to the erection of partition bins or the like in the manner indicated in Fig. 2.

It will be noticed, also, that the freely adjustable lengths of the several cross bars enable these bars to accommodate themselves to variations in the width of the car or to variations in the spacing between other members which are spanned by these bars. Variations of this sort are encountered for various reasons. For example, due to errors in original construction or to deformations encountered in service, the widths of cars are found to vary at different points along the length of the car. Operating stresses also cause periodic variations in the car dimensions. All such variations are readily compensated for, and/or reinforced against, by the present adjustable features.

It will be noticed that all of the herein illustrated members are capable of, and in most cases are subjected to what may be termed "beam

loading" as distinguished from axial or column loading. The construction of the individual members is advantageous in resisting beam loading, since the reinforcing members therefor, being flanged, strengthen them against both vertically and horizontally applied forces. In this connection, also, it will be appreciated that the relatively long telescopic connections are of material advantage, since these connections afford relatively long bearing surfaces along which the beam forces are distributed.

Although only several specific embodiments of the invention have been described in detail, it will be appreciated that various further modifications in the form, number and arrangement of the parts may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. As an article of manufacture, a freight-holding bar having locking means at each end thereof to rigidly fix the ends in selected adjusted positions along side supports of a freight car, or the like, the major intermediate portion of said bar having substantially flat freight-engaging faces, and said intermediate portion being axially rotatable between the end portions.

2. As an article of manufacture, a freight-holding bar having a body adapted to engage freight and holding portions secured to the body and spaced from each other lengthwise of the body for cooperation with associated bar supporting means, said body being non-circular and rockable about its axis relative to said holding portions, said bar being constructed to sustain beam loading.

3. As an article of manufacture, a freight-holding bar constructed to sustain beam loading and having a body adapted to engage freight and holding portions secured to the body and spaced from each other lengthwise of the body for cooperation with associated bar supporting means, said body being non-circular and rockable about its axis relative to said holding portions, and said holding portions including means enabling them to interlockingly engage said supporting means.

4. The structure of claim 2 wherein the said body portion is normally freely rockable and wherein means are provided to releasably hold the said body in selected rocked positions, said means being mounted on one of said portions and engaging the other of said portions.

5. The structure of claim 2 wherein the body is connected to the holding portions by telescopically related elements which permit such rocking.

6. As an article of manufacture, a freight-holding bar constructed to sustain beam loading and having a body portion adapted to engage freight and holding portions connected to the body portions at the ends thereof for cooperation with spaced bar supporting means with which the bar is associated, at least certain of said connections including adjustable elements enabling the corresponding holding portion to move relative to the body portion so as to increase or decrease the spacing between the holding portions, and said connections enabling the body of the bar to rock about its axis relative to the holding portions.

7. The structure of claim 6 wherein at least one of the connections is provided with holding means for releasably securing the body in selected rocked positions.

8. The structure of claim 2 wherein the holding portions are provided with a plurality of tooth-like projections formed to have a non-rockable rack-like supporting engagement with corresponding projections on the supporting means.

9. The structure of claim 2 wherein the holding portions are provided with a plurality of tooth-like projections formed to have a rack-like engagement with corresponding projections on the supporting means, and wherein releasable latch means are provided to latch the holding portions in selected positions of engagement with the supporting means.

10. In combination, a pair of spaced supporting members having holding elements distributed along their lengths, a freight-holding cross bar constructed to sustain beam loading and having a body adapted to engage freight and holding portions connected to the body and spaced lengthwise thereof, said holding portions being interlockingly engageable with said holding elements, said bar including means enabling the body to be rockable about its axis relative to the holding portions.

11. In combination, a pair of spaced supporting members having holding elements distributed along their lengths, a freight-holding cross bar constructed to sustain beam loading and having a body adapted to engage freight and holding portions connected to the body and spaced lengthwise thereof, said holding portions being interlockingly engageable with said holding elements, said bar including means enabling the body to be rockable about its axis relative to the holding portions, and enabling the spacing between the holding portions to be increased and/or decreased.

12. The combination, for use in a freight car or the like, of a pair of spaced supporting members having holding elements distributed along their lengths, a freight bracing cross bar constructed to sustain beam loading whereby to firmly hold or support freight against lateral or vertical displacements, said bar having a body, holding portions and means connecting the holding portions to the body so that they are spaced lengthwise thereof, said holding portions being interlockingly engageable with said holding elements, said connecting means including relatively rotatable parts enabling the body to be rocked about its axis relative to the holding portions.

13. The combination, for use in a freight car or the like, of a pair of spaced supporting members having holding elements distributed along their lengths, a freight bracing cross bar constructed to sustain beam loading whereby to firmly hold or support freight against lateral or vertical displacements, said bar having a body, holding portions and means connecting the holding portions to the body so that they are spaced lengthwise thereof, said holding portions being interlockingly engageable with said holding elements, said connecting means including relatively rotatable parts enabling the body to be rocked about its axis relative to the holding portions, and at least certain of said parts being relatively movable axially of the body so as to enable the spacing between the holding portions to be increased and/or decreased.

14. The combination, for use in a freight car or the like, of a pair of spaced supporting members having holding elements distributed along their lengths, a freight bracing cross bar constructed to sustain beam loading whereby to firmly hold or support freight against lateral or vertical displacements, said bar having a body, holding portions, means connecting the holding portions to

the body so that they are spaced lengthwise thereof, said holding portions being interlockingly engageable with said holding elements, at least certain of said connecting means including telescopically related elements freely slidable relative to each other lengthwise of the bar, said relative sliding enabling movement of the corresponding holding portion relative to the body lengthwise thereof, said holding elements being a rack-like series of tooth-like projections and said holding portions each being provided with a plurality of complemental projections which mesh with the first mentioned projections, and are readily meshed by reason of said freely slidable relation.

15. The combination, for use in a freight car or the like, of a pair of spaced supporting members having holding elements distributed along their lengths, a freight bracing cross bar constructed to sustain beam loading whereby to firmly hold or support freight against lateral or vertical displacements, said bar having a body, holding portions, means connecting the holding portions to the body so that they are spaced lengthwise thereof, said holding portions being interlockingly engageable with said holding elements, at least certain of said connecting means including telescopically related elements freely slidable relative to each other lengthwise of the bar, said relative sliding enabling movement of the corresponding holding portion relative to the body lengthwise thereof, said holding elements being a rack-like series of tooth-like projections, said holding portions each being provided with a plurality of complemental projections which mesh with the first mentioned projections, and latch means carried by the bar for releasably securing the bar in selected positions of adjustment along the supporting members.

16. The article set forth in claim 1 in which said bar also includes an intermediate axially telescopic portion to permit limited extension or shortening thereof.

17. As an article of manufacture, an elongated freight holding bar constructed to sustain beam loading and having holding portions spaced apart lengthwise of the bar for cooperation with associated bar supporting means, said holding portions adapting the bar for readily detachable connection to said supporting means, said bar further having a freight engaging face which is angularly adjustable about its longitudinal axis relative to said holding portions whereby said face can be differently inclined to the freight.

18. As an article of manufacture, an elongated freight holding bar constructed to sustain beam loading and having spaced apart and longitudinally adjustable holding portions for cooperation with associated bar supporting means, said holding portions adapting the bar for readily detachable connection to said supporting means, said bar further having a freight engaging face which is angularly adjustable about its longitudinal axis relative to said holding portions whereby said face can be differently inclined to the freight.

19. The structure of claim 18 wherein means are provided to lock the said face in selected angular positions relative to said one holding portion while permitting said longitudinal adjustment.

20. As an article of manufacture, a freight holding bar having, in combination, holding portions which are spaced apart lengthwise of the bar for cooperation with associated supporting means, means extending along the length of the bar providing a row of spaced securing means for cooperation with associated loading elements, said means being angularly adjustable about the longitudinal axis of the bar relative to said holding portions.

21. The structure of claim 17 wherein the bar also includes means providing a row of spaced securing means for cooperation with associated loading elements.

22. The structure of claim 2 wherein the holding portions are provided with a plurality of toothlike projections formed to have a rack-like engagement with corresponding projections on the supporting means, said projections extending in a direction which enables them to control movement in a direction normal to the length of the bar, and wherein the holding portions are provided with additional means for interlocking with the supporting means to control movement of the holding portions relative to the supporting means in a direction lengthwise of the bar.

23. As an article of manufacture, a freight-holding bar adapted to engage freight and also adapted to rest on and be adjusted along and to be secured between two spaced rack members each having a toothed upper surface, an under surface, and a side surface, said bar being constructed to sustain beam loading and comprising an elongated member, a metal member fixed to each end thereof having a projecting portion with a plurality of teeth to mesh with the teeth of said rack members, a portion to engage over the side surface of said rack members to prevent longitudinal disengagement of said teeth, and a manually adjustable, movable portion to engage the under surface of the corresponding said rack member to secure the corresponding teeth in meshed relation to said corresponding rack member.

24. As an article of manufacture, a freight-holding cross bar having interengaging securing means adjacent each end thereof for holding it in a desired adjusted position between and with its securing means interengaged with certain of a series of interfitting holding means spaced along the opposite side walls of a freight car or the like, the upper or lower surfaces and the side surfaces of said bar being all adapted to engage freight so that the bar is usable to form a holddown or platform or to form a bulkhead without tilting, turning or different mounting thereof, and said bar having a series of spaced holding means along its length between its end securing means to interengage with and to secure in desired adjusting positions therealong the corresponding interengaging securing means adjacent the ends of other bars to thus form in a freight car or the like, side by side bins, central, vertical partitions, horizontal partitions, platforms or holddowns secured between spaced cross bars across the car, or other arrangements, said last-mentioned holding means being recessed inwardly from adjacent surfaces of the bar so as to not interfere with the freight-engageability of said bar surfaces.

25. As an article of manufacture, an elongated freight-holding cross bar adapted to engage freight and to extend horizontally and to be secured in selected positions between spaced engaging means carried by the side walls of the freight car, said bar having a head adjacent each end thereof, at least one of said heads being mounted for free telescopic motion relative to and along the length of said bar, each of said

heads comprising portions to interengage with selected said engaging means to prevent any substantial displacements of said heads relative to said side walls in directions transverse to the length of the bar and also comprising portions to interengage with said selected engaging means to prevent any substantial displacements of said heads relative to said side walls along the length of said bar, while free relative motion between said heads is permitted to accommodate weaving between said side walls in transit, each said head further comprising a latch to permit or prevent disengagement of said head from said engaging means.

26. The organization of claim 25 in which said portions to prevent transverse displacement of said heads relative to said side walls comprise laterally spaced portions to prevent tilting of said heads relative to said side walls.

27. The organization of claim 25 in which said latch comprises one of the portions to prevent transverse displacements of said head relative to said side walls.

28. The organization of claim 25 in which said bar comprises a straight, elongated intermediate body portion and in which each of said heads is mounted for free telescopic motion relative to and along the length of said intermediate body portion.

29. The organization of claim 25 in which said portions to prevent displacements of said heads relative to the side walls in directions along the length of the bar comprise spaced-apart upright surfaces to receive said engaging means therebetween.

30. The organization of claim 25 in which said bar comprises an intermediate body portion having opposite flat vertical freight-engaging sides.

31. As an article of manufacture, a freight-bracing bar adapted to be secured in adjusted positions along and between horizontally extending rows of rack means carried by opposite side walls of a freight car to tightly engage and thus secure freight articles against motion in the car, said bar comprising, in combination, a freight-engaging intermediate body portion and holding portions at each end thereof each having projecting means arranged to securingly engage selected rack means by a moton of said freight-engaging body portion only in a vertical plane, and at least one of said holding portions being connected to said body portion by parts which are freely extensible and contractible axially of the bar to initially fit different widths or variations in freight car widths and permit weaving of the freight car walls in transit, whereby said bar can have its length suitably adjusted and its holding portions securingly engaged while its body portion is tightly pressed against an upright freight article.

32. The organization of claim 31 including nonremovably mounted latch means supported by said holding portions to selectively prevent said vertical motion of the body portion and the relative disengagement of said holding portions from said rack means.

33. As an article of manufacture, a freight-holding bar constructed to sustain beam loading and having a body adapted to engage freight and holding portions for cooperation with associated bar supporting means, said body being non-circular and rockable about its axis relative to said holding portions, and said bar including adjustable elements enabling the spacing between said holding portions to be increased or decreased.

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