

Dec. 29, 1964

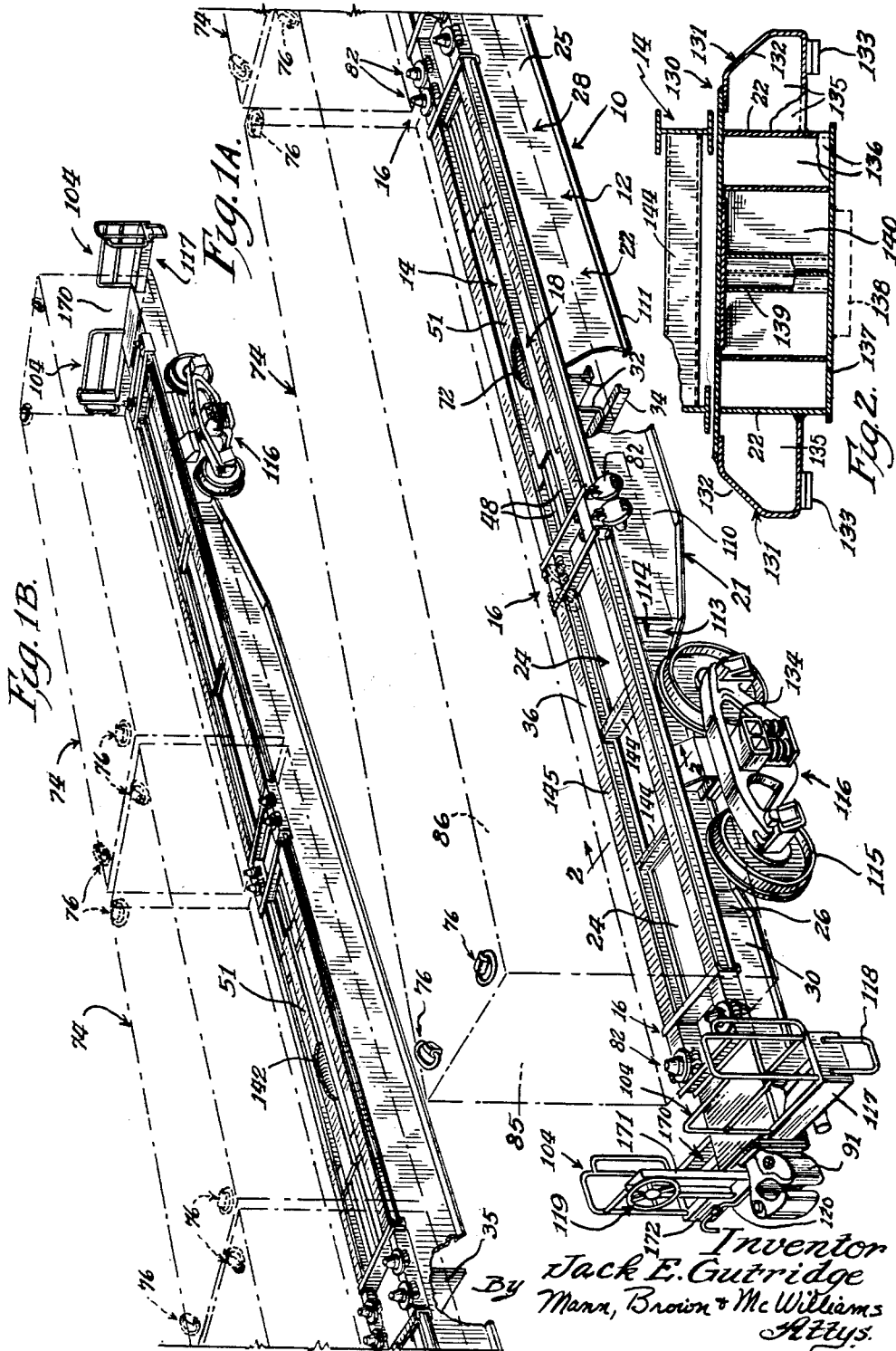
J. E. GUTRIDGE

3,163,129

SKELETON CAR WITH LONG TRAVEL CUSHIONING CHARACTERISTICS
FOR TRANSPORTING FREIGHT CONTAINERS

Original Filed April 11, 1960

12 Sheets-Sheet 1



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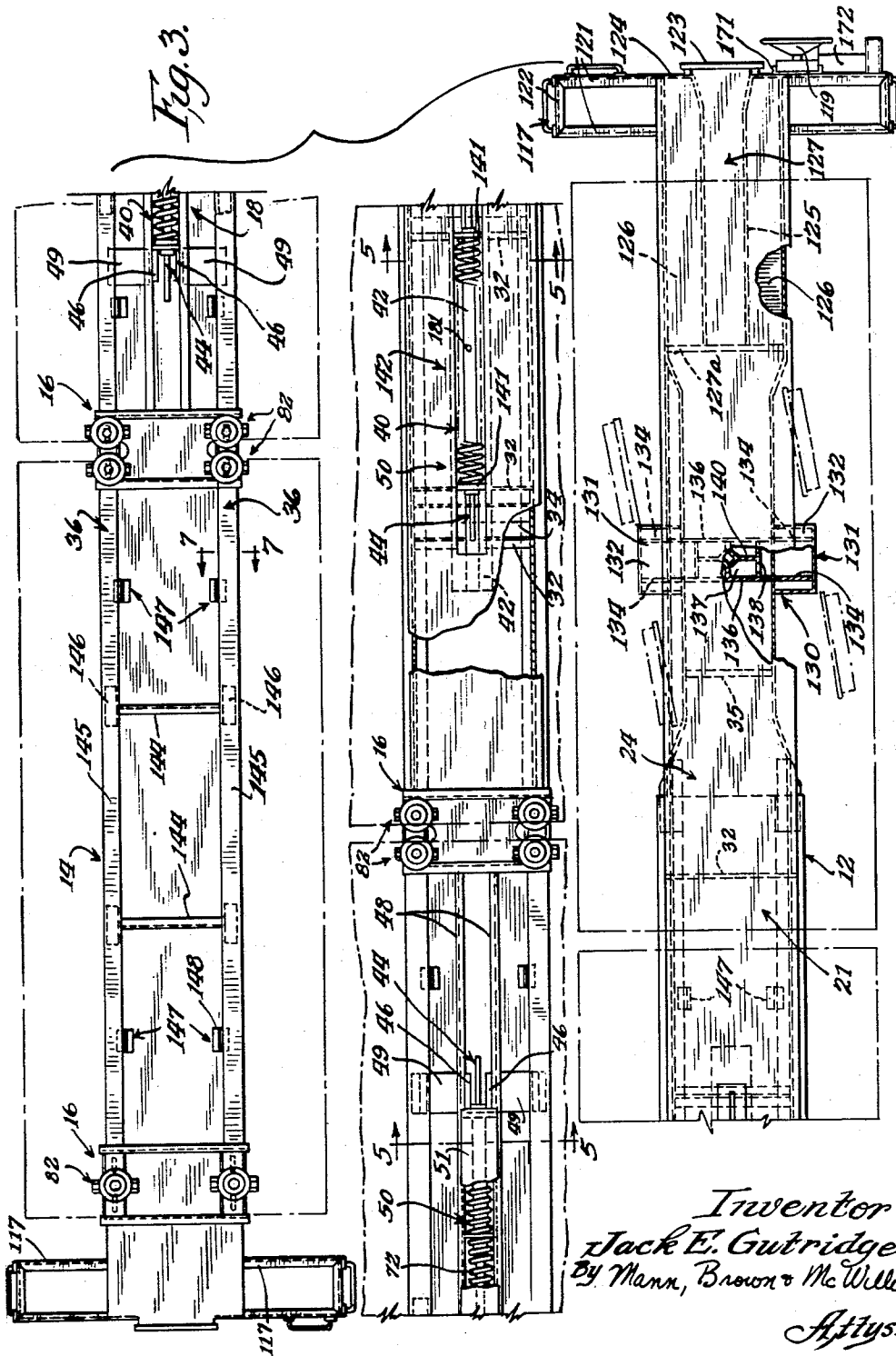
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12 Sheets-Sheet 2



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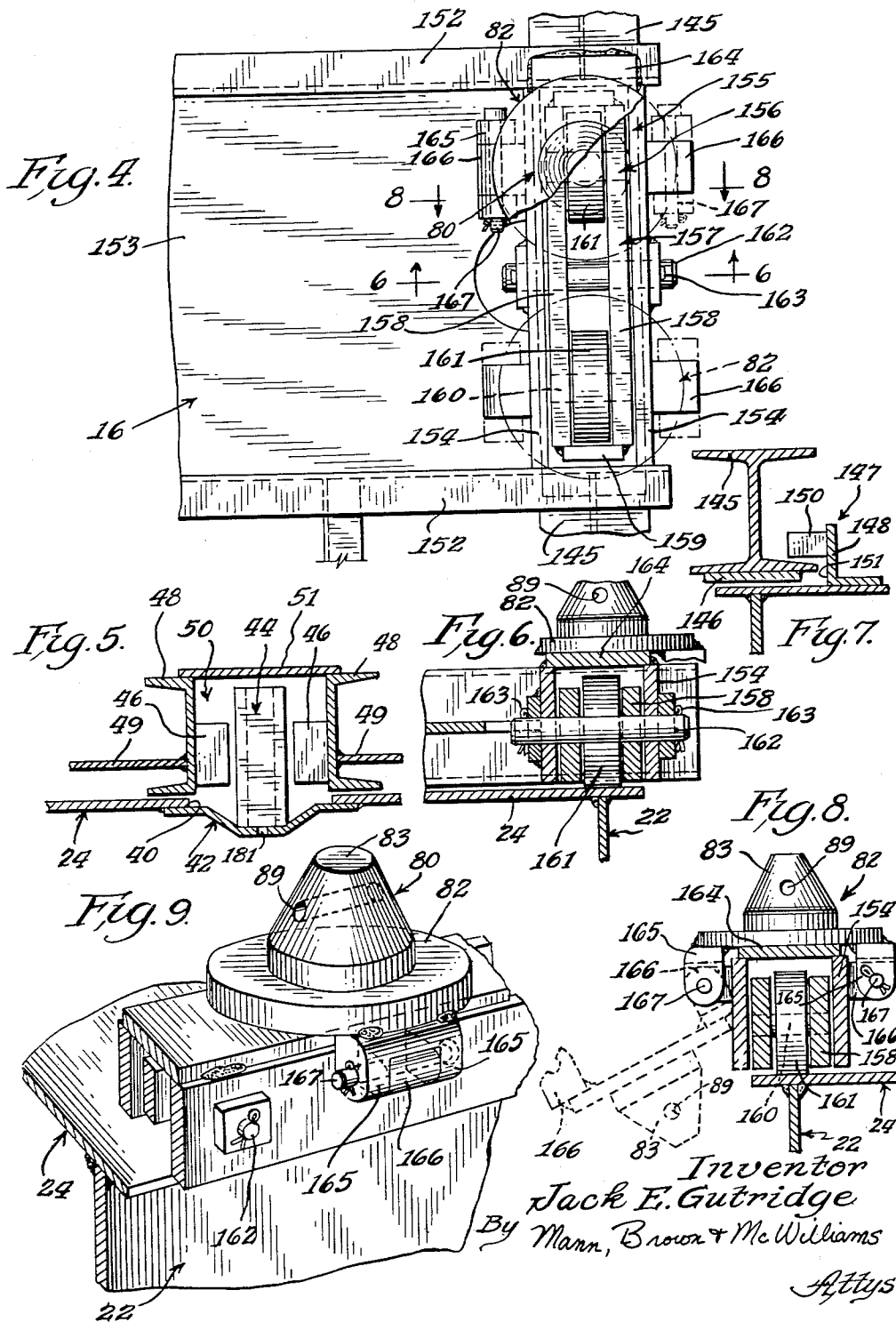
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12 Sheets-Sheet 3

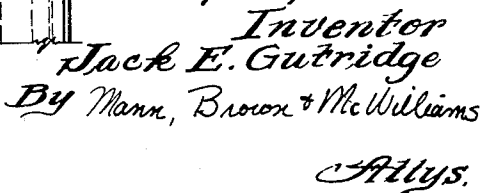


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FOR TRANSPORTING FREIGHT CONTAINERS

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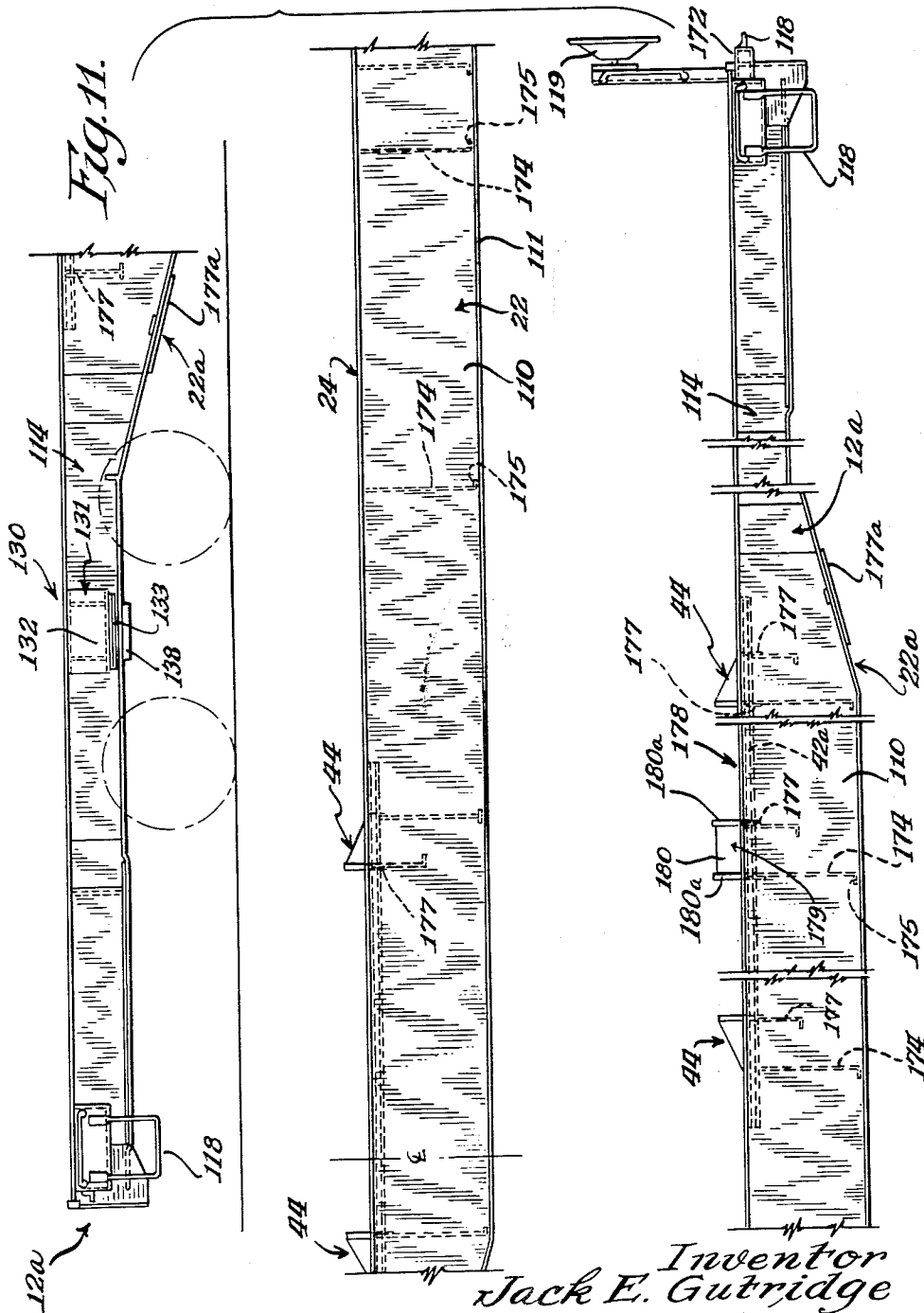
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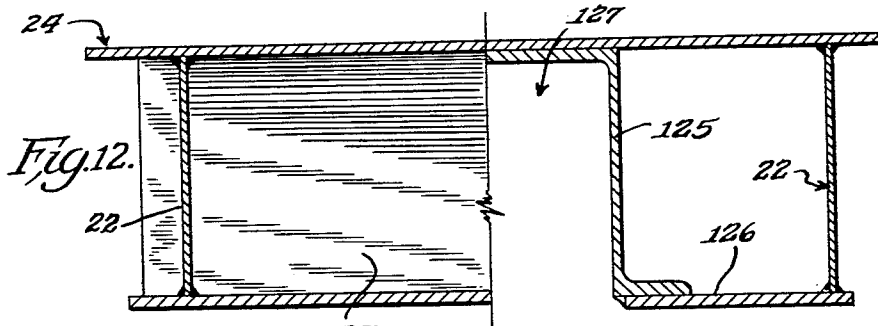
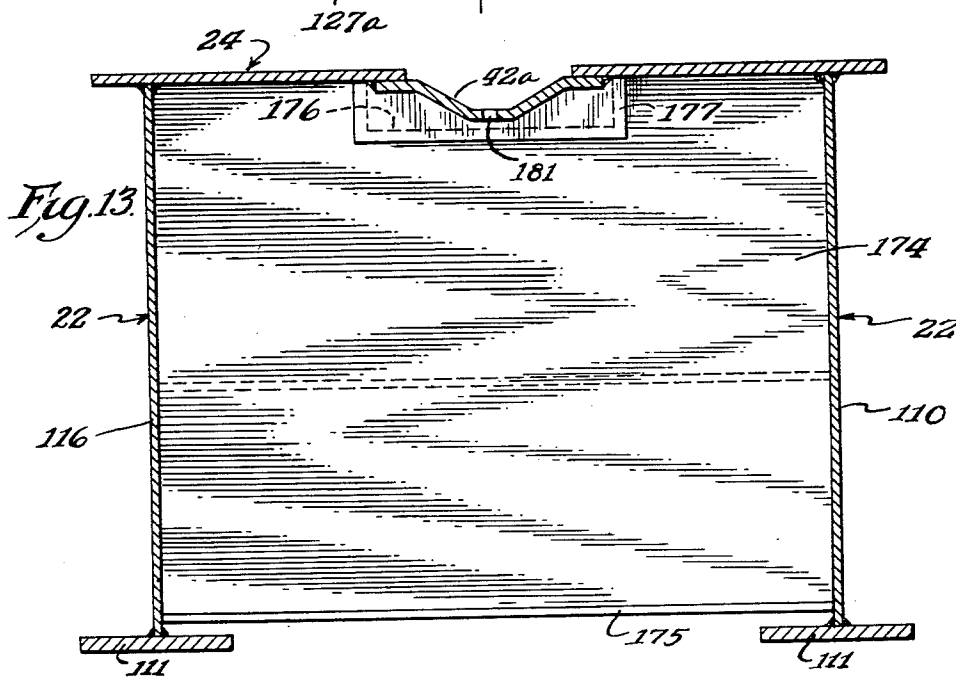
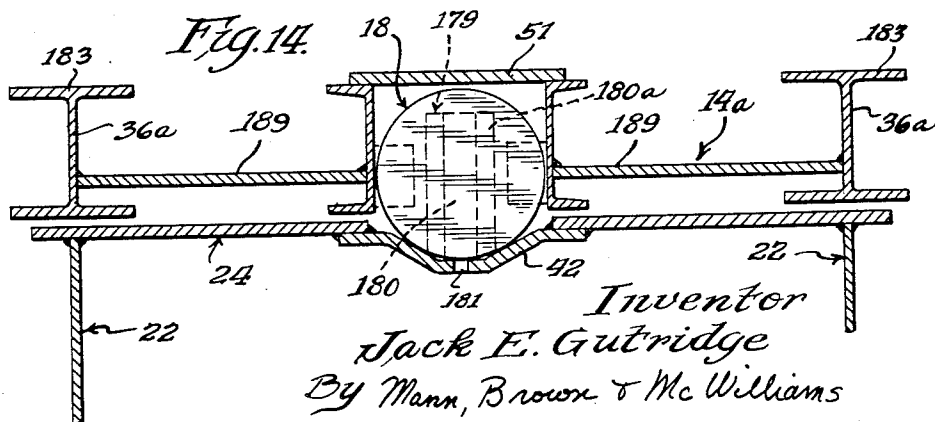
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12 Sheets-Sheet 6



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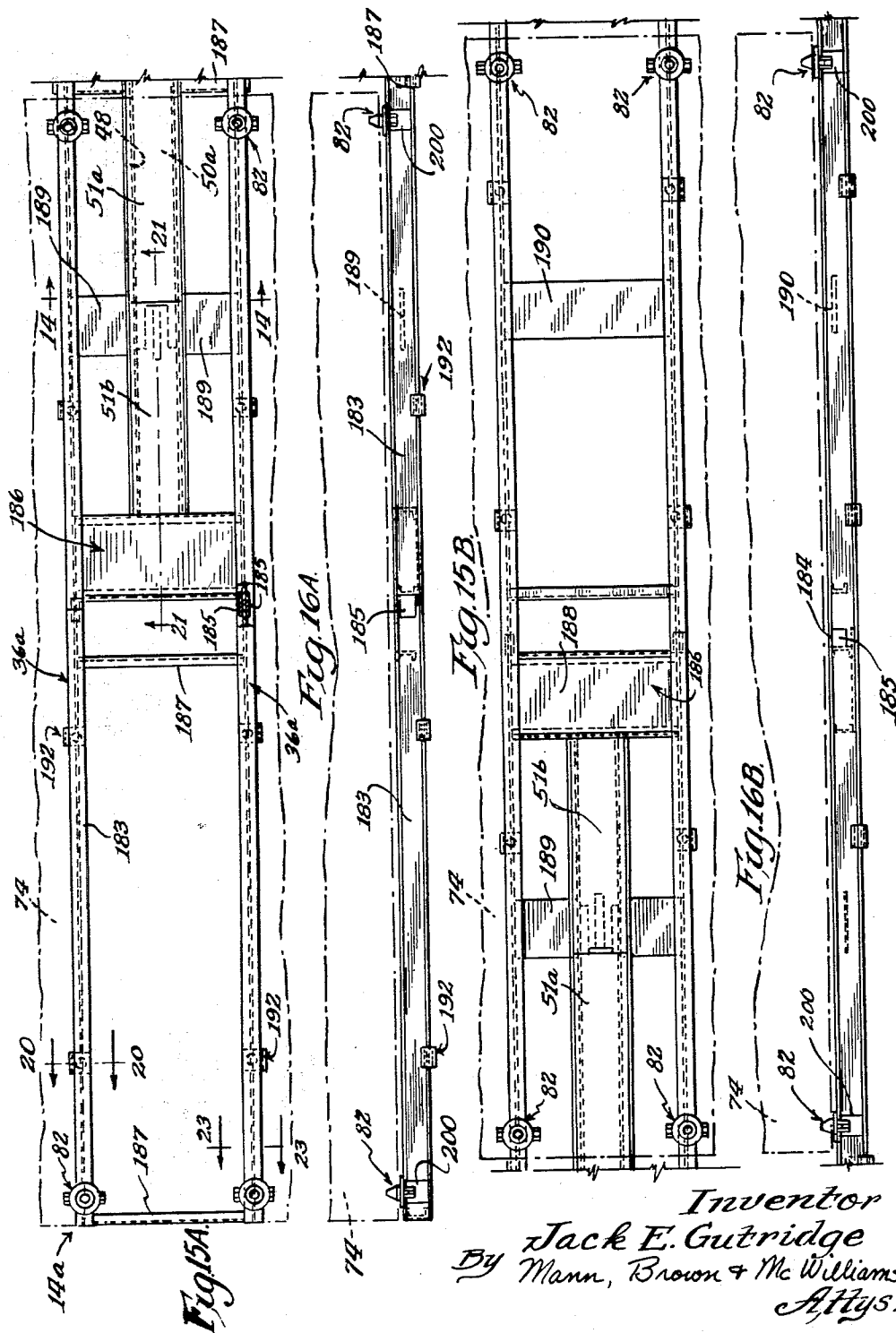
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12 Sheets-Sheet 8

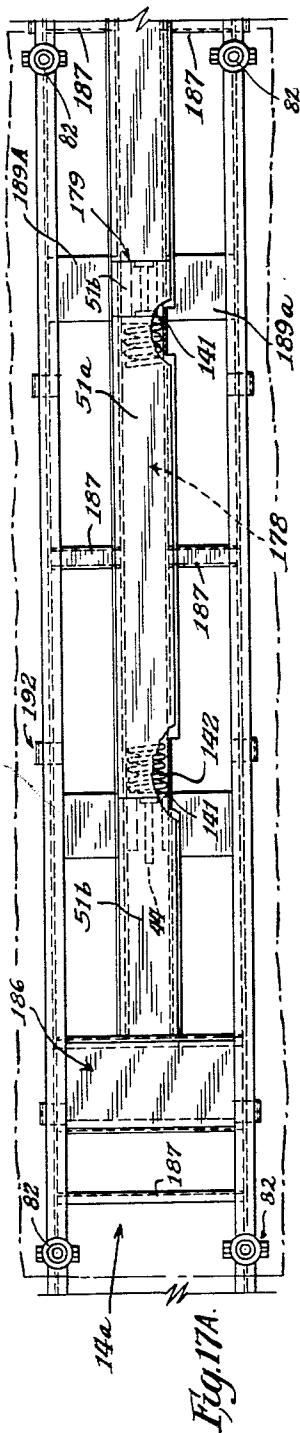


Fig. 17A.

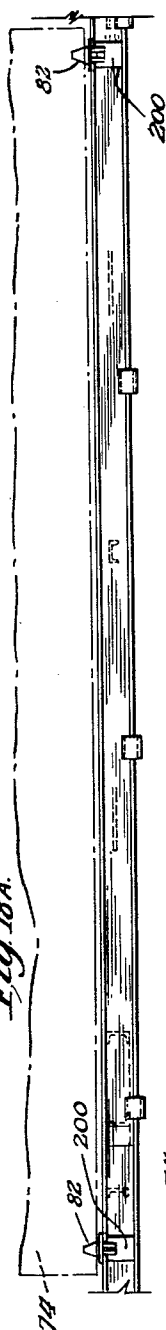
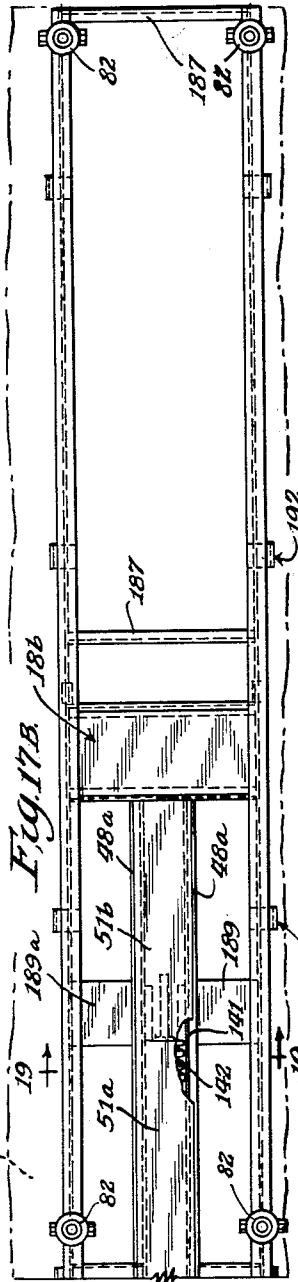


Fig. 17B.

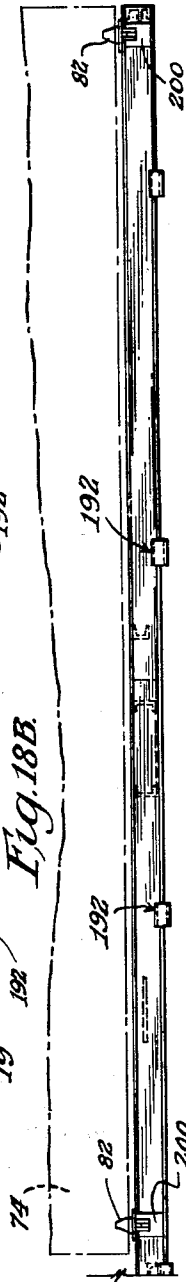


Fig. 18B.

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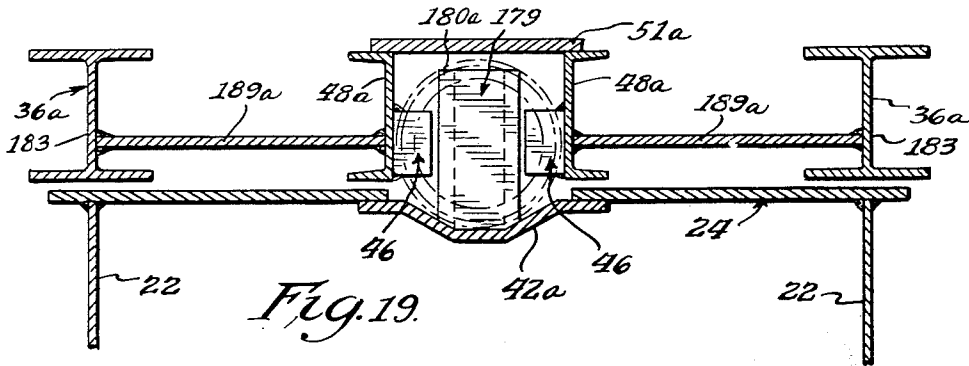
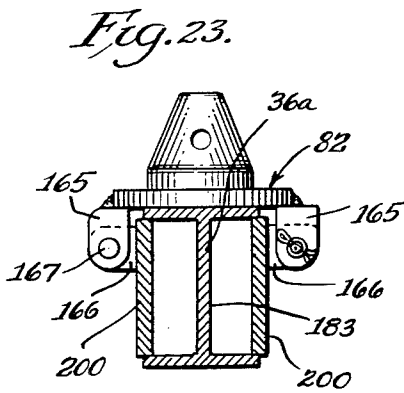
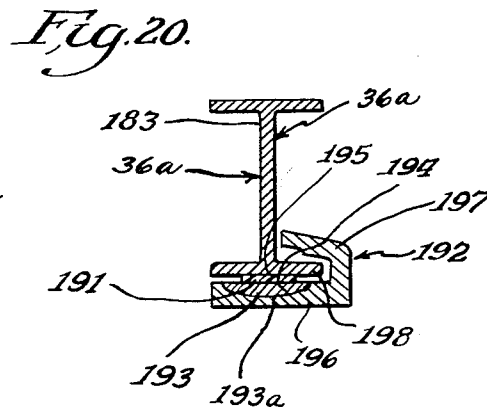
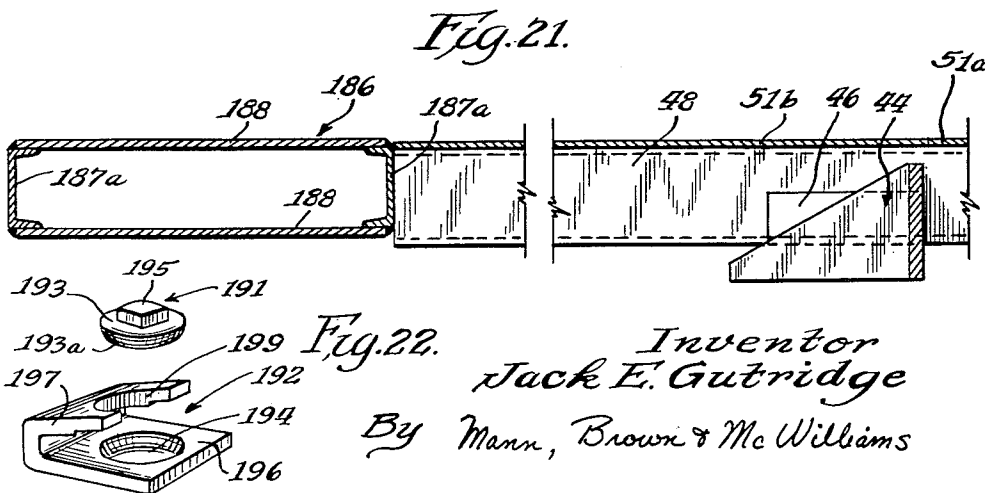
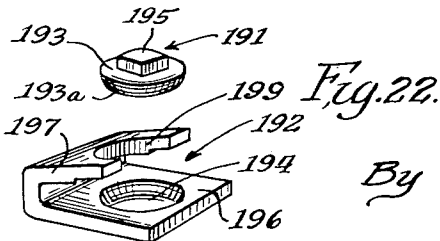
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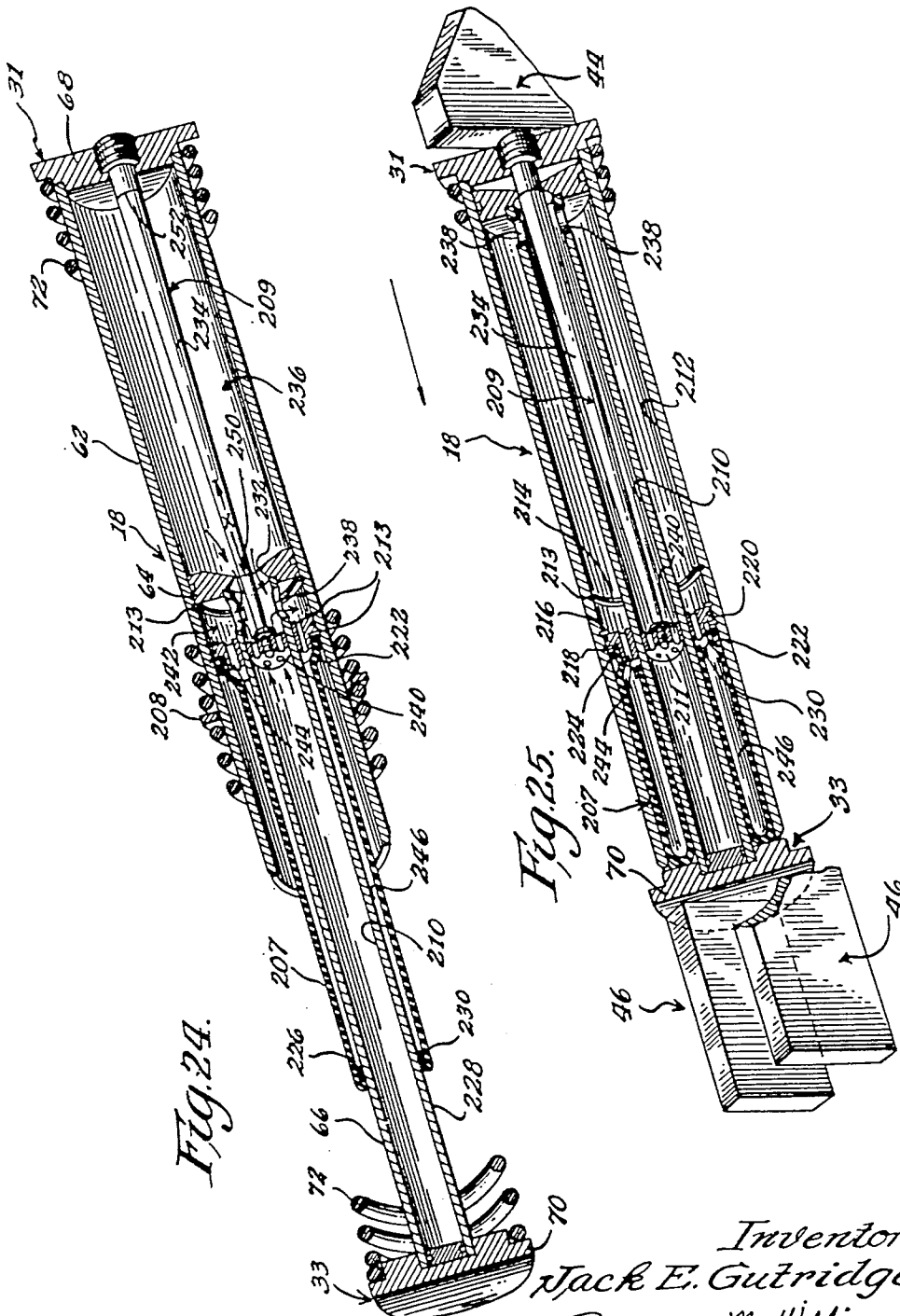


Fig. 25.

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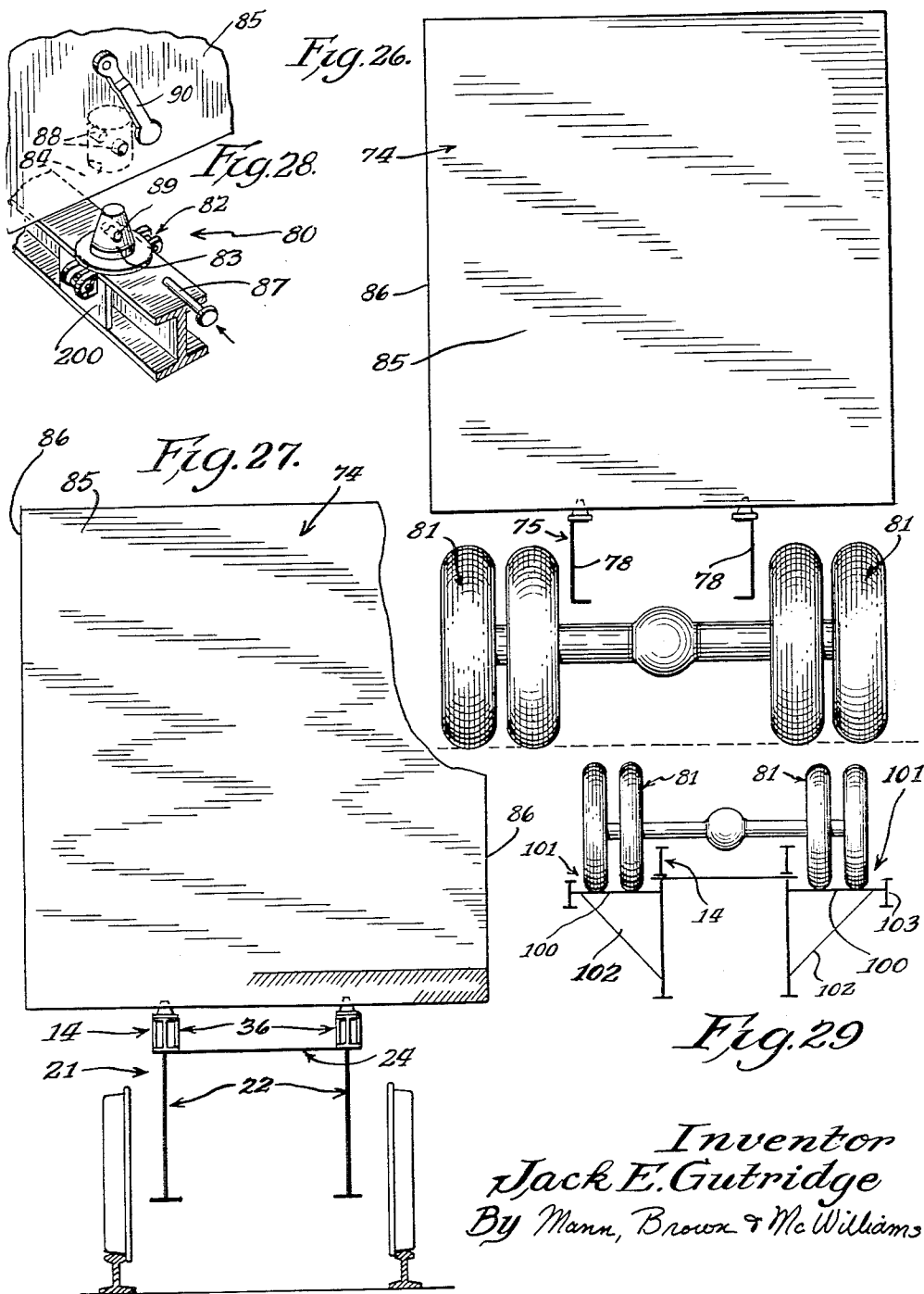
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FOR TRANSPORTING FREIGHT CONTAINERS

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12 Sheets-Sheet 11



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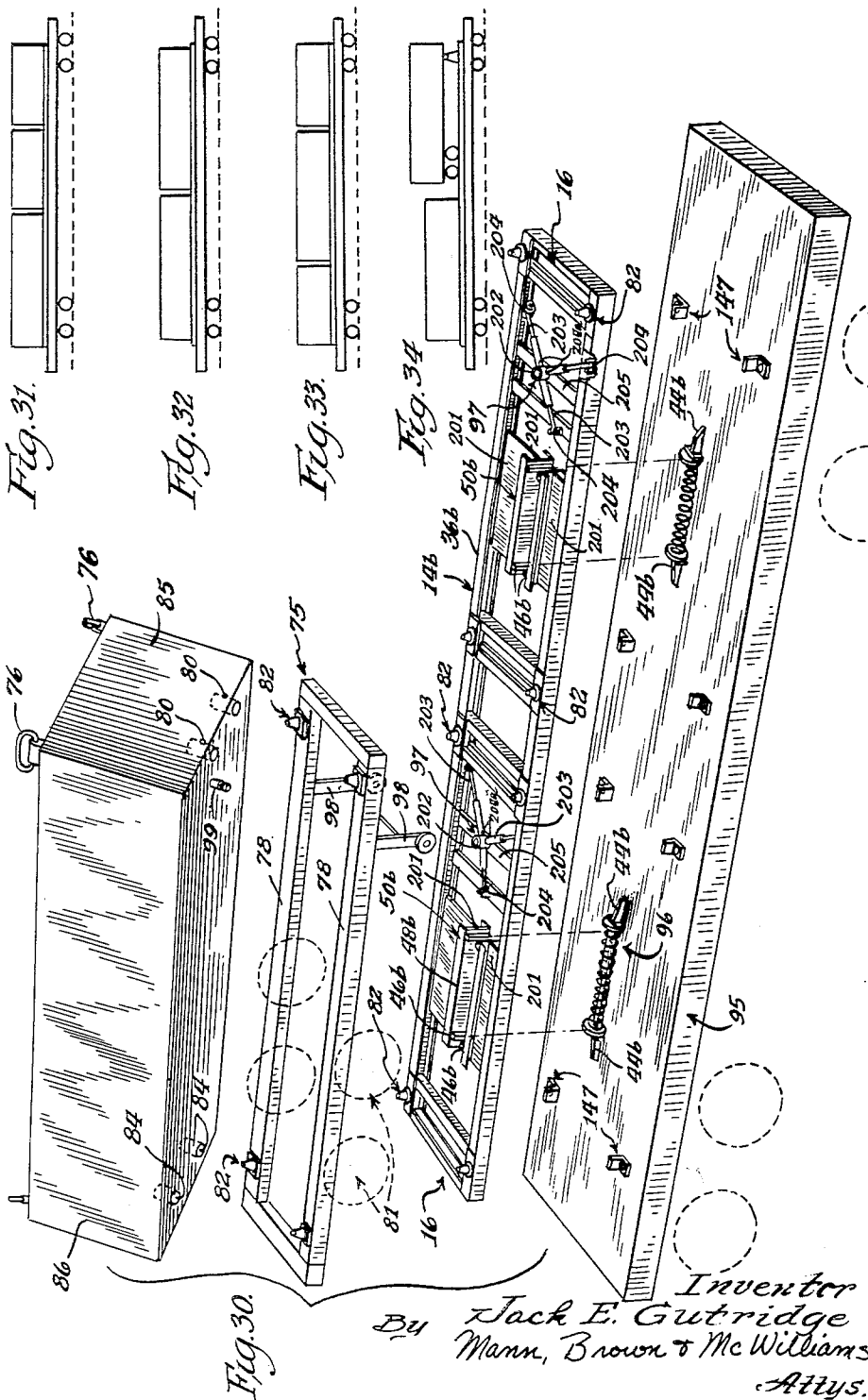
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FOR TRANSPORTING FREIGHT CONTAINERS

FOR TRANSPORTING FREIGHT CONTAINERS

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3,163,129

SKELETON CAR WITH LONG TRAVEL CUSHIONING CHARACTERISTICS FOR TRANSPORTING FREIGHT CONTAINERS

Jack E. Gutridge, Dyer, Ind., assignor to Pullman Incorporated, Chicago, Ill., a corporation of Delaware
Continuation of application Ser. No. 21,331, Apr. 11, 1960. This application Apr. 1, 1964, Ser. No. 356,392
24 Claims. (Cl. 105-368)

This application is a continuation of application Serial No. 21,331, filed April 11, 1960, now abandoned.

My invention relates to a railroad car for transporting freight containers, and more particularly, to a railroad car structure employing a skeletonized underframe structure carrying a container support platform or carriage that is cushioned against longitudinal impacts in accordance with the principles described in the copending application of William H. Peterson, Serial No. 856,963, filed December 3, 1959, now Patent 3,003,436, granted October 10, 1961 (the entire disclosure of which is incorporated herein by this reference).

Lading damage resulting from coupler impacts and the claims resulting therefrom have always been a major problem for the railroad industry, but during recent years the problem has been greatly magnified by increased service speeds with the resulting increase in severity and frequency of coupler impacts between freight cars.

The invention of said Peterson application Serial No. 856,963 provides a new approach to the protection of lading in transit on railroad cars, which is applicable to both standard railroad cars, such as boxcars and flatcars, as well as to cars specially designed for piggyback and freight container systems of handling freight.

As disclosed in said Peterson application Serial No. 856,963, during impacts, changes in the absolute velocity of the lading, which are normally caused by stopping and starting of the car, and by impacts against the car couplers during transit, are affected by adding or subtracting kinetic energy to the lading through the frictional forces acting between the lading and the car as well as the pressure of the car end wall on the lading (the car end wall involved depending on which car coupler is initially subjected to the longitudinal shock and whether the shock is in buff or in draft). Said Peterson application discloses that damage free lading protection against longitudinal impacts (that is, impacts applied against the car couplers) can be obtained if there is interposed between the couplers and the car body containing the lading a cushioning device or arrangement having a cushion travel sufficient in capacity and length that the absolute velocity of the lading is changed to that required by the Law of Conservation of Momentum for Inelastic Bodies by employing to a substantial degree the frictional forces acting between the lading and the car, as distinguished from the compressive forces applied to the lading by the car end wall. This novel approach is particularly applicable to resilient lading (goods packed in fibre boxes) and involves, among other things, extending the time of closure of the cushioning device employed sufficiently so that the changes that must occur to the absolute velocity of the lading (by reason of the aforementioned Law of Conservation of Momentum) occur to the lading as a unit. The length of travel found essential for U.S. railroad practices is in the range of 20 to 40 inches, and preferably is on the order of 30 inches.

It has been found, as disclosed in said Peterson application, that a cushion travel in this range permits the inherent stability of the load and the friction between the lading and the car body to act as substantial factors in creating the lading acceleration (either positive or nega-

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tive) necessary to achieve the absolute velocity dictated by the aforementioned Law of Conservation of Momentum, without developing within the lading the destructive compressive forces which cause lading damage.

Said Peterson application discloses that when the Peterson invention is employed to protect lading, the car structure may be greatly simplified, as impact stresses acting on the car body and underframe are necessarily greatly reduced, and that this applies to cars and freight container bodies employed in the practice of piggyback and container system of handling freight.

My invention is an example of the car and freight container simplification made possible by said Peterson invention, and it contemplates in one form of the invention a railroad car employing a skeletonized deckless underframe carrying a freight container supporting carriage or platform that is mounted for movement longitudinally of the underframe and having a cushion device of the type contemplated by said Peterson application interposed between the carriage or platform and the underframe. The car underframe otherwise includes only sufficient structure necessary to support and make operable the conventional equipment required by A.A.R. regulations, such as couplers, draft gear, uncoupling devices, brakes, ladders, and the like.

It is therefore a principal object of this invention to provide a railroad car of simplified design for use in practicing piggyback and freight container systems of handling freight, which car employs the principles of said Peterson invention for transporting lading by rail.

Another principal object of my invention is to provide a freight container transporting car which is compatible with standardization of devices for latching or securing the freight container both to highway vehicle chassis and railroad cars.

Still another principal object of the invention is to provide a dual purpose flatcar arrangement that accommodates both demounted freight containers and highway vehicle chassis mounted containers, and provides cushioning for both.

Other objects of my invention are to provide a low cost railroad car particularly adapted to transport simplified box-like freight containers, to provide a long travel cushioning arrangement embodying the invention of said Peterson application, to provide an improved platform or carriage construction for securing freight containers to railroad cars, and to provide an improved system of handling freight that is applicable to both the container and piggyback freight handling systems.

Further objects, uses and advantages will become obvious or be apparent from a consideration of the following detailed description and the application drawings.

In the drawings:

FIGURES 1A and 1B when considered together form a composite diagrammatic perspective view of one embodiment of my invention having several freight containers applied thereto, with the freight containers being shown only in outline;

FIGURE 2 is a diagrammatic cross-sectional view approximately along line 2-2 of FIGURES 1A and 1B;

FIGURE 3 is a composite plan view of the railroad car of FIGURES 1A and 1B, with the container support platform or carriage being omitted from the right hand end of the car for clarity of illustration and showing a different way of arranging containers on the car (the containers being shown in outline), parts being broken away to facilitate illustration;

FIGURE 4 is a fragmental plan view of one of the container carriage or platform support assemblies forming a part of the carriage or platform of the embodiment of FIGURES 1-3 on an enlarged scale;

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FIGURE 5 is a fragmental cross-sectional view approximately along lines 5—5 of FIGURE 3, on an enlarged scale and with the cushioning device omitted;

FIGURE 6 is a fragmental cross-sectional view along line 6—6 of FIGURE 4;

FIGURE 7 is a fragmental cross-sectional view approximately along line 7—7 of FIGURE 3, on an enlarged scale;

FIGURE 8 is a fragmental cross-sectional view approximately along line 8—8 of FIGURE 4, illustrating one of the container support bracket structures employed in connection with this invention, with the solid line shown illustrating the operative position of the bracket structure and the dashed line shown illustrating the inoperative position of the bracket structure;

FIGURE 9 is a diagrammatic perspective view of the container support bracket structure of FIGURE 8;

FIGURE 10 is a composite plan view of a modified form of car underframe contemplated by this invention;

FIGURE 11 is a composite side elevational view of the car shown in FIGURE 10;

FIGURE 12 is a diagrammatic fragmental cross-sectional view approximately along line 12—12 of FIGURE 10;

FIGURE 13 is a diagrammatic fragmental transverse cross-sectional view substantially along lines 13—13 of FIGURE 10, on an enlarged scale;

FIGURE 14 is a diagrammatic transverse cross-sectional view substantially along line 14—14 of FIGURES 10 and 15A, on an enlarged scale and illustrating a modified container support platform or carriage applied to the car underframe;

FIGURES 15A and 15B when considered together form a composite plan view of the left hand half of a modified form of container support platform or carriage, with the containers being shown in outline;

FIGURES 16A and 16B when considered together form a composite side elevational view of the car structure shown in FIGURES 15A and 15B;

FIGURES 17A and 17B when considered together form a composite plan view of the right hand half of the modified form of container support platform or carriage, with the containers being shown in outline;

FIGURES 18A and 18B when considered together form a composite side elevational view of the structure shown in FIGURES 17A and 17B, respectively;

FIGURE 19 is a diagrammatic cross-sectional view approximately along line 19—19 of FIGURE 17B, with the modified container support platform or carriage shown applied to the railroad car;

FIGURE 20 is a diagrammatic fragmental cross-sectional view approximately along line 20—20 of FIGURE 15A;

FIGURE 21 is a diagrammatic cross-sectional view through the carriage or platform approximately along line 21—21 of FIGURE 15A;

FIGURE 22 is a diagrammatic perspective view of the antifriction support and guide device shown in FIGURE 20;

FIGURE 23 is a fragmental cross-sectional view approximately along line 23—23 of FIGURE 15A;

FIGURES 24 and 25 are diagrammatic perspective views, in section, illustrating one embodiment of the specific long travel hydraulic cushion device that may be used in practicing my invention and the invention of said Peterson application, showing said device in extended and contracted positions, respectively;

FIGURES 26 and 27 are diagrammatic end views illustrating the container support bracket spacing contemplated by this invention together with the spacing of the corresponding supporting sills of a highway vehicle truck chassis and railroad car respectively in accordance with this invention;

FIGURE 28 is a diagrammatic representation of a suitable container latching device that may be interchange-

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ably employed on truck chassis and railroad cars in accordance with this invention;

FIGURE 29 is a view similar to that of FIGURE 27, but showing the railroad car of this invention modified to permit a highway vehicle, such as a truck-tractor and trailer chassis, to be driven onto the car for end loading trailer bodies on the car;

FIGURE 30 is a diagrammatic exploded perspective view showing certain features of this invention applied to a standard railroad car flatcar and illustrating a container support platform or carriage that is adapted for connection to trailer chassis kingpins as well as for support of freight containers, with the platform or carriage, the trailer chassis, and the container being shown in exploded relation; and

FIGURES 31—34 are small scale diagrammatic side elevational views of the railroad car and cushion platform or carriage of this invention illustrating a number of different ways that freight containers may be arranged on my car for railroad transit.

General Description

Referring now more particularly to the diagrammatic showing of FIGURES 1A and 1B, reference numeral 10 generally indicates one embodiment of the invention including a skeletonized car underframe 12 carrying a container support platform rack or carriage 14, which is mounted for movement longitudinally of the car underframe on support assemblies 16. Interposed between the platform or carriage 14 where indicated by reference numeral 18 is a long travel cushioning device of the type contemplated by said Peterson application, the structural features of which are shown in FIGURES 24 and 25.

The arrangement is preferably such that the cushion device 18 has a closure travel on the order of 30 inches and the car underframe 12 and platform or carriage 14 are proportioned to permit this relative movement between the two, as when coupler impacts are occasioned.

The railroad car underframe 12 in the form of FIGURES 1—3 comprises a center sill structure 21 of inverted open box-like configuration in transverse section (see FIGURE 27) which is made up of a pair of spaced sill members 22 disposed in parallel vertical planes and joined together at their tops by a top plate structure 24. Sill members 22 are relatively wide or deep at their middle portions 25 and relatively narrow at their end portions 26 to provide the center sill structure 21 with relatively deep and relatively narrow center and end portions 28 and 30, respectively. The sill members 22 below their top edges are joined together along their center portions by spaced diaphragms 32 and angle members 34 (see FIGURES 1A and 3). Planar vertical diaphragms 35 may be fixed between sills 22 at the longitudinal center of the car, and adjacent the car trucks.

The platform or carriage 14 is formed by longitudinally extending sill members 36 affixed to the support assemblies 16 and having a transverse spacing comparable to the spacing between the underframe sill members 22 (see FIGURE 27).

The top plate structure of the underframe extends the length of the center sill structure 21 and is interrupted where indicated at 40 in FIGURES 3 and 5 and a cushion carrier plate 42, formed with suitable spaced drain holes 181, as affixed to the undersurface of plate structure 24 (as by welding) to support the cushion device 18. The cushion device 18 is interposed between a pair of stop members 44 affixed to either end of the cushioned carrier plate 42 as well as between spaced pairs of lugs 46 applied between the longitudinal extending rigid frame members 48 that are applied between two of the adjacent support assemblies 16 (see FIGURES 1A and 3). Frame members 48 are braced by plates 49 rigidly connected between the respective members 48 and sills 36.

Referring to FIGURES 24 and 25, the cushion device

18 includes follower members 31 and 33, which bear against the lugs 46 and stops 44 (these latter components together with the cushion carrier plate 42 and framing members 48 defining a cushion pocket 50 in which the hydraulic cushion device is received). Device 18 comprises a cylinder 62 and a piston head 64 having affixed thereto a tubular piston rod 66 which projects outwardly of the cylinder 62. The heads or closures 68 and 70 of the cylinder 62 and piston rod 66, respectively, form the cushion followers 31 and 33, respectively, and these are held against the spaced pairs of lugs and stop members by high strength compression springs 72.

Cushion device 18 is double acting, as it effects a cushioned transfer of impacts applied to either end of car 10, and it preferably is provided with a substantially constant force travel closure characteristic. The cushion pocket is preferably closed by a removable top plate 51 applied between framing members 48, as by employing suitable bolts (not shown).

The containers carried by car 10 are generally indicated at 74 in FIGURES 1A, 1B and 3. These containers may be of any conventional design though preferably they are simple box-like construction. The containers 74 may employ suitable access openings and covers therefor and may be of right parallelepiped construction and carry suitable eyes 76 at their upper corners for crane lifting between the railroad car and a truck chassis or loading dock.

The containers 74 may be applied to a trailer chassis such as that diagrammatically shown at 75 in FIGURES 26 and 30 for highway transit. As is well known in the art, highway trailer or truck chassis 75 adapted to carry or form a part of container or trailer bodies customarily include longitudinally extending frame members 78 on which the container body rests. These longitudinally extending frame members 78 are customarily spaced apart a distance in the range of between 34 and 40 inches, which spacing is limited by regulations dealing with the spacing between the chassis wheels 81.

In accordance with this invention, the sill members 22 of the car underframe 12 and the sill members 36 of the container support platform 14 are given the same spacing as the spacing between the chassis frame members 78. Furthermore, the container bodies 74 are supported on and secured to the highway vehicle chassis 75 and railroad car support platform 14 by identical latching devices which are located on such sills, respectively, and thus are similarly spaced. The principal features of these latching devices are generally indicated at 80 in FIGURE 28 and devices 80 thus may be composed of a bracket structure 82 including a cone-shaped protuberance 83 that is adapted to be received in a recess 84 formed in the undersurface of the container 74 adjacent its respective ends 85 but spaced from its respective sides 86. The latching devices 80 also include a pin 87 that is adapted to be received through holes 88 and 89 of the container and bracket structure respectively to secure the two together, the pin being screw threaded into position in the container or being held in place by a suitable latch 90.

A significant aspect of the indicated spacing of sill members 22 and 36 in their corresponding bracket structures 82 is as follows:

The center of gravity of the typical mass system involving a standard highway vehicle trailer body as riding on its wheels or a container 74 mounted on a chassis 75 (see FIGURE 26) has a conventionally recognized maximum dimension above the ground which is the same as the corresponding dimension that is conventionally recognized for a mass system including a container 74 mounted on a car 10 (see FIGURE 27).

And it is conventionally recognized that as long as the load is braced against tilting from points outside a stability line drawn between the container center of gravity and the point of support of the wheel load on

the ground (or rails as the case may be), the load will be stable.

I have found in arriving at my invention that the spacing range of highway vehicle chassis longitudinal extending frame members falls outside this so-called stability line for mass system involving a container 74 mounted on either a chassis 75 or a railroad car supported rack or platform 14, and consequently the rack and chassis sill spacing, and in particular, the spacing of the container support bracket structures 82 laterally of the vehicle, could be the same as the chassis longitudinal sill or frame member spacing that is conventionally employed, and at the same time eliminate the need for load bearing cross bearers in the railroad car 10.

It should also be appreciated that this avoids having to provide for container support structures that engage and support the containers at their corners, with consequent savings of materials and cost of manufacture.

The bracket structures 82 are applied in transversely disposed pairs to the chassis frame sill members and containers support platform sill members, respectively, and a standard spacing longitudinally of the chassis frame members and platform sill members is employed between pairs of bracket structures, such as required for supporting a container having a nominal 20 foot length. In a preferred arrangement, the actual containers are 19 feet 9 inches in length and the pairs of container support brackets and their corresponding recesses in the undersurface of the container are spaced apart on centers 19 feet 2 inches apart.

In the case of the highway vehicle chassis 75, the support brackets 82 may be applied adjacent the ends of the chassis longitudinally extending sills 78, as indicated in FIGURE 30, where the chassis is to support a 20 foot freight container, or an additional set of eight support brackets 82 may be applied to the chassis where the chassis is of sufficient length to support a 40 foot container.

In the case of the railroad car 12, the container support bracket structures 82 are pivoted to the support assemblies 16 (see FIGURES 4, 8 and 9) and intermediate the ends of the platform or carriage 14, the container support brackets are applied to the support assembly 16 in adjacent pairs so that the different container loading arrangements of FIGURES 31-33 may be employed if so desired.

Thus, at a loading point a container 74 may be applied to the chassis 75 by a crane, with the chassis bracket structures 82 being received in the recesses 84 of the container body and pins 87 applied to the respective bracket structures and container body recesses to complete the respective latching devices 80 for securing the container to the chassis. Assuming that the container body 74 has been previously loaded, the highway vehicle is then driven through a suitable railroad yard for application to car 10. At the yard, the latching devices 80 are unlatched and the appropriate support brackets 82 of the car are positioned as shown in FIGURE 8 to receive the container when it is crane lifted from the highway chassis onto platform or carriage 14, after which the latching assemblies 80 are again completed by employing suitable pins 87 to the respective container body recesses and platform or carriage bracket structures as before described.

By selecting and appropriately positioning the container support brackets of the railroad car platform or carriage 14 in accordance with the length of the container to be carried, containers may be arranged on the car in any one of the ways suggested by FIGURES 3 and 31-33, the support bracket structures not in use being swung to the positions indicated in FIGURES 1A and 8.

When sufficient containers have been applied to the car to fully load it in the manner indicated above, the car is ready for transit. When an impact occurs, for instance, in the direction of the arrow of FIGURE 25, the underframe 12 moves under the impetus of the impact

against one end of the hydraulic device 18 to move the latter from the extended position of FIGURE 24 to the contracted position of FIGURE 25. As the hydraulic device moves to its contracted position, hydraulic liquid is forced through orifices to dissipate in the form of heat substantially all of the energy that is involved in the so-called "impact effect" when a car impacts against, or is impacted by one or more other cars; the cushion also adds to or subtracts from the platform 14, the containers 74, and their lading, the energy of the impact that is to be acquired thereby or lost therefrom (as kinetic energy) as a result of the impact (depending upon the condition of impact).

Under the impact condition of FIGURE 25, the impact has been applied to the coupler 91 at the right hand end of the car shown in FIGURE 1, and this forces the right hand stop member 44 against the hydraulic device closure member 68 forming follower 31, which presses the cushion device against the left hand pair of lugs 46 as indicated in FIGURE 25. Due to the inertia of the containers and their lading, and the connection between the containers and the platform or carriage 14, the absolute velocity of the platform or carriage 14 is initially unaffected by the impact, but the pressure of the hydraulic device follower 33 acting on the left hand pair of lugs 46 gradually transfers the kinetic energy of the impact to the platform or carriage 14 and its containers. The cushion device continues to close until its parts have the operative relation indicated by FIGURE 25, at which time, the containers and the platform 14 have the ultimate velocity dictated by the aforementioned Law of Conservation of Momentum.

After the impetus of the impact has been dissipated and the kinetic energy involved in the impact has been transferred to the containers and their lading through the cushion device, springs 72 acting in tandem on heads 68 and 70 restore the platform or carriage 14 and the containers to their normal central position with respect to the car 10. When the direction of impact is in the opposite direction, the functioning of the hydraulic device and the railroad car stop members and lugs is the same, though the forces involved act in the opposite direction.

FIGURES 10-23 illustrate a simplified form of car 10a including a slightly modified underframe 12a and a simplified container support platform or carriage 14a, with the platform or carriage 14a having the container support bracket structures applied thereto in the same manner as already described.

FIGURE 30 diagrammatically illustrates some of the basic principles of this invention applied to a standard flatcar 95 which has applied thereto a container support platform rack or carriage 14b conforming to the principles of this invention, with the hydraulic cushion device of the type illustrated by FIGURES 24 and 25 being employed between the car 95 and platform 14b where indicated by reference numeral 96. The car 95 is supplied with stop members 44b and the platform 14b includes lugs 46b between which the cushion device is interposed. The platform or carriage includes the container support bracket structures 82 located approximately where indicated and the sill members 36b have the spacing suggested by FIGURES 26 and 27. The platform 14b also carries a suitable trailer hitch device in the form of a fifth wheel stand generally indicated at 97, which may be of any suitable type, but ordinarily includes a latching mechanism for engaging the kingpin of trailer bodies.

Thus, the embodiment of FIGURE 30 is adapted to transport trailer bodies as well as containers, in a manner indicated in FIGURE 4, since the platform or carriage 14b is sufficiently narrow to either permit the highway trailer chassis to be driven by its tractor onto the car from one of its ends for positioning the trailer body kingpin over one of the fifth wheel stand kingpin latching devices 97, or to be crane lifted to such position. The trailer body may be applied to the fifth wheel stand in

accordance with any conventional practice, depending upon the type of fifth wheel stand employed though customarily the highway vehicle tractor is left standing on its landing gear 98 after being correctly spotted on car 95, after which the fifth wheel stand 97 is raised to engage the kingpin 99. After the fifth wheel stand is latched in its upright position, the landing gear 98 is retracted upwardly to leave the front end of the container supported by the fifth wheel stand 97.

As stated, a trailer chassis and body may be crane loaded as a unit onto car 95 for piggyback rail transit, or if the trailer chassis is of the general type illustrated in FIGURE 30, the container 74 may be separated from the chassis and positioned at one of the points indicated in FIGURES 31-33.

If so desired, the specific car underframes shown in FIGURES 1-23 may be adapted for application of trailer bodies by the end loading procedure above described, as by applying suitable support plate structures 100 in the manner diagrammatically illustrated in FIGURE 29 to define ways 101 for the highway vehicle wheels 80 and substituting platform 14b for platforms 14 and 14a. The support plates 100 may be braced as deemed necessary or desirable by appropriate members 102 located intermediate the ends of the car and stiffening side sills 103, it being understood that the guard rails indicated at 104 in FIGURES 1A and 1B would be eliminated or made removable when the embodiment of FIGURE 29 is practiced.

Alternately, the car underframe of FIGURES 1-23 may be adapted to receive crane lifted trailer bodies by making support plate structures 100 of a length sufficient to support chassis wheels 81 and applying them to the sides of the car underframe as dictated by the positioning of fifth wheel stands 97.

Specific Description

Referring now again to FIGURES 1-9, the underframe sill members 22 are in the form of spaced vertical plates 110 which may be of one piece construction along the length of the car and are preferably provided with reinforcing plates or webs 111 along their lower edges. The plates are indented as indicated at 113 to define wheel wells 114 for the wheels 115 of the respective car trucks 116. At the ends of the car, end sills 117 are fixed to the center sill structure 12 for supporting the conventional ladders 118, hand brake 119, the uncoupling device 120, and any other conventional equipment required or desired. End sills 117 may be defined by suitable channel members 121 and 122 which may be fixed together to the center sill structure 12 in any suitable manner, as by welding. A suitable plating structure may be applied across the ends of the center sill structure to define striker 123 and end walls 124. A short draft gear housing member 125, having the standard Z-26 cross-sectional configuration, may be affixed to the top plate structure 24 and braced by horizontal plates 126 to define a draft gear pocket 127 for containing and supporting in a conventional way a suitable type of draft gear (not shown) and coupler 91. Pocket 127 is closed at its inner end by web 127a affixed between sills 22 and plates 125.

The underframe 12 includes a bolster structure of the type illustrated in FIGURES 2 and 3 and generally indicated by reference numeral 130. The bolster structure 130 is defined by bolster members 131 on either side of the center sill structure in the form of pressed substantially U-shaped plates 132 welded to the top plate structure 24 and the respective underframe sills 22 in the manner diagrammatically illustrated in FIGURE 2. The plates 132 carry a wear plate arrangement 133 for engagement with a conventional form of end bearing applied to the bolster 134 of the car truck.

The bolster plates 132 are also affixed to spaced webs 135 that are also welded to the undersurfaces of sills 22. Between the sills 22, webs 136 are welded in transverse alignment with the respective webs 135, and affixed to

the lower edges of plates or webs 136 and the sills is a bottom cover plate 137 having affixed thereto a center plate structure 138 that is arranged in a conventional way to cooperate with the corresponding center plate structure of truck 116. A kingpin receptacle 139 of any conventional type is affixed to bottom cover plate 137 and braced by suitable brace plates 140. The receptacle 139 receives the conventional kingpin that is applied between a railroad car body bolster and a railroad car truck bolster, as is well known in the art.

The wheel wells 114 formed in the sill member may be defined by indentations formed in the plates 110, or by separate plates suitably welded together as will be obvious to those skilled in the art.

I prefer to supplement the return action of the hydraulic cushion device 18 by a booster spring located where indicated by reference numeral 142 of FIGURES 1B and 3. The booster spring 142 is applied to a cushion pocket 50 that is identical to the previously described cushion pocket 50, as indicated by the corresponding reference numerals employed in FIGURES 1B and 3, and thus it will be noted that the top plate structure 24 of the underframe is interrupted at a second position as indicated by reference numeral 40, and a cushion carrier plate 42, stop members 44, lugs 46, and their supporting and bracing structures previously described are employed in connection with the booster springs 142. As a matter of fact, the booster spring 142 and the cushion device 18 may be used interchangeably in the pockets 50.

Booster spring 142 is needed to augment the return action of the cushion device springs 72 when platform 14 is fully loaded with containers, due to the large masses involved, and it acts against spring seats 141 that bear against the respective stop members and lugs 44 and 46 of its cushion pocket.

The sill members 36 of platform 14 are braced by reinforcing channel members 144 as well as the support assemblies 16. The sills 36 are in the form of I beams 145 (see FIGURE 7) and the bottom surfaces of the sills 36 have affixed thereto wear plates 146. The wear plates 146 have limited sliding engagement with the top surface of the top plate structure 24 of the underframe and hold the midportions of beams 145 in guiding relation with the platform or carriage movement guide devices 147 best shown in FIGURE 7, which comprise an angle member 148 affixed to the top surface of the underframe top plate structure adjacent the inner flange 149 of the respective container support platform sills 36 and carrying an outwardly directed projection 150 in the form of a block that is positioned just above the top surface of the flange 149.

The container support platform or carriage movement guide devices 147 are spaced somewhat as indicated in FIGURE 3 along the top surface of the underframe top plate structure 24, and the outer surfaces 151 of angle members 148 maintain the correct position of the platform laterally of the underframe. The projections 150 are insurance against vertical movement.

The support assemblies 16 are best depicted in FIGURES 4, 6 and 8 and generally comprise spaced channel members 152 affixed at like ends to adjacent ends of the I beams 145 forming the platform sill members 36. The channel members 152 are joined together by a brace plate 153 and spaced pairs of framing members 154, the latter defining a roller pocket 155 in each of which is mounted a roller assembly 156.

The roller assemblies 156 each comprise a roller frame 157 formed by elongate members 158 joined together at their ends by short end members 159. Frame 157 carries pins 160 which journal the spaced rollers 161. The frame 157 is keyed to the respective pairs of frame members 154 by a pin 162 held in place by suitable keys 163, such as cotter pins.

The roller pockets 155 are closed by top plates 164 which in the form of the invention of FIGURES 1-3 have

applied thereto the container support bracket structures 82 (and positioned in the manner indicated in FIGURES 1A and 1B and thus depending upon their location with respect to the ends of the cushioned support platform or carriage).

Each container support bracket structure 82 has affixed to diametrically opposed edges thereof lugs 165 that are adapted for hinging alignment with complementary lugs 166 affixed to the roller pocket frame members 154. Pins 165 are movably applied to the lugs 166 and 165 to secure the respective support brackets in the full line position of FIGURE 8, one of the pins 167 being removed to permit the support bracket structure to be pivoted to the dashed line position of FIGURE 8, as desired.

At the ends of the platform 14, a single bracket structure 82 is applied to either side of the end support assembly 16, while the intermediate support assembly 16 have two container support brackets applied to either side thereof, as indicated in FIGURES 1A and 1B. Thus, when the length of a container that is to be applied to the car 10 is such that it will extend over a support assembly 16, the container support bracket structures 82 carried by such support assembly 16 may be swung out of the way, as indicated in FIGURE 1A. When shorter containers are to be carried by the car, the container support brackets may be replaced to the full line position of FIGURE 8.

As indicated in FIGURES 1A and 1B, guard rail structures 104 are applied to the end sills to form a gateway 170 through which members of the train crew may pass to the car 10 if desired. The guard structures 104 are provided to keep one from stepping onto an end sill 117 and then falling to the track below through the space between the end sill and the car truck, as described in the copending application of Kenneth J. Austgen, Serial No. 1,935, filed February 16, 1960 now abandoned in favor of continuation application Serial No. 228,215, filed September 27, 1962. The guard structures 104 may be of any suitable type, though in the illustrated embodiment they are formed by suitable railing.

An appropriate channel member 171 affixed to the end sill at the brake end of the car provides the necessary support for the hand brake and a suitable operator's platform may be provided where indicated at 172.

Referring now to the embodiment of the invention shown in FIGURES 10-23, the underframe 12a is essentially the same as underframe 12 and like reference numerals are employed to designate like parts. The underframe sills 22 are braced intermediate their ends by spaced diaphragms 174 having their lower ends angled as at 175 for reinforcing purposes. The cushion carrier plates of the cushion pockets 50 are applied across recesses 176 formed in their respective diaphragms 174, and a brace plate 177 welded between the respective diaphragms and the carrier plate provides support in addition to that given by the welding of the carrier plate to the underframe top sill structure. Brace plates 177a are affixed between sills 22 at the tapering portions 22a thereof.

The bolster structure 130 and the draft gear pocket 127 of the embodiment of FIGURES 10-23 is essentially the same as already described, and the showings of FIGURES 2 and 12 are intended to represent the structures for both of the embodiments of the invention of FIGURES 1-23.

The booster spring pocket 178 of the embodiment of FIGURES 10-23 is enlarged to accommodate a second booster spring 142 (see FIGURE 10). As indicated in FIGURES 10, 11 and 13 the carrier plate 42 of pocket 178 has the same characteristics as that shown in FIGURE 3, but it is made sufficiently long to accommodate the two booster springs and have applied thereto a central stop member 179 of the type suggested by FIGURES 10 and 11, in addition to the stop members 44. The stop member 179 comprises a vertical plate 180 affixed to the carrier plate 42a as by welding, and having

affixed to its ends abutment plates 180a also affixed to carrier plate 42a in like manner. Carrier plate 42a is likewise formed with drainage holes 181 of the type previously described with reference to carrier plate 42.

The container support platform, rack, or carriage 14a comprises spaced sill members 36a made up of I beams 183, which are secured together to form each sill member as at 184 by employing suitable splice plates 185.

The sill members 36a are affixed in spaced apart relation by the brace assemblies 186 and spaced reinforcing channels 187; the brace assemblies 186 each comprise (see FIGURE 21) spaced channel members 187a welded between the sill members 36a and having affixed thereto upper and lower brace plates 188, as by welding.

The brace assemblies 186 are arranged with respect to the cushion carrier plates of the underframe so that a brace assembly will be positioned adjacent each end of the respective cushion pockets to be defined by the underframe stop members 44 and container support platform lugs 46 (see FIGURES 15A-18B). In the case of the pocket 50a for the hydraulic cushion device 18, the channel members 48 previously described extend between adjacent brace assemblies and carry the lugs 46 that the cushion is to cooperate with. Reinforcing plates 189 are preferably applied between the channel members 48 and the adjacent sill members 36a in the area of the lugs and stop members for reinforcing purposes (see FIGURES 15A and 19) and top plates 51a and 50b close off the cushion pockets between the respective brace assemblies 186.

Adjacent the booster spring pocket 178, similar channel members 48a are employed between the adjacent brace assemblies 186, as are brace plates 189 and cover plates 51a and 51b. Additional brace plates 189a are applied between the sill members 36a and the channel members 48a adjacent the center stop member 179 (see FIGURE 17A).

Of course, top cover plates 51a and 51b are applied to the channel members 48 and 48a, respectively, after the cushion device and booster springs have been applied to the respective cushion pockets. Sills 36a may be braced between the cushion pockets by a tie plate 190 (see FIGURE 15B).

In this embodiment of the invention, the platform 14a is slidably mounted on antifriction pads 191 (see FIGURE 20) secured in pad retainer and movement guide devices 192 or brackets (see FIGURES 20 and 22).

The pads 191 are preferably formed from a TFE fluorocarbon resin, known as Teflon, made and sold by E. I. du Pont de Nemours & Co., Inc. Each pad 191 is of parallelepiped configuration and is affixed by a suitable adhesive to a bearing block 193 including a spherically contoured convex surface 193a that is suitably received in a spherically contoured concave seat 194 formed in device 192. The pads 191 are formed with an upper planar surface 195 against which the respective sill members 36a rest.

The individual brackets 192 are each preferably a one piece member including a base 196 in which seat 194 is formed and that may be affixed to the top plate structure 24 of the underframe 12a as by welding and a hooked arm 197 that is to extend over the bottom flange 198 of the sill member 36a supported by the bracket. The bracket 192 is preferably formed with a rounded opening 199 in its arm 197 for ease of applying the pad 191 and its bearing block 193 to the bracket.

The material Teflon is preferred for the antifriction pad as it has been found that it has relatively high frictional characteristics when the platform 14a is moved over the pads at relatively high speeds during the dissipation of an impact, while at the same time evidencing low frictional characteristics when the container support platform 14a is being returned to its normal position at low speed by the cushion spring and the booster spring after the impetus of an impact has been dissipated. For in-

stance, when the car 10a is subjected to a 10 mile an hour impact when loaded with containers (each containing a normal load), the cushion fully closes and the platform travels its full distance in about one twentieth of the time it takes for the return of the platform to its normal centered position with respect to the car. Tests have shown that the apparent frictional characteristics of a Teflon pad 191 during closure of the cushion are about twice as great as they are during return of the cushion to its extended position, thus permitting the use of smaller return springs than would normally be thought possible.

Of course, the brackets 192 are applied to the car underframe to define the path of movement desired for the platform with respect to underframe 12a. The spherically contoured surfaces 193a and 194 provide the pad with a self centering action so that surface 195 will be in full contact with the undersurface of the respective sill members 36a in spite of minor tolerance variations.

As indicated in FIGURE 23, the container support bracket structures 82 are applied to the I beams 183, as by having the lugs 166 applied to mounting plates 200 that are in turn affixed between the upper and lower flanges of the I beams, as by welding. The container support brackets are otherwise the same as previously described, and are arranged along sills 36a at the spacing already indicated.

The container support platform or carriage 14b of FIGURE 30 is substantially the same as that shown in FIGURES 1-9 and includes the side sills 36b (that are similar to side sills 36 and have the same spacing), support assemblies 16, and movement guiding devices 147.

The cushion pockets 50b are defined by spaced channel members 48b affixed to the respective side sills 36b by brace plates 201. Stop members 44b are affixed to the flatcar 95, the lugs 46b are affixed to the respective channel members 48b, and a suitable cover plate (not shown) may be provided over the cushion pockets 50b, such as the top plates previously described.

The fifth wheel stand 97 may be of any suitable type, though in the form shown it consists of a kingpin latching body 202 and three telescoping legs 203 affixed to the platform 14b by appropriate ball and socket joints where indicated at 204. The fifth wheel stand in its retracted position may rest on a suitable support plate 205 affixed between side sill members 36b and in its extended position suggested by FIGURE 34 the telescoping legs are held in extended relation as by suitable pins or the like. Legs 203 are secured to body 200 by ball and socket joints where indicated at 204a.

The stand 97 is that described in the copending application of myself and Jack W. Borger Serial, No. 36,310, filed June 15, 1960.

The fifth wheel stand 97 illustrated is intended to represent any conventional fifth wheel stand which may be operated in any conventional manner to secure the kingpin of a trailer body to the platform 14b, the improvement of this invention insofar as the fifth wheel stand is concerned being that the stand is secured to platform 14b, rather than to the railroad car body.

The chassis 75 of FIGURE 30 and the container body 86 may be of the type described in my application Serial No. 699,759, filed November 29, 1957, now Patent 3,070,041, granted December 25, 1962, but for purposes of my invention, the chassis and body can be of any suitable type providing for a kingpin 99 (which customarily is fixed to the chassis) and bracket structures 82 applied to the chassis longitudinal frame members 78 to have the spacing described in connection with FIGURES 26 and 27. Container 86 for purposes of this disclosure may be considered substantially identical to containers 74 of FIGURES 1-23, and is formed with the cone receiving recesses 84 and suitable eyes 76 for crane lifting the container from the chassis onto the railroad car.

In the embodiment of FIGURE 30, the chassis 75 and the container 86 as a unit may be transferred to car 95 by loading same in a manner similar to standard piggy-back practices, in which the trailer comprising the chassis 75 and the container 86 is either backed onto the car from its end by the trailer tractor, or the container and its chassis may be crane lifted onto the car in position for connection to a fifth wheel stand 97.

Also, the embodiment of FIGURE 30 is adapted to handle standard trailer bodies in like manner.

It should be understood that the railroad cars illustrated will also include such structures as may be necessary to make operative the conventional safety and other equipment required by A.A.R. regulations, some of which has already been referred to. For instance, the brake rigging and trainline conduits, and other similar equipment, may be secured to the center sill structure of the car in any suitable manner.

Hydraulic Cushion Device

The hydraulic cushion device 18 is preferably that described in the copending application of William H. Peterson, Serial No. 782,786, filed December 24, 1958, now Patent No. 3,035,827, granted May 22, 1962, the entire disclosure of which is hereby incorporated herein by this reference. The device 18 is a dissipative energy system type constant force travel long travel cushioning mechanism arranged to transfer and dissipate substantially all kinetic energy imposed upon the center sill structure 12 (or 12a) by draft and buff forces applied to the car couplers (in excess of the minor amounts absorbed by the draft gear and return springs of the device 18). This is to be distinguished from conservative energy type cushioning devices that merely store the energy on impact and return it in the form of oscillations. As described in said Peterson application Serial No. 856,963, device 18 is a 100 percent efficient cushion travel device meaning that it transfers and dissipates the required energy with minimum travel and with no uncontrolled recoil.

In other words, and as specified in said Peterson application Serial No. 856,963, the cushioning device 18 should have a travel of from about 20 inches to about 40 inches, or its equivalent, and be characterized by its ability to dissipate a sufficient amount of the energy of impact (other than that portion of such energy needed to recenter the cushioning device), either on closing of the device, or on closing and return of the device (note that the restricted flow of hydraulic liquid in cushioning device 18 on its return to normal is energy dissipating and thus cushion 18 has controlled recoil), so that the major portion of the remaining energy of impact is transmitted as kinetic energy to the load. Thus, in essence this makes the cushioning device 18 a dissipative energy system cushion as opposed to a conservative energy system cushion that stores and returns substantially all kinetic energy applied to it, although such dissipative energy system cushion should have sufficient energy storing and return characteristics to return the cushion and the rack to neutral or recentered position.

By employing the long travel cushioning device 18, the time required for the transfer of, for instance, the momentum of a striking car to a struck car (carrying a lading in question) is prolonged sufficiently to achieve the afore-described benefits that are disclosed in said Peterson application Serial No. 856,963.

The device 18 generally comprises (see FIGURES 24 and 25) the aforementioned tubular cylinder 62 in which piston head 64 is reciprocally mounted, tubular piston rod 66 affixed to piston head 64, and invaginating tubular member or boot 207 connected between the tubular cylinder 62 and the tubular piston rod 66, and the helical compression springs 72 extending between the closure members 68 and 70 of the tubular cylinder 62 and the tubular piston rod 66 and a spring seat 203.

The closure member 68 and tubular cylinder 62 carries a metering pin 209 that is reciprocally received within the bore 210 of the tubular piston rod 66. The metering pin 209 preferably is provided with a guide member 211 at its projecting end.

The internal surface 212 of tubular cylinder 62 is formed in any suitable manner as at 213 (see FIGURES 24 and 25) to receive three snap rings 214, 216 and 218. The snap ring 214 serves as a stop for piston head 64 when the device is in its extended position of FIGURE 24, while the snap rings 216 and 218 hold in place a piston rod guide member 220 to which one end 222 of the invaginating boot or tubular member 207 is secured by a suitable clamp 224. The other end 226 of the boot or tubular member 207 is turned outside in, and is secured to the external surface 228 of the piston rod 66 by a suitable clamp 230.

The device 18 is charged with hydraulic liquid as described in said copending application Serial No. 782,786 to completely fill the space defined by the tubular cylinder 62, the tubular piston rod 66, and the invaginating boot or tubular member 207. When in use, the device 18 has the normal positioning indicated in FIGURE 24, and in the illustrated arrangement, the device 18 engages the lugs 46 and stops 44 at both ends of, for instance, cushion pockets 50, as previously described. When the center sill structure 12 or 12a receives a shock either in buff or draft, either the tubular member 62 will commence movement to the left of FIGURE 24 or the tubular piston rod 66 and piston head 64 will commence movement to the right of FIGURE 24, or possibly both movements may occur. In any event, as the device 18 retracts under the force being pushed, the metering pin 209 displaces hydraulic liquid contained within the tubular piston rod 66 and the piston head 64 causes a hydraulic liquid flow through its orifice 232 through which the metering pin 209 extends. As shown, metering pin 209 is provided with a tapered surface 234 that preferably is designed to provide a constant force travel characteristic as the hydraulic cushion 18 contracts under the shock imposed on it; that is, the arrangement is such that for every unit of travel, the cushioning device provides a substantially constant cushioning effect.

As indicated in FIGURE 24, the oil flow then initiated is from the chamber 236 on the high pressure side of the piston head 64 through the orifice 232 and into the bore 210 of tubular piston rod 66, thence radially outwardly of the piston rod 66 through orifices or ports 233 of the tubular piston rod 66. As the hydraulic liquid within the tubular piston rod is displaced by the metering pin 209, it likewise moves through the ports 233, as indicated by the arrows in FIGURE 24. Metering pin guide member 211 is formed with relatively large apertures 240 to permit a free flow of hydraulic liquid during movement of the metering pin.

The hydraulic liquid flow through ports 238 is under relatively high velocity and creates great turbulence in the chamber 242 that is formed by the space between the tubular piston rod guide member 220 and the piston head 64. This great turbulence is caused at least in part by the radically directed flow of hydraulic liquid impinging directly against the inner surface 212 of tubular cylinder 62, and is responsible for dissipation of much of the kinetic energy of the hydraulic liquid in the form of heat.

As the contraction of the hydraulic cushion device 18 proceeds, the high pressure chamber 236 is reduced in volume by the advancement of the piston head 64 toward the tubular cylinder closure member 68. The hydraulic liquid passing through orifice 232 fills the chamber 242 behind the piston head 64, while a volume of hydraulic liquid equivalent to that displaced by the total entry into the fluid chamber of the piston rod 66 passes through apertures 244 of guide member 220 into the space 246 enclosed by the invaginating boot or tubular member 207 which inflates or expands and rolls to

the position suggested by FIGURE 25. The apertures 244 are relatively large in cross-sectional area which provides and permits the relatively large volume and consequently low pressure hydraulic liquid flow from chamber 242 to space 246. This avoids generation of any appreciable compressive force on the relatively slender metering pin and prevents any possibility of it buckling.

After the shock has been fully dissipated, the compression springs 72, acting in tandem, return the hydraulic cushioning components to the initial extended position of FIGURE 24. During this movement under the action of the compression springs, the oil flow illustrated in FIGURE 24 is reversed, and invaginating tubular member or boot 207 deflates and returns to the position of FIGURE 24 thereby insuring that the hydraulic liquid displaced by the piston head 64 and piston rod 66 is restored to its normal operative locations.

It will therefore be seen that not only is the device 18 composed of few and simple components, and that all sliding or dynamic seals are eliminated, but a reliable long travel cushioning action is provided. Furthermore, all kinetic energy applied to the cushion device, with the exception of the small potential energy stored in the return springs 72, is either dissipated in the form of heat by the passing of the hydraulic liquid through orifice 232 and the turbulence in chamber 242, or is transferred as kinetic energy (positive or negative, depending on the condition of impact) to the struck car with its load.

Reference may be had to said copending application Serial No. 782,786, for a more specific description of this unit. It may be added, however, that the tapering surface 234 of the metering pin 209 extends between points 250 and 252 (see FIGURE 24) and that the contour of tapered surface 234 in the illustrated embodiment is designed from the relationship $A_x = A_0 \sqrt{1 - x/d}$ wherein A_x is the orifice area of any position x (see FIGURE 24) along the total nominal stroke d (the length of the tapered surface 234), and A_0 is the initial orifice area defined by the orifice 232 at the beginning of a stroke, in the case where a completely rigid body is being cushioned from impact. While in most cases and for a given car weight this assumption will result in a reasonably efficient design, small alterations can be readily made to this shape to give it a closer approach to the optimum of constant force travel characteristic for a given situation after a few experimental trials. However, the shape given by the above formula is the best starting point. Furthermore, it is usually possible to obtain a reasonably efficient design by approximating the curved shape given by the above expression as by calculating a series of spaced cross-sectional areas so determined by straight tapers, if this facilitates manufacture. Moreover, the pin could be contoured so as to provide for the desired stroke of from about 20 to 40 inches while having a reserve stroke which would give a substantially higher force travel characteristic than that throughout the normal stroke, in order to protect against overloads or other unusually severe condition. In fact, there is no limit to the possibilities of how the pin might be shaped to suit special situations or the application of existing knowledge of this art. The orifice areas referred to are the orifice areas of orifice 232 minus the cross-sectional area of the metering pin at any given position along the stroke of the metering pin.

The components of the unit 18 may be formed from any suitable materials, boot 207 of the illustrated embodiments being formed from suitable impervious, flexible, rubber-like material with special additives for low temperature flexibility and clamps 224 and 230 being of the type of clamp sold under the trademark "PUNCH-LOK," made and sold by the Punch-lok Company of Chicago, Illinois. The unit 18 of the illustrated embodiments is preferably charged with the high viscosity index oil sold by Shell Oil Company under the trade designation AERO-SHELL NO. 4, as this oil desirably has a relatively

small variation in viscosity between the extremes of minus 60 degrees F. and 150 degrees F.

The hydraulic liquid when the device 18 is in fully extended position is under very little pressure, perhaps no more than 2 p.s.i., but even though the pressures in the high pressure chamber 236 may rise to as much as 8,000 p.s.i. as when the device is employed in railroad cars to cushion buff and draft forces, the maximum pressure within the invaginating boot 207 (when fully inflated) is believed to be about 10 p.s.i. Boot 207 stretches about 100 percent when fully inflated. Units 18 can be designed for operating pressures up to the limit of the yield strength of cylinder 62 and the device of FIGURES 24 and 25 when employed as indicated, is capable of handling kinetic energy on the order of a million foot pounds, depending, of course, on the specific design required for a specific purpose. Units 18 will thus easily handle 15 mile per hour impacts when applied to, for instance, the railroad car structures of FIGURES 1-23 and 26-34.

Distinguishing Characteristics of the Invention

It will therefore be seen that I have provided a highly simplified railroad car for transporting containers which is composed of an underframe comprising essentially a center sill structure of inverted open box-shaped configuration and a cushioned platform or carriage, together with a cushioning arrangement having the characteristics described in said Peterson application Serial No. 856,963.

My invention not only conforms to the principles described in said Peterson application Serial No. 856,963, but the spacing of the sill members of the car underframe and container support platform or carriage together with the similar spacing of the container support bracket structures permits standardization of freight container equipment, at least to the extent that the same latching devices may be used on both the highway vehicle and railway vehicle employed. This spacing also permits both crane loading and car end loading of trailers in the embodiments of FIGURES 29 and 30, and in all embodiments insures that the container is supported in a similar manner by both its trailer chassis and the railroad car.

The relation between the spacing of the underframe and cushion platform sill members in the embodiments of FIGURES 1-29 insure that the load carried by the platform sills is transmitted vertically to the underframe sills, thus eliminating the need for load bearing cross bearers. The sill members of the car underframes of FIGURES 1-29 are also adapted to receive between them a sliding draft and buffing column of the type described in said Peterson application Serial No. 856,963, in which case the cushioning arrangement may be as described in said Peterson application Serial No. 856,963, and platforms 14, 14a and 14b may be fixed, as by welding, directly to the top plate structure of the underframe.

Furthermore, the spacing of the individual pairs of container support bracket structures on the railroad car platform or carriage permits the car to be loaded with containers of different lengths, and since the containers are separably removable, the same car can readily handle containers destined for different arrival points.

When a fifth wheel stand arrangement is applied to the platform or carriage in the manner suggested by FIGURE 30, this further increases the dexterity of the platform, and permits trailers to be transported with or without containers and receive the benefits of the invention described in said Peterson application Serial No. 856,963.

In this connection, it should be noted that each of the car arrangements of FIGURES 29-34 is a dual purpose car characterized by the fact that in a given load-carrying area of the car, as for example a given half of the car, the freight load may be carried either in a semitrailer or in demountable freight containers, with the trailer being secured to the fifth wheel stand in said area with its

wheels disposed on either side of the rack sills, and the container being secured to the rack.

The term "highway vehicle chassis longitudinal frame member spacing" as employed in the appended claims means the spacing customarily employed between the longitudinal frame members of highway trucks or chassis, which is in the range of between 34 and 40 inches.

The foregoing description and the drawings are given merely to explain and illustrate my invention and the invention is not to be limited thereto, except insofar as the appended claims are so limited, since those skilled in the art who have my disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

I claim:

1. A skeleton railroad car for transporting containers comprising an underframe structure composed essentially of a center sill structure defined by a pair of longitudinally extending sill members joined together by spaced cross ties to provide a highway vehicle chassis longitudinal frame member spacing, a top plate structure secured between the tops of said sill members and extending longitudinally of the sill members, said center sill structure carrying bolster structures each adapted for connection to a railroad car truck, a container support carriage positioned on said top plate structure, means for mounting said carriage on said top plate structure for movement longitudinally thereof, said carriage comprising sill members disposed transversely of the center sill structure and joined together by spaced cross ties to have a highway vehicle chassis longitudinal frame member spacing, said carriage sill members being respectively vertically aligned with said center sill structure sill members, and spaced pairs of container support bracket structures carried by and secured to said carriage and including means for releasably securing a container when mounted on said bracket structures to said carriage, with the brackets of each pair of brackets being disposed on either side of said carriage and in vertical alignment with the respective sill members of said underframe and carriage, respectively and cushioning means operatively interposed between said underframe structure and said carriage for cushioning said carriage against impact forces acting longitudinally of said underframe structure.

2. A skeleton railroad car for transporting containers comprising an underframe structure composed essentially of a center sill structure defined by a pair of longitudinally extending sill members joined together by spaced cross ties to provide a highway vehicle chassis longitudinal frame member spacing, said sill members each comprising an elongate plate structure disposed in a substantially vertical plane, a top plate structure secured between the top edges of said sill members and extending longitudinally of the sill members, said center sill structure carrying bolster structures each adapted for connection to a railroad car truck, a carriage positioned on said top plate structure, means for mounting said carriage on said top plate structure for movement longitudinally of said center sill structure and comprising sill members disposed transversely of the center sill structure and joined together by spaced cross ties to have a highway vehicle chassis longitudinal frame member spacing, said carriage sill members being respectively substantially vertically aligned with said center sill structure sill members, spaced pairs of container support bracket structures carried by said carriage, with the bracket structures of each pair of bracket structures being disposed on either side of said carriage and in vertical alignment with the respective sill members of said underframe structure and carriage respectively, and cushioning means interposed between said center sill structure and said carriage for cushioning said carriage and containers supported thereon against impact forces acting longitudinally of said underframe structure.

3. A skeleton railroad car for transporting containers comprising an underframe structure composed essentially

of a center sill structure defined by a pair of sill members extending longitudinally of the car and joined together to provide a highway vehicle chassis longitudinal frame member spacing, said sill members each comprising an elongate plate structure disposed in a substantially vertical plane, a top plate structure secured between the top edges of said sill members and extending longitudinally of the sill members, said center sill structure carrying bolster structures each adapted for connection to a railroad car truck, said top plate structure being substantially horizontally disposed and interrupted along the longitudinal center of the car to define a cushion pocket, a cushion carrier plate fixed across said top plate structure interruption, said cushion carrier plate being downwardly indented longitudinally of the car, a stop member fixed to said cushion carrier plate adjacent each end of said interruption, a cushioning device interposed between said stop members, a carriage mounted on said top plate structure for movement longitudinally of said center sill structure and comprising sill members extending longitudinally of the car and spaced transversely of the center sill structure and joined together to have a highway vehicle chassis longitudinal frame member spacing, said carriage sill members being respectively vertically aligned with said center sill structure sill members, spaced pairs of container support bracket structures carried by said carriage, with the bracket structures of each pair of bracket structures being disposed on either side of said carriage and in vertical alignment with their respective sill members of said underframe and said carriage respectively, said carriage including spaced pairs of frame members extending transversely of the car and positioned on either side of said center sill structure top plate structure interruption, said transversely extending frame members of each pair being joined by brace plate means, a pair of rigid frame members extending longitudinally of the car and fixed between said pairs of transversely extending members and disposed on either side of said cushion device and said stop members, said rigid members each having fixed thereto a lug in alignment with the respective stop members transversely of the car adjacent each end of said cushion device and in alignment with the respective ends of said cushion device longitudinally of the car, and means for guiding the movement of said carriage longitudinally of said car during operation of said cushion device.

4. The car set forth in claim 3 wherein said carriage guide means comprises spaced upright members fixed to said top plate structure and disposed in guiding relation with the inner edges of said carriage sill members.

5. The car set forth in claim 3 wherein said carriage sill members each include an outwardly directed flange, and wherein said carriage guide means comprises spaced hooked members fixed to said top plate structure and received over said carriage sill member flanges respectively, and an antifriction pad interposed between each of said hooked members and the undersurface of said carriage sill members.

6. The car set forth in claim 3 wherein said bracket structures comprise a cone-shaped member pivoted to the respective carriage sill members, for movement between a position resting on top of the respective sill members to a position wherein the cone-shaped member is disposed below and to one side of the respective sill members, and means for releasably locking said cone-shaped members in their first mentioned positions.

7. The car set forth in claim 3 wherein laterally directed support members are affixed to the outer surface of said center sill structure sill members for providing supports for highway vehicle chassis wheels.

8. The car set forth in claim 3 wherein spaced roller assemblies are interposed between said center sill structure top plate structure and said carriage, said roller assemblies each comprising spaced rollers, a roller frame

journalling said rollers, and pin means securing the respective roller frames to said carriage.

9. The car set forth in claim 8 wherein said cushion device comprises a pair of telescoping members, return spring means encircling said telescoping members to bias them against the respective stop members and lugs adjacent each end of said cushion device, and hydraulic means for effecting a constant force travel cushion force on closure of said cushion device.

10. The car set forth in claim 9 including booster return spring means interposed between said center sill structure and said carriage at a point spaced from said cushion device.

11. Apparatus for handling freight comprising a railroad car body including a deck having a width sufficient to support the wheels of highway vehicle chassis, a rack carried by said body, means for mounting said rack on said body for movement longitudinally of said body, said rack being substantially centered along the longitudinal axis of said car body and comprising spaced sills extending longitudinally of said body and joined together by cross ties to have a highway vehicle chassis longitudinal frame member spacing, a plurality of container support means carried by said sills for supporting a freight container on said rack, said container support means being spaced longitudinally of the rack and including container engaging means for directly supporting the container, said container engaging means having said spacing laterally of said rack, and a cushioning device operatively interposed between said car body and said rack, said rack including fifth wheel stand means for securing highway vehicle chassis thereto, whereby, both freight containers and highway vehicle chassis may be carried by said body, with the containers resting on said container engaging means of said rack, and the highway vehicle chassis being secured to said rack by said fifth wheel stand means and having its wheels disposed on either side of said sills.

12. Apparatus for handling freight comprising a railroad car body including a deck having a width sufficient to support highway vehicle chassis, a rack carried by said body, means for mounting said rack on said deck for movement longitudinally of said body, said rack being substantially centered along the longitudinal axis of said car body and comprising spaced sills extending longitudinally of said body and joined together by spaced cross ties to have a highway vehicle chassis longitudinal frame member spacing, spaced bracket means spaced longitudinally of said rack for releasably mounting a freight container on said rack by seating same solely on said rack sills, said bracket means being mounted on said sills and a cushioning device operatively interposed between said car body and said rack, said car body carrying fifth wheel stand means for securing highway vehicle chassis thereto, whereby, both freight containers and highway vehicle chassis may be carried by said body, with the containers resting on said rack and the chassis being secured to the body by said stand means and having its wheels disposed on either side of said sills.

13. Apparatus for handling freight comprising a railroad car body including a deck having a width sufficient to support highway vehicle chassis, means for supporting said body for travel over the rails of a track, a rack carried by said body, means for mounting said rack on said body for movement longitudinally of said body, said rack being substantially centered along the longitudinal axis of said car body and comprising a frame structure including spaced sills extending longitudinally of said body and having a highway vehicle chassis longitudinal frame member spacing, and cross tie means fixed between said sills at points spaced longitudinally of said rack to join said sills together with said spacing, means for securing a freight container to said rack sills including latch means for releasably securing the container to the rack for movement therewith longitudinally of the car body,

and cushioning means operatively interposed between said car body and said rack for cushioning the rack and container carried thereby against impact forces acting longitudinally of the car body, said car body carrying fifth wheel stand means for securing highway vehicle chassis thereto, whereby, both freight containers and highway vehicle chassis may be carried by said car body, with the containers resting on said rack and the chassis being secured to the body by said fifth wheel stand means and having its wheels disposed on either side of said rack sills.

14. Apparatus for handling freight comprising a railroad car body including a deck having a width sufficient to support highway vehicle chassis, means for supporting the body for travel over the rails of a track, a rack carried by said body, means for mounting said rack on said deck for movement longitudinally of said body, said rack being substantially centered along the longitudinal axis of said car body and comprising a frame structure including spaced sills extending longitudinally of said body and positioned to have a highway vehicle chassis longitudinal frame member spacing, and cross tie members fixed between said sills at positions spaced longitudinally of said rack to join said sills together to have said spacing, means for securing a freight container to said rack including latch means for releasably securing the container to the rack for movement therewith longitudinally of the car body, and cushioning means operatively interposed between said car body and said rack for cushioning the rack and container when secured thereto against impact forces acting longitudinally of the car body, said rack including fifth wheel stand means secured thereto and carried thereby for securing highway vehicle chassis thereto, whereby both freight containers and highway vehicle chassis may be carried by said car body, with the containers secured to said rack and the chassis being secured to the body by said fifth wheel stand means and having its wheels disposed on either side of said rack sills.

15. A skeleton railroad car for transporting containers comprising an underframe structure composed essentially of a center sill structure defined by a pair of longitudinally extending sill members joined together by spaced cross ties to have a highway vehicle chassis longitudinal frame member spacing, a top plate structure secured between the tops of said sill members and extending longitudinally of the sill members, said center sill structure carrying spaced bolster structures each including means for operatively connecting same to a railroad car truck, a container support rack positioned on said top plate structure, means for mounting said rack on said plate structure for movement longitudinally of said underframe structure, said rack comprising sill members disposed transversely of the center sill structure to have a highway vehicle chassis longitudinal frame member spacing, said rack sill members being respectively vertically aligned with said center sill structure sill members, cross tie members fixed between said rack sill members at positions spaced longitudinally of said rack to join said rack sill members together to have said spacing, and means for mounting a freight container on said rack sills including latch means for releasably securing the container to the rack for movement therewith longitudinally of the underframe structure, and cushioning means operatively interposed between said underframe structure and said rack for cushioning said rack and the container when carried thereby against impact forces acting longitudinally of said underframe structure.

16. The car set forth in claim 15 wherein said rack comprises spaced support assemblies spaced apart longitudinally of said rack and joined by elongate members that are spaced apart transversely of said rack and extend longitudinally of the car when said rack is applied thereto, said elongate members comprising said sill members, said support assemblies each including spaced parallel brace members extending normally of said elongate members

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and having like ends joined together by a pair of spaced framing members, said brace members comprising said cross tie members, and a roller assembly secured between the framing members of each pair of framing members, said roller assemblies each comprising a pair of parallel plates having a roller journaled therebetween adjacent each end thereof, and pin means positioned between the rollers of each roller assembly and between said plates of each pair of plates for pivotally securing the respective roller assemblies to the respective pairs of framing members.

17. The skeleton railroad car set forth in claim 15 wherein said underframe structure defines a relatively deep center portion and relatively shallow end portions, said bolster structures being secured to each of said end portions, said end portions of said center sill structure being indented transversely inwardly of said center sill on either side of said bolster structures to form a wheel well for the respective railroad car truck wheels, said bolster structures each comprising a bolster member on either side of said center sill structure including a substantially U-shaped outwardly projecting plate having its legs horizontally disposed and fixed to said center sill structure, vertically disposed web plates fixed between the opposite sides of the respective U-shaped plates and said center sill structure and extending transversely of the center sill structure, a pair of vertically disposed web members fixed between said sill members of said center sill structure and aligned with the respective web plates transversely of the center sill structure, a reinforcing plate structure fixed between the lower edges of said center sill structure sill members and in alignment with said U-shaped plates transversely of said center sill structure, said reinforcing plate structure carrying center plate means for operative engagement with the respective railroad car trucks, and truck kingpin receiving means fixed to said reinforcing plate structure between said vertically disposed web members.

18. The car set forth in claim 17 wherein at the ends of said center sill structure an inverted channel shaped housing is mounted between and spaced from the respective center sill members to form a draft gear pocket, said housing being in longitudinal alignment with said center sill structure and including horizontally disposed brace plates fixed between the respective housings and the adjacent center sill members.

19. Apparatus for handling freight comprising a railroad car body including a deck having a width sufficient to support a highway vehicle chassis and a lading supporting container carried thereby, means for supporting said body for travel over the rails of a track, a platform carried by said body, means for mounting said platform on said body for movement longitudinally of said body, said platform being substantially centered along the longitudinal axis of said car body and having a width equivalent to a highway vehicle chassis longitudinal frame member spacing, means for releasably securing a demounted freight container to said platform, fifth wheel stand means for securing highway chassis to said platform when the chassis is received on said body with the wheels of the chassis disposed on either side of said platform, and cushioning means operatively interposed between said car body and said platform for cushioning the platform and the containers secured thereto against impact forces acting longitudinally of the car body, whereby chassis carried loads and freight container loads are cushioned by common cushioning means.

20. In a railroad freight car adapted to carry a freight load either by piggyback or by freight container, said car having a load-carrying deck having a width sufficient to support wheels of highway trailers, fifth wheel stand means carried by the car for securing a trailer to a specified load carrying area of the deck, and a rack also carried by the car in said area, said rack being substantially centered along the longitudinal axis of the car and comprising spaced sills extending longitudinally of the car

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and having a spacing transversely of the car to proportion said rack to be received between the wheels of trailers when trailers are positioned on said deck, said spacing being at least a highway vehicle chassis longitudinal frame member spacing, means for supporting said rack on said car for movement longitudinally of the car, means for securing a freight container to said rack including latch means for releasably securing the container to said rack for movement therewith longitudinally of the car, and cushioning means operatively interposed between said car and said rack for cushioning said rack and a container when secured to said rack against impacts delivered to the end of the car, whereby either freight containers or highway trailers may be carried in said load carrying area of said car, with the containers being secured to said rack and the trailers being secured to the car by said fifth wheel stand means and having their wheels disposed on either side of said rack sills.

21. A dual purpose railway freight car capable of carrying railway freight on the car either in large demounted freight containers or in highway vehicle semi-trailers, said car comprising a wheeled underframe supporting longitudinally extending trackways extending the length of the car along the sides of the car for supporting the wheels of a semi-trailer; a cushion rack mounted on the car underframe, said cushion rack lying between said trackways and having a width at least as great as a highway vehicle chassis longitudinal frame member spacing but less than the distance between the wheels of the semi-trailers; means for detachably mounting a freight container in operative association with said rack, and cushion means interposed between the car underframe and the point or points of connection between said cushion rack and the container for cushioning freight in said container against longitudinal impacts delivered to the car; and a retractable fifth wheel stand mounted on the car substantially along the center line thereof and in the same area of the car as said rack, whereby when raised said stand may be secured to the fifth wheel plate of a semi-trailer to be carried by the car with the wheels of said semi-trailer resting in said trackways on opposite sides of said rack, and when said stand is lowered said cushion rack may be used for operatively carrying a freight container with the container thereby being cushioned against longitudinal impact shocks.

22. Apparatus for handling freight comprising a railroad car body including a deck having a width sufficient to support highway vehicle chassis, a rack carried by said body, means for mounting said rack on said body for movement longitudinally of said body, said rack being substantially centered along the longitudinal axis of said car body and comprising spaced sills joined together by cross ties to have a highway vehicle chassis longitudinal frame member spacing, spaced pairs of freight container support bracket structures carried by said rack, with the bracket structures of each pair of bracket structures being disposed on either side of said rack and in vertical alignment with the respective sills thereof, and a cushioning device operatively interposed between said car body and said rack for cushioning container loads applied to said rack, said rack including fifth wheel stand means carried thereby for securing trailer chassis thereto, whereby both freight containers and trailer chassis may be carried by said body, with the containers resting on said support brackets and the trailer chassis being secured to the rack by said stand means and having its wheels disposed on either side of said sills.

23. Apparatus for handling freight containers comprising a vehicle body structure having a width sufficient to support highway vehicle chassis and including means for mounting said body structure for movement over the rails of a track, a rack carried by said body structure, means for mounting said rack on said body structure for movement longitudinally of said body structure, said rack being substantially centered along the longitudinal axis of said

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body structure and comprising spaced sills extending longitudinally of said body structure and secured together by cross tie means to have a spacing transversely of said body structure to proportion said rack to be received between the wheels of trailer chassis when trailer chassis are positioned on said body structure, said spacing being at least a highway vehicle chassis longitudinal frame member spacing, means for mounting a freight container on said body structure including latch means for releasably securing the container to the rack for movement therewith longitudinally of the body structure, and cushioning means operatively interposed between said body structure and said rack for cushioning the rack and container when the container is carried by said body structure against impact forces acting longitudinally of said body structure, said body structure carrying fifth wheel stand means for securing highway vehicle chassis thereto, whereby both freight containers and highway vehicle chassis may be carried by said body structure, with the containers being secured to said rack and the chassis being secured to said body structure by said stand means and having its wheels disposed on either side of said rack sills.

24. In a railroad flatcar including a deck having a width sufficient to support a highway vehicle chassis, a double acting impact absorbing arrangement for protecting highway vehicle chassis and freight container loads carried by the car, said arrangement comprising a rack positioned on the flatcar deck and defined by spaced parallel elongate sills extending longitudinally of the car and connected together by spaced cross ties to have a

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highway vehicle chassis longitudinal frame member spacing, means for mounting said rack on the car for movement longitudinally thereof, said rack being substantially centered along the longitudinal axis of said car, means for releasably securing a freight container to said sills, said rack further comprising a cushion pocket arrangement including a pair of cushion abutment members positioned between the respective rack sills, with said abutment members being aligned longitudinally of said sills and spaced from each other longitudinally of said sills, said abutment members being fixed with respect to said rack, and double acting cushion means operatively interposed between said abutment members and the car for cushioning the rack and its load against impact forces acting in either direction longitudinally of the car, said sills and said cushioning means being in substantially coplanar relation, said flatcar carrying fifth wheel stand means for securing highway vehicle chassis thereto, whereby highway vehicle chassis may be carried by the car with the chassis being secured to the car by said stand means and having its wheels disposed on either side of said rack.

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