July 4, 1939. S. M. NAMPA 2,164,662

CAR LOADING DEVICE

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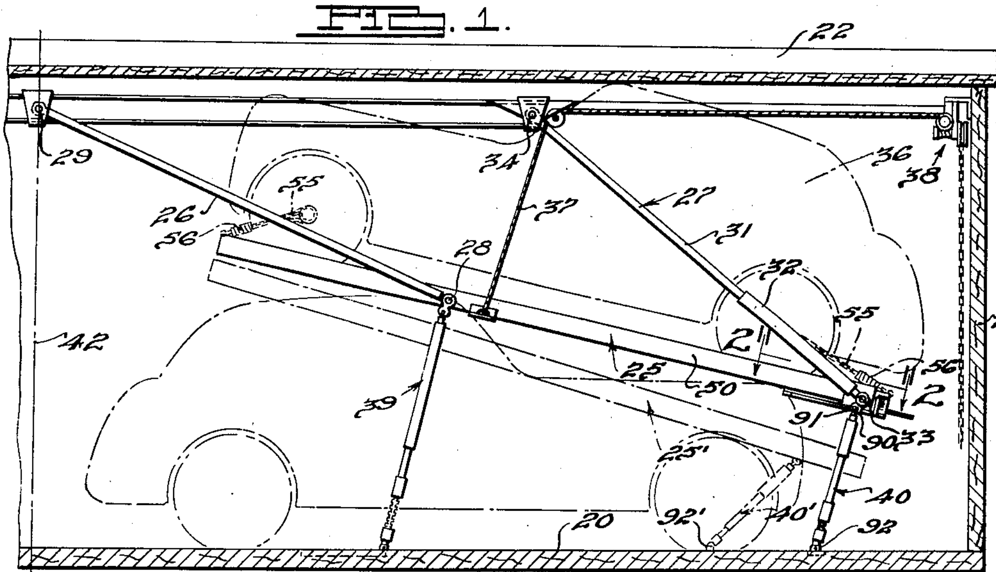
FIG. 1.



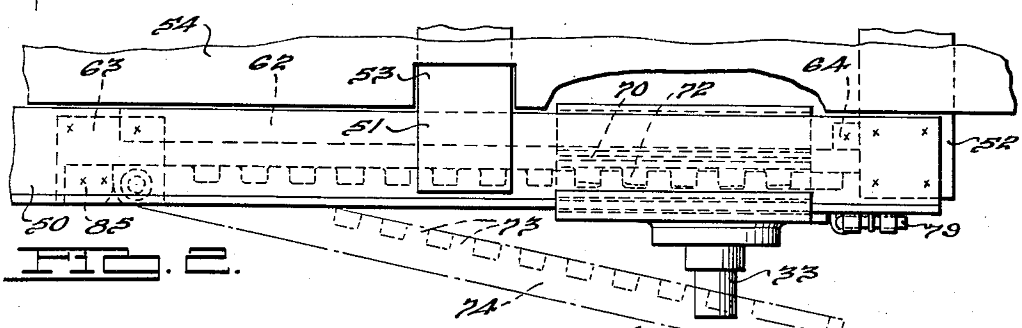


FIG. 2.

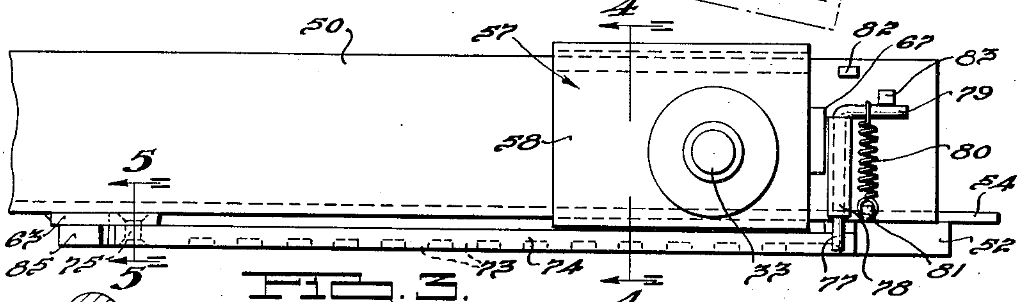
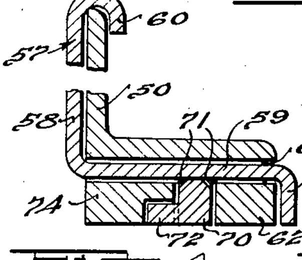


FIG. 3.



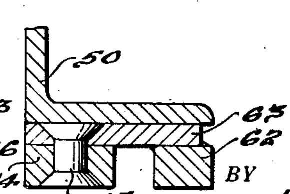


FIG. 4. FIG. 5.

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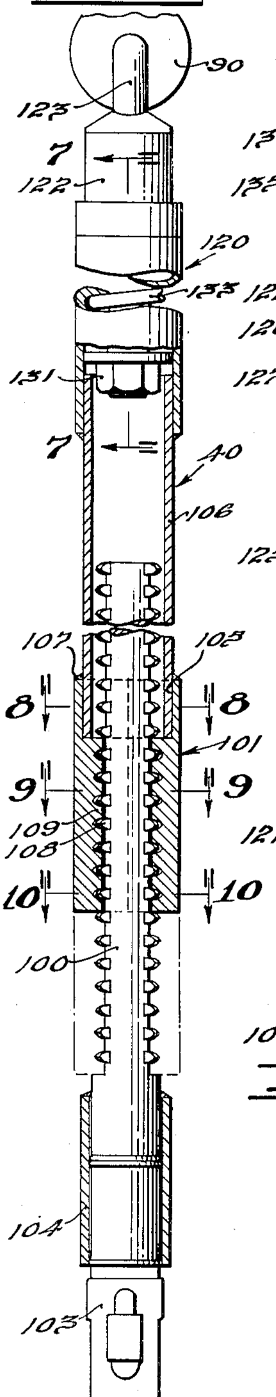
Fig. 6.



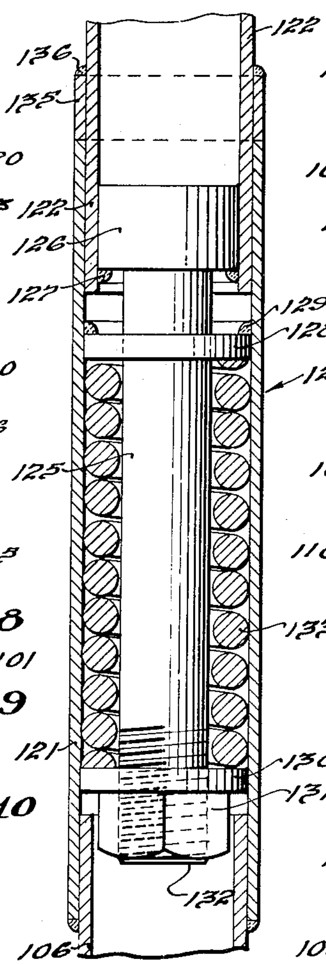
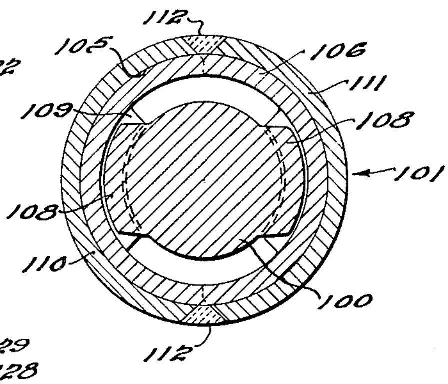


Fig. 7.

Fig. 8.



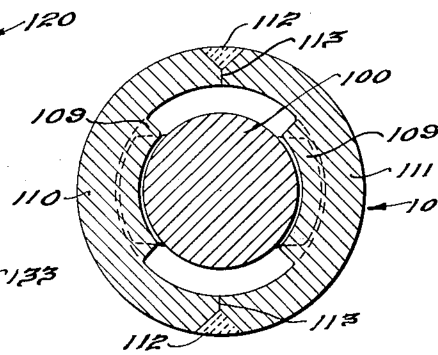


Fig. 9.

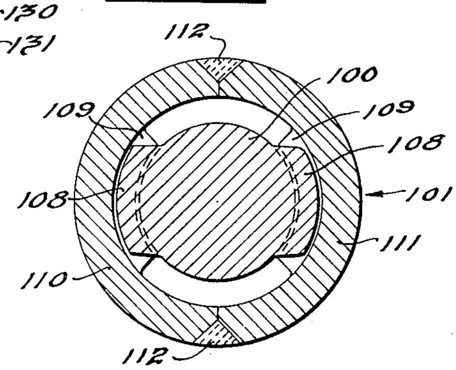


Fig. 10.

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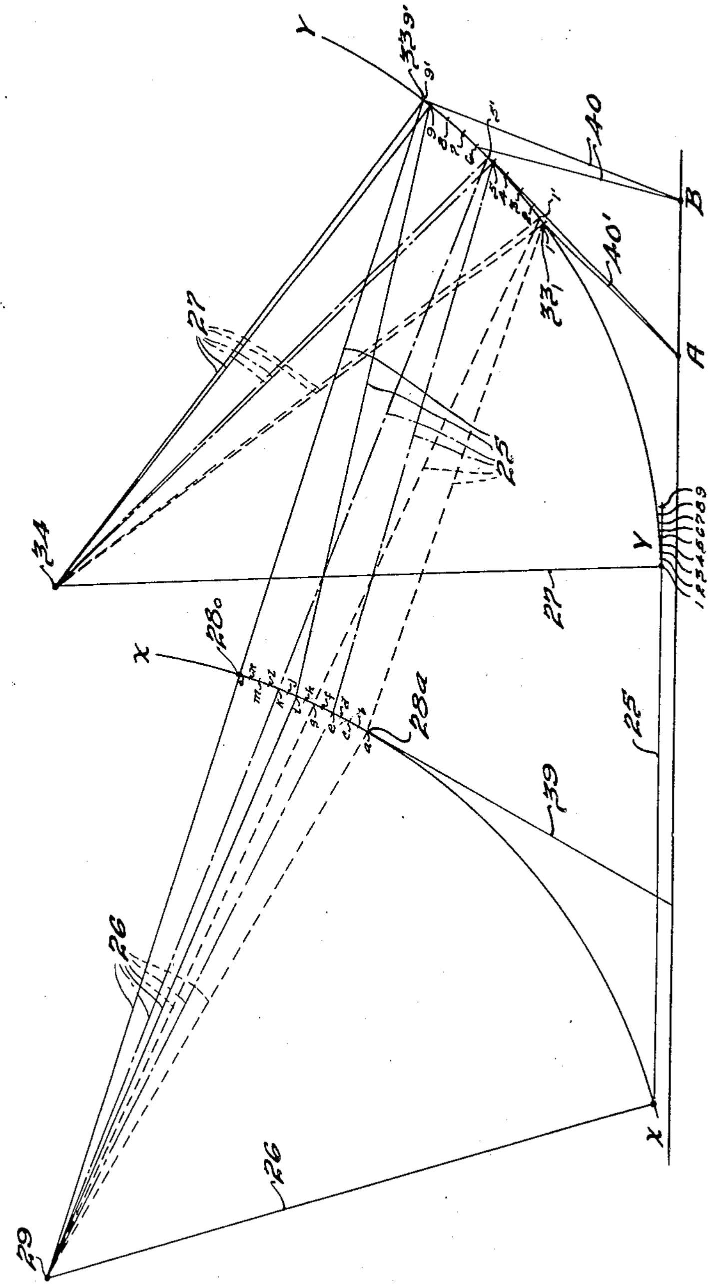

FIG. 11.

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Patented July 4, 1939 2,164,662

UNITED STATES PATENT OFFICE

2,164,662

CAR LOADING DEVICE

Sulo M. Nampa, Detroit, Mich., assignor to The Worth Company, Detroit, Mich., a corporation of Michigan

Application July 8, 1937, Serial No. 152,600

18 Claims. (Cl. 105—368)

The present invention relates to car loading devices of the type disclosed in the patent to Samuel D. Butterworth 2,079,930, granted May 11, 1937, which devices are in extensive use for loading automobiles in freight cars. More particularly the present invention comprises a complete system for independently adjusting the height of both ends of the loading frame when in transport position.

This application is a continuation in part of applicant's copending application, Serial No. 57,206, filed January 2, 1936.

One of the objects of the present invention is to provide means for independently adjusting the height of both ends of the frame without removing the load from the swinging arms which connect the frame to the roof of the car.

Another object is to provide means for elevating or lowering the transport position of the lower end of the frame without changing the transport position of the upper end of the frame.

Another object is to provide means for elevating or lowering the transport position of the upper end of the frame without substantially changing the position of the lower end of the frame.

A further object is to provide means whereby the elevation of the upper end of the frame may be adjusted after the lower end of the frame is secured in position by the supporting struts.

Another object of the invention is to provide a resilient or floating support for one end of the loading frame in order to cushion jars and jolts.

Other objects include the provision of means whereby all of the above adjustments can be made without eliminating the load on the frame supporting arm; and the provision of means of the type mentioned which is simple in construction and operation, and inexpensive to manufacture.

Other objects and advantages will become apparent from the following specification, the accompanying drawings and the appended claims.

In the drawings.

Figure 1 shows a longitudinal sectional view of one end of a freight car showing a loading device of the type mentioned, and illustrating the manner in which it is utilized to transport automobiles.

Fig. 2 is a fragmentary plan view of a portion of the frame showing the means for adjustably mounting one of the swinging arm trunnions thereon.

Fig. 3 is a side elevation of the structure shown in Fig. 2.

Fig. 4 is a section taken on the line 4—4 of Fig. 3.

Fig. 5 is a section taken on the line 5—5 of Fig. 3.

Fig. 6 is a longitudinal sectional view of one of the adjustable struts utilized to secure the lower end of the frame in transport position.

Fig. 7 is a longitudinal sectional view of a portion of the strut taken on line 7—7 of Fig. 6.

Figs. 8, 9 and 10 are transverse sectional views taken on the line 8—8, 9—9 and 10—10 of Fig. 6, respectively, showing the internal construction of the strut.

Fig. 11 is a diagrammatic illustration of the manner in which the various types of adjustment of the loading frame are effected.

Referring to the drawings, and particularly to Fig. 1 thereof, there is shown a portion of a freight car having a floor 20, an end wall 21, and a roof 22 all of conventional construction. Mounted within the freight car is an automobile loading frame indicated generally at 25, which is secured to the freight car by means of a pair of rigid swinging arms 26 at one end thereof, and a pair of telescoping swinging arms 27 at the opposite end thereof. Arms 26 are pivotally connected to trunnions 28 fixedly secured adjacent the forward end of the frame, and are pivotally connected at their upper ends to the freight car at 29. The telescoping struts 27, each of which is formed of a pair of relatively telescoping members 31 and 32 respectively, are pivotally secured to trunnions 33 carried by the lower end of the frame 25, and are pivotally connected to the freight car at their upper ends at 34. The arrangement is such that the loading frame 25 may be swung from a position wherein it rests flat upon the floor of the car to the position shown in Fig. 1 of the drawings, wherein it supports an automobile, indicated in broken lines at 36, in an inclined elevated position. After the frame is swung to the transport position, shown in Fig. 1 of the drawings, by means of a cable 37 and a hoist mechanism indicated generally at 38, strut members 39 and 40 are pivotally secured to the frame and to the floor of the car for holding the frame in the transport position.

In order to avoid side sway of the frame during transportation there is preferably provided an anti-side sway device. Inasmuch as the frame is adjustable in height this anti-side sway device is preferably constructed in the manner disclosed in applicant's aforementioned copending application, Serial No. 57,206, filed January 2, 1936. While only one side of the frame is shown in the drawings and described hereinafter, it will be understood that the arms 26 and 27, the struts 39 and 40, the cable 37 and all other features are duplicated at the opposite side of the frame.

The loading frame and supporting arms 26 and 27 are so designed that during movement of the frame from its loading position on the floor of the car to its inclined elevated transport position shown in solid lines in Fig. 1, the telescoping strut 27 remains at its full length and assists in supporting the frame and automobile in elevated position. However, when it is desired to utilize the freight car for other purposes than transporting automobiles, the frame may be swung into proximity with the roof of the freight car, during which movement upwardly from the position shown in Fig. 1, the telescoping strut 27 shortens in length and the frame 25 and arm 26 swing upwardly about the pivotal connection 29 of the arm 26 with the freight car.

The structure so far described corresponds in general to that of the aforementioned Butterworth patent, and operates in the manner described in greater detail therein. However, in the structure disclosed in the aforementioned Butterworth patent it is impossible to adjust either the elevation or inclination of the loading frame without causing a telescoping collapse or shortening of the telescoping arm 27. This is undesirable inasmuch as it is highly advantageous to distribute at least a part of the supporting load upon the swinging arm 27.

In recent years, the over-all size of commercial passenger automobiles has gradually increased particularly with reference to the overall length and to the height of the forward end of the automobile with the result that it has become increasingly difficult to place four automobiles in a single freight car. Some indication of the manner in which present day automobiles must be crowded in order to accommodate four in a single freight car is indicated by Fig. 1 in the drawings wherein is shown two standard commercial models of a well known make of automobile positioned in one end of a freight car, in conjunction with the loading device of the present application. It will be noted that the forward portion of the hood and the forward portion of the roof of the automobile located upon the loading frame are in very close proximity to the roof of the freight car and that it would be substantially impossible to increase the height of either end of the frame without danger of interference. At the same time it will be noted that the forward portion of the hood and the forward portion of the roof of the car which rests upon the floor are likewise in exceedingly close proximity to the loading frame, with the result that it would be impossible either to lower the frame or to advance the automobile which rests upon the floor of the freight car any closer to the end wall 21. Moreover it will be noted that the rear end of the automobile which is located upon the floor of the freight car is in very close proximity to the transverse center line 42 of the freight car. Accordingly, if the automobile positioned on the floor was of any greater length or was located any further from the end wall of the freight car, it would interfere with the corresponding automobile positioned upon the floor of the opposite end of the freight car. It is apparent therefore that it is essential to so design the loading frame supporting structure that the height and inclination of the loading frame very closely corresponds to the shape of the automobile which is to be loaded. This of course can be done in designing a structure of the type shown in the aforementioned Butterworth patent, but the difficulty resides in the fact that the same loading mechanism must be used on various makes and models of automobiles and no two makes of automobiles are of exactly the same size or shape in the same year, and furthermore the size of each model varies from year to year.

In applicant's aforementioned copending application, Serial No. 57,206, filed January 2, 1936, means are shown for adjusting the height of the upper end of the frame. Such means while satisfactory will permit only a limited amount of adjustment in the height of only the upper end of the frame, and in addition any lowering of the frame from the maximum height shown, will result in a collapse of the rear swinging arms, which are telescoping. This is undesirable as it relieves those arms of all load. As a matter of fact, it is found that the variations in height and length between the various current models of commercial passenger automobiles is quite substantial and that as a result it is absolutely impossible to load different makes of automobiles in a loading device of the present type without substantially changing not only the height of both ends of the loading frame but also its inclination for the various models. Moreover, these adjustments must be very accurately made within relatively small limits.

Accordingly, the present invention contemplates means for elevating either end of the loading frame by any desired number of small increments independently of the opposite end of the frame in order to accommodate automobiles of various sizes and shapes with the same loading mechanism. Generally speaking this object is accomplished by providing means for adjusting the length or effective length of the supporting struts 39 and 40 in combination with means for varying the spacing between the arm trunnions 28 and 33. As will appear hereinafter, it is necessary to co-ordinate the adjustment in the effective length of the struts 39 and 40 with adjustments in the spacing of the trunnions 28 and 33, in order to produce an operative structure and one wherein the adjustment will not effect telescoping collapse of the arm 27.

The means for adjusting the trunnion 33 longitudinally of the frame and thereby adjusting the distance between the trunnions 28 and 33, which will now be described, is shown in detail in Figs. 2–5 inclusive. The loading frame which is preferably constructed in the manner shown in greater detail in applicant's copending application, Serial No. 57,670, filed January 6, 1936, comprises a pair of side frame angle members 50 connected adjacent the lower end of the frame by a pair of transverse members 51 and 52. The transverse members are welded to the horizontal flanges of member 50, member 51 being welded to the top surface of this flange and then deflected downwardly at 53 in order that its top surface will be in the same plane as that of transverse member 52 which is welded to the under surface of the flange. A plate or pan 54 rests upon members 51 and 52 and is adapted to receive one of the wheels of the automobile to support the same. When the automobile is positioned on the frame, it is resiliently secured against displacement by means of chains 55 having spring sections 56.

The adjustable trunnion 33 is welded or otherwise permanently secured to a slide 57 which is generally of angle formation with vertical and horizontal legs 58 and 59, adapted to embrace the legs of the side frame member 50. The upper edge of the vertical leg 58 of the slide is bent at 60 over the top of the side flange of the angle frame member 50; and the horizontal leg 59 of the slide is held in proximity to the member 50 by means of a bar 62, which is secured in spaced relation to the horizontal flange of angle frame member 50 by welding the same at one end to a plate 63, as best shown in Fig. 4, and at the other end to a small block 64, shown in dotted lines in Fig. 2. The plate 63 and the block 64 are, in turn, welded to the underside of the horizontal flange of angle frame members 50. The slide 57 is further retained in position and guided in its sliding movement on member 50 by means of a downwardly turned flange 66 formed on the inner edge of the horizontal leg 59. It will be observed that bar 62, the bent over slide portion 60 and the slide flange 66 positively prevent displacement of the slide from the frame, and that the connection is permanent but one which will permit free sliding movement. The slide is limited in its movement in one direction by plate 63 and in the opposite direction by a block 67 which is welded to the side of frame member 50.

Means are provided for securing the slide 57 with its trunnion 33 in any one of a plurality of longitudinally adjusted positions. This means comprises a rack element 70 which is welded at 71 to the underside of leg 59 of the slide and which is provided with a plurality of teeth 72. The teeth 72 are adapted to mesh with correspondingly shaped teeth 73 on a pivoted rack bar 74. Rack bar 74 is pivoted to frame member 50 by means of a pin 75 which in turn is carried by the plate 63, previously described, as best shown in Fig. 5. The rack element 70 and pivoted rack bar 74 are preferably formed as drop forgings in order to provide maximum strength. The teeth need not be machined after the forging operation. A latch pin 77 is slidably journaled in a bracket 78 carried by the frame member 50 and is adapted to project into the path of movement of rack bar 74 to hold it in the position shown in solid lines in Figs. 2–5, wherein the teeth thereof are engaged with the teeth of rack element 70. The upper end of latch pin 77 is bent over at 79; and a spring 80 connects the bent over end with a lug 81 on frame member 50 to hold the latch pin in the position shown. A block 82 welded to the frame member 50 prevents complete withdrawal of the latch pin from the bracket 78, and a similarly welded block 83 assists the spring in preventing accidental release of the latch pin from the rack bar.

It is apparent that by virtue of the structure just described, it is possible to shift the trunnion 33 into any one of a plurality of positions longitudinally of the frame and to positively secure it in adjusted position by means of the pivoted rack bar 74. Among the advantages of this structure is the fact that it allows adjustment of the trunnion by a plurality of small increments. This is important as it is found desirable to provide a total of approximately nine positions of adjustment within a total movement of approximately twelve inches in order to secure the best results. In addition, the rack teeth on the slide are always engaged with a plurality of teeth on the rack bar, hence, providing a latching engagement adapted to sustain the very heavy loads to which devices of this character are subject. As will be shown hereinafter, the loads on the latch bar are directed toward the pivot pin 75, and accordingly, in order to further reinforce the bar and relieve the load on the pin 75, there is provided a block 85 which is welded to plate 63 and abuts against the end of the rack bar 74 when the latter is engaged with the rack 70. The block 85, therefore, sustains a substantial portion of the load applied to rack bar 74.

Means, provided for adjusting the elevation of the lower end of the frame and for securing it in adjusted position, are shown in Figs. 1 and 6–10, inclusive. Referring to Fig. 1, the lower end of the frame is secured in transport position by means of a strut 40 which is pivotally secured to an ear 90 formed on the eye 91 carried by the lower end of arm 27. The lower end of strut 40 is detachably pivoted to the floor of the freight car at 92 by means of the floor socket device, the nature of which is shown in detail in the co-pending application of Samuel D. Butterworth and Sulo M. Nampa, Serial No. 743,372, filed September 10, 1934. For certain positions of the frame, such as the position shown in broken lines in Fig. 1 at 25′ the strut is pivoted to the floor at an alternative point 92′, for reasons brought out hereinafter. Independently of the above, however, the strut 40 is adjustable in length and embodies other important features to be described.

Referring to Fig. 6, it will be seen that the strut 40 comprises a pair of relatively telescoping inner and outer members 100 and 101, respectively. The inner or shank member 100 is secured to a clevis element 103 at its lower end by means of an overlapping sleeve 104, which is welded to the members 100 and 103. The clevis member 103 carries the pivot pin 92 which is utilized to pivotally connect the lower end of the strut 40 to the floor socket device indicated in Fig. 1. The structure of this clevis member forms no part of the present invention, but is shown in detail in the co-pending application of Oliver V. Cardinal, Serial No. 735,807, filed July 18, 1934. The outer or housing member 101 is provided with an enlarged bore 105 at its upper end within which is positioned a tubular member 106, the tubular member 106 being welded to the housing member 101 at 107. Shank member 100 and the housing member 101 are provided with mating teeth or projections 108 and 109 respectively, which teeth or projections, as best shown in Figs. 8 to 10, inclusive, are positioned upon opposite sides of the respective members in two longitudinally extending rows. The teeth of each row moreover extend circumferentially of the members through an angle of less than 90 degrees, with the result that the mating teeth 108 and 109 may be engaged with each other or disengaged by relative rotation of the members 100 and 101 through an angle of approximately 90 degrees.

The shank member 101 is preferably formed as a drop forging, the teeth or projections 108 being formed during the forging operation, following which they need not be machined. The housing member is likewise formed by drop forging, but is formed in two halves 110 and 111, as shown best in Figs. 8 to 10, inclusive. The two halves of the housing member 101 are formed as semi-cylindrical members having the projections 109 formed centrally of their concave faces during the drop forging operation. Following the formation of the half housing members 110 and 111, they are assembled in the manner shown in Figs. 8 to 10, inclusive, and welded together at their abutting edges at 112. It will be observed that when the shank and housing members are formed in the manner described no machining operations are necessary, except that the abutting edges 113 of the half housing members 110 and 111 are subject to a surface grinding operation in order that they will properly fit each other and in order to properly space the opposite rows of teeth 109 with respect to the shank 100. The shank and housing members, therefore, are inexpensive to manufacture but are extremely rugged in construction. Since the teeth on the housing member 101 engage a plurality of teeth on the shank member 100 at all times, the severe load to which the strut member is subject is distributed over a plurality of teeth, thereby increasing the load carrying capacity of the strut.

For reasons which will become apparent hereinafter, it is desirable to provide means whereby the strut member 40 may slightly increase in length after it is connected in load supporting position. Accordingly, there is provided in conjunction with the strut 40 a spring section, indicated generally at 120, which will permit a slight elongation of the strut. As best shown in Fig. 7, the spring section referred to is mounted within a tubular housing 121, which is telescoped over and welded to the upper end of the tubular strut member 106. Slidably mounted within the tubular member 121 is a second tubular strut member 122, which carries at its upper end an angle pin 123 which is permanently journaled in the ear 90 carried by the eye 91 of the frame supporting arm 27, as shown best in Figs. 1 and 6. A rod 125 is positioned within the tubular housing 121 and is provided with a cylindrical head 126 which is welded at 127 to the interior of the tubular strut member 122, with the result that the rod 125 will slide with the tubular member 122 relative to the housing 121. The rod 125 projects through a suitable opening in a disc member 128, which is welded at 129 to the interior of a tubular housing member 121, and is provided at its outer end with a similar disc member 130, which is held in position by means of a nut 131 threaded upon the lower end of the rod. The end of the rod at 132 is preferably peaned over the nut 131 to permanently secure the nut in position on the rod. A relatively heavy helical spring 133 surrounds the rod 125 between the disc members 128 and 130. Since the rod 125 and therefore disc 130 are fixedly secured to the sliding tubular member 122 and the disc 128 is fixedly secured to the housing 121, the spring 133 resists upward movement of the tubular member 122 relative to the housing 121 and thereby resists elongation of the strut. However, when a force is applied to the strut tending to elongate it, the spring will permit a limited amount of elongation up to the point where the spring is entirely collapsed. It is found that a collapsing movement of the spring in the order of three quarters of an inch provides sufficient range of elongation of the strut member to produce satisfactory results if the movements of adjustment of the strut are less than that amount. An annular ring member 135 is welded at 136 to the tubular member 122 in such a position that it will abut against the end of the tubular housing 121 and limit collapsing movement of the strut to the position shown in Fig. 7. It is apparent, therefore, that strut 140 provides an adjustable means adapted to sustain severe compression forces without telescoping or shortening and at the same time, when subject to a tension force, it may increase in length to a limited extent. This feature is important for reasons which will appear hereinafter.

The strut 39 at the forward or upper end of the frame is preferably constructed in the same manner as the strut 40 just described, except that the spring section of the strut 40 is omitted. Hence strut 39 is adjustable in length but not subject to elongation or compression independently of the adjusting device.

As an alternative construction, the forward strut 39 may be made as a single rigid strut and the adjustment provided by a multiple floor pocket construction in the manner shown in the copending application of Sulo M. Nampa and Oliver D. Cardinal, Serial No. 57,207, filed January 2, 1936.

The mode of operation of the present invention and the manner in which the various adjustments must be coordinated to produce the desired results may best be understood by reference to Fig. 11, which is a diagrammatic showing of a few of the possible positions of the loading frame. In this figure, the lines 26 illustrate a plurality of possible positions of the forward frame supporting arm 26, the lines 27 illustrate a plurality of possible positions of the rearward frame supporting arm 27, and the lines 25 illustrate corresponding positions of the loading frame. It should first be noted that inasmuch as the swinging supporting arm 26 is a rigid arm pivoted on a fixed axis to the freight car at 29 that the trunnion 28 will always lie at some point on the arc X—X regardless of the position of the supporting arm 26. Likewise, so long as the frame supporting arm 27 is maintained at its full length, the trunnions 33 at the lower end of the frame will always be located at some point on the arc Y—Y in Fig. 11, regardless of the position of the supporting arm 27. Since the two arcs X—X and Y—Y are struck about different centers and have different radii, it is apparent that so long as the distance between the trunnions 28 and 33 remain constant, it is theoretically impossible to adjust one end of the loading frame independently of the other.

This is indicated in Fig. 11 by the dotted lines 26, 27 and 25, which illustrate two positions of the loading frame when the spacing between the trunnions 28 and 33 is at its minimum. Under these circumstances, the frame 25 may be swung from its loading position upon the floor to a minimum loading position, indicated at *a*—1. While loading positions below the position *a*—1 are theoretically available, it is found in practice that such positions are too low to be of any practical value, and accordingly none are shown in the diagram. Now, if it is desired to elevate the frame above the position *a*—1 without changing the distance between the trunnions 28 and 33, it is found that the height of the frame may be increased until it assumes the position indicated at *g*—1′, in which position the arm 26, which will then lie at 29—*g*, is in alignment with the frame *g*—1′. Further elevation of the frame from this position will result in an undesirable shortening of the telescoping arm 27, and hence the position *g*—1′ represents the maximum height to which the loading frame may be raised when the distance between the trunnions 28 and 33 is at a minimum. It should be noted, moreover, that while other positions are available for the frame between the position a—1 and the position g—1′, that both ends of the frame move for each change of position and hence it is impossible to elevate one end of the frame independently of the other, so long as the distance between the trunnions 28 and 33 remains constant at the minimum length. It is for this reason that means are provided for increasing the distance between the trunnions 28 and 33. In accordance with the structure shown in this application nine positions of adjustment are available, these being indicated by the numerals 1 to 9, on the line showing the loading or floor position of the frame 25, in Fig. 11.

If the difference between the trunnions 28 and 33 is adjusted to position 5, that is, increased by one-half the total amount of adjustment available, it is found that the loading frame may be elevated to a maximum theoretical position indicated in broken lines at k—5′, in which position the supporting arm 26, which then occupies the position 29—k, is in alignment with the frame k—5′, thereby limiting further upward movement of the frame. It will be observed, however, that this position of the frame is substantially higher than that shown at g—1′ which is the maximum position corresponding to the minimum distance between the trunnions 28 and 33. If the distance between the trunnions 28 and 33 is further increased to the ninth position, that is the maximum extension, it is found that the loading frame may be elevated to a maximum theoretical position indicated at 0—9′ wherein the supporting arm 26, then in position 29′—o is in alignment with the frame position 0—9′, thus preventing further upward movement. It is apparent therefore that by merely varying the distance between the trunnions 28 and 33 that the elevation of the loading frame as a whole may be varied between the limits a—1 and 0—9′. While only three adjustments in the length of the distance between trunnions 28 and 33 are indicated in Fig. 11 it is apparent that any one of the nine positions of adjustment may be utilized to secure other ranges of adjustment for the loading frame.

There is also shown in Fig. 11 another peculiarity of the frame movement which is utilized in accordance with the present invention to produce exceedingly valuable results. In this connection it will be noted that for any given spacing between the trunnions 28 and 33 a very substantial adjustment in the forward or higher end of the frame may be made without substantially affecting the height of the lower end of the frame. This is indicated in connection with each of the three maximum positions of the loading frame illustrated in Fig. 11. Thus with the trunnions adjusted to their maximum spacing and the frame at its maximum elevation 0—9′, Fig. 11 shows that without changing the trunnion spacing the upper end of the frame may be lowered to the point i, during which lowering movement the lower end of the frame will move on arc Y—Y through the very small distance 9—9′ along the arc y—y. The same thing is true with respect to the frame in any of its other positions of adjustment. For example, when the frame is adjusted to its length 5, the upper end of the frame may be adjusted between the limits c and k, which are substantially spaced apart while the lower end of the frame moves through only the small distance from 5 to 5′. Likewise with the frame in its minimum position, the upper end may be adjusted from the point a to the point g while the lower end moves from point 1 to point 1′. The same thing is true for all other intermediate positions of adjustment of the length of the distance between trunnions 28 and 33. The reason for this is apparent when it is noted that the frame 25 and arm 26 in effect form a toggle linkage which is fully straightened when the frame is in its maximum position for any given adjustment of the trunnion spacing. Accordingly, as the trunnion 28 is lowered the toggle is broken and draws the trunnion 28 inwardly along the arc X—X. It is well known that initial breaking movements of the hinge of a toggle linkage have little effect upon the position of the ends of links, and this accounts for the limited movement of the trunnion 33 upon a substantial movement of the trunnion 28. This phenomenon is taken advantage of in accordance with the present invention to greatly simplify the operation and structure of the adjusting mechanism as will be brought out hereinafter.

It will be observed that as the distance between the trunnions 28 and 33 is varied, and the height of the upper end of the frame is varied, the trunnion 33 at the lower end of the frame will assume various positions along the arc Y—Y and that accordingly it is necessary to coordinate the length and/or position of the strut 40 with these various positions of the trunnion 33, in order that the strut may secure the loading frame in final adjusted position. There are several ways in which this coordination may be effected, but in accordance with the present invention there is provided a special and exceedingly important co-relation between the strut adjustments and the frame positions. This special relation is arrived at in the following way:

As previously indicated, for each position of adjustment of the trunnion spacing there exists a maximum position of the frame wherein the toggle linkage formed by the frame 25 and arm 26 is straightened. Three such positions of the frame are indicated on Fig. 11, at o—9′, k—5′ and g—1′. Instead of coordinating the strut adjustments with the positions 1′, 5′ and 9′ along arc Y—Y the strut adjustments are so arranged that with the strut in its fully collapsed and normal length for various adjustments the trunnion 33 will be held at positions falling approximately three quarters of an inch below each of the maximum positions 1′ to 9′ inclusive, this distance being equal to the amount by which the strut 40 may be elongated incident to compression of spring 133. These lower positions are indicated in an exaggerated manner at 1–9 inclusive on arc Y—Y. In other words there is a position of adjustment on strut 40 which will hold trunnion 33 at the point 1 on arc Y—Y, another which will hold the trunnion at point 2, etc., all when the expansible section 120 of strut 40 is entirely collapsed. These positions of adjustment of strut 40 may be termed the primary positions of adjustment and they may be numbered or otherwise designated in accordance with similar designations on the means for adjusting trunnion 33 along the frame in order that the primary positions of adjustment on strut 40 may readily be coordinated with corresponding adjustments of the slide carrying trunnion 33. In addition strut 40 is provided with secondary positions of adjustment intermediate the primary positions, for a purpose to be brought out hereinafter.

The advantage of correlating the strut adjustments with the frame positions in the manner set forth above will now be described. When the strut adjustments are arranged in the manner described, the trunnion 33 can be adjusted to any desired position along the frame and the frame then elevated until the trunnion 33 is located at the position along arc Y—Y corresponding to the trunnion position on the frame, whereupon the strut 40, adjusted to the corresponding position, may be secured in position. Thereafter the frame may be further elevated to any desired height up to the maximum height permissible for the given trunnion adjustment, and the slight upward movement of trunnion 33 will be taken care of by elongation of the expansible section 120 of strut 40. This makes possible a very substantial adjustment in the height of the upper end of the frame after the lower end is secured in position and without substantially affecting the height of the lower end.

The extent of adjustment available in accordance with the above method is indicated diagrammatically in Fig. 11. With the trunnion 33 at position 1, the frame is elevated to position *a*—1 and strut 40 secured in position. Thereafter the frame may be further elevated to place trunnion 28 at any point along arc X—X between *a* and *g*, whereupon the strut 39, adjusted to the proper length, may be secured in position. The same method may be followed for each of the nine adjustments in trunnion spacing up to position 9 where the frame is elevated to *i*—*o*, strut 40 adjusted to the corresponding length and secured in position, and the trunnion 28 secured by strut 39 at any position along arc X—X between *i* and *o*.

It should be noted that the first step in adjusting the frame is to shift trunnion 33 to the desired position along the frame and that this is done while the frame is supported upon the floor of the freight car. The arc Y—Y is substantially tangent to the frame when the latter is on the floor and hence the trunnion can be adjusted to the first few positions while the frame rests upon the floor itself. However, when adjusting the trunnion 33 to the higher positions such as position 9, it is necessary to place blocks beneath the frame to hold the rear end slightly above the floor. This can be done as the frame is lowered from the roof. Alternatively a crow-bar may be used to raise the frame when the trunnion adjustment is made.

If the points 1–9 inclusive are arrived at in accordance with the principles outlined above, it will be found that their spacing is not exactly equal along arc Y—Y. Although very nearly equal, there is a tendency for the points to spread slightly at the upper end of the arc. This, however, is not objectionable because it is found that equal increments of adjustment of strut 40 so closely approximate points 1–9 that none of the beneficial results of the arrangement are lost. To compensate for this tendency, however, the position at which strut 40 is secured to the floor is shifted when the frame is fixed at positions 6–9 inclusive. It will be noted from the diagram that for positions 1–5 inclusive strut 40 is secured to the floor at point A and extends substantially tangent to the arc Y—Y at these points. For the upper positions 6–9 inclusive, however, the lower end of strut 40 is fixed at point B, and extends at an angle to a tangent to the arc Y—Y at these points. Accordingly, a given increment of adjustment of the length of strut 40 produces a slightly greater adjustment of the trunnion 33 along arc Y—Y when the strut is secured at B than when it is secured at A.

It is found that the range of positions in which the frame 25 may be placed by the above method is sufficient to accommodate practically all present day passenger automobiles and many trucks. When loading trucks having flat or stake bodies and relatively high cabs at the forward end thereof, the front end of the truck is positioned at the lower end of the frame. Otherwise trucks are loaded in the same manner as passenger cars.

In certain instances, however, it may be desirable to adjust the frame beyond the limits available by the method just described and the present construction is adapted to provide even greater variations in the inclination of the frame than those available in accordance with the loading procedure just described. It will be noted that in accordance with the procedure previously outlined the strut 40 was secured at the position along arc Y—Y corresponding in number to the position of adjustment of trunnion 33 along the frame. This, however, is unnecessary as, for example, the trunnion 28 may be fixed at point *a* on arc X—X and the trunnion 33 fixed at the point 7 on arc Y—Y, provided the trunnion 33 is adjusted to the position 9 along frame 25. Or, the trunnions may be secured in any other combination of positions along the respective arcs *x*—*x* and *y*—*y* and the spacing of trunnions 28 and 33 adjusted to correspond. This is made possible by reason of the fact that there are provided a plurality of secondary adjustments of the length of strut 40 intermediate the positions 1, 2, 3, etc., along the arc Y—Y, and the increments of adjustment of the strut 40 are less than the amount by which the strut may elongate by reason of spring section 120. It has been found desirable, for example, to provide approximately twenty positions of adjustment in the strut 40 in increments of one half inch each. It should be noted, however, that the farther the toggle formed by frame 25 and arm 26 is broken, the less the upper end of the frame may be adjusted after strut 40 is secured in position.

It should be noted that after strut 40 is secured in position the upper end of the frame cannot be lowered without causing collapse of the telescopic arm 27. Accordingly the strut 40 should always be secured in position when the upper end of the frame is at or below the desired position.

The strut 40 is, of course, adjustable in length to accommodate any desired height of the upper end of the frame. Any desired number of increments of adjustment may be provided but it has been found desirable to provide approximately thirty positions of adjustment spaced in increments of one-half inch.

Aside from the fact that the expansible section 120 in strut 40 permits substantial adjustment of the height of the upper end of the frame independently of the lower end thereof, and in addition makes possible a universal adjustment of the frame to any desired height and inclination, this expansible section has the further important advantage that it assists in cushioning the loading frame and automobile against the severe jolts and bumps to which the freight cars are subject during transportation, and particularly during switching and handling in freight yards. Thus, for example, when the frame is thrown toward the end wall 21 of the car there is a tendency for the lower end of the frame to raise, and the expansible section permits a limited raising movement thus relieving the tension load on strut 40 and member 27. If the frame is thrown in the opposite direction the expansible section, which in many positions of adjustment will have been somewhat expanded beyond its normal position, can collapse slightly, thereby relieving the shock. Finally, the rear end of the frame is in a sense floating and hence not subject to the usual pounding encountered during normal travel of a freight car.

While only one form of the invention is shown and described herein, it is apparent that others are available within the spirit of the foregoing specification, and within the scope of the appended claims. The particular structure shown for adjusting the spacing of trunnions 28 and 33 and for adjustably securing the ends of the frame in elevated position is of peculiar value from the standpoint of simplicity, low cost, ruggedness, and ease of operation, but it is apparent that the broad principles of the present invention are applicable to making and coordinating the various adjustments in the manner set forth herein. The preferred size of the various increments of adjustment are likewise given but it will be understood that any desired variations in those dimensions may be utilized.

What I claim is:

1. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position adjacent the floor to an elevated transport position, and means to adjust the point of connection between one of said arms and said frame with respect to one of them to vary the transport position of the frame.

2. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position adjacent the floor to an elevated transport position, and means for varying the distance between the points of connection of said arms with said frame for varying the transport position of the frame.

3. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position adjacent the floor to an elevated transport position, and means for varying the distance between the points of connection of said arms with said frame for varying the transport position of the frame, said last named means comprising a member slidable longitudinally of the frame, a trunnion carried by said member for pivotally engaging one of said arms, and means for locking said slide member in any one of a plurality of adjusted positions.

4. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position adjacent the floor to an elevated transport position, means for securing one end of the frame in elevated position, adjustable means for securing the opposite end of said frame in any one of a plurality of elevated positions, and means to adjust the point of connection between one of said arms and said frame with respect to one of them for varying the transport position of the frame.

5. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position adjacent the floor to an elevated transport position, adjustable means for securing one end of the frame in any one of a plurality of elevated positions, adjustable means for securing the opposite end of the frame in any one of a plurality of elevated positions, and means for adjusting the point of connection between one of said arms and said frame with respect to one of them for varying the transport position of the frame.

6. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes, and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position on the floor to an elevated transport position, means for securing one end of the frame in elevated position, adjustable means for securing the other end of the frame in any one of a plurality of elevated positions, and means for varying the distance between the points of connection of said arms with said frame for accommodating the various adjusted positions of said other end of the frame.

7. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes, and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position on the floor to an elevated transport position, adjustable means for securing one end of the frame in any one of a plurality of elevated positions, adjustable means for securing the other end of the frame in any one of a plurality of elevated positions, and means for varying the distance between the points of connection of said arms with said frame for accommodating the various adjusted positions of the frame.

8. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position adjacent the floor to an elevated transport position, a strut element between the floor of said freight car and one end of said frame, said strut element having a resilient expansible portion, and adjustable means for securing the opposite end of said frame in any one of a plurality of elevated positions, said expansible strut portion being adapted to elongate to permit raising of said one end of the frame incident to elevating adjustments of said opposite end after the strut is secured in position.

9. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position adjacent the floor to an elevated trans-

port position, an adjustable strut element between the floor of said freight car and one end of said frame adapted to secure said end of the frame in any one of a plurality of elevated positions, said strut element having a resilient expansible portion, and adjustable means for securing the opposite end of said frame in any one of a plurality of elevated positions, said expansible strut portion being adapted to elongate to permit raising of said one end of the frame incident to elevating adjustments of said opposite end after the strut is secured in adjusted position.

10. In combination, a freight car, an automobile loading frame, means for securing the frame in the car including a pair of arms pivoted at their upper ends to the car on longitudinally spaced axes and at their lower ends to the frame at opposite ends of the frame respectively, said arms being adapted to swing the frame from a position adjacent the floor to an elevated transport position, means for adjusting the distance between the points of connection of said arms with said frame whereby said frame may be elevated to a plurality of transport positions, a member adapted to connect one end of the frame with the floor of the car, said member being adjustable for accommodating the various transport positions of said end of the frame, means for adjustably securing the opposite end of said frame in any one of a plurality of elevated transport positions, and resilient means associated with said member whereby said member can increase in length when said opposite end of the frame is elevated after said member is secured in position.

11. In combination, a freight car, an automobile loading frame adapted to support an automobile in elevated position, means for pivotally supporting one end of the frame in elevated position in said freight car, and spring means providing a resilient floating support for the opposite end of the frame.

12. In a device for supporting an automobile in elevated position, a support, a frame adapted to support an automobile, means for pivotally securing one end of said frame in elevated position, a tension device secured at its upper end to said support and at its lower end to the opposite end of said frame for holding said opposite end of the frame in elevated position, and means for adjusting the point of connection of said tension member with said frame with respect to said frame for varying the elevation of said opposite end of the frame.

13. In a device for supporting an automobile in elevated position, a support, a frame adapted to support an automobile, means for pivotally securing one end of said frame in elevated position, a tension device secured at its upper end to said support and at its lower end to the opposite end of said frame for holding said opposite end of the frame in elevated position, means for adjusting the point of connection of said tension member with said frame with respect to said frame for varying the elevation of said opposite end of the frame, and an adjustable strut for securing said opposite end in position and maintain said device in tension for the several adjusted positions of said opposite end.

14. In a device for supporting an automobile in elevated position, a support, a frame adapted to support an automobile, means for pivotally securing one end of said frame in elevated position, a tension device secured at its upper end to said support and at its lower end to the opposite end of said frame for holding said opposite end of the frame in elevated position, means for adjusting the point of connection of said tension member with said frame with respect to said frame for varying the elevation of said opposite end of the frame, and an adjustable strut for securing said opposite end in position and maintain said device in tension for the several adjusted positions of said opposite end, said strut containing a resilient section adapted to urge the same in a direction effective to maintain said device in tension.

15. In a device for supporting an automobile in elevated position, a support, a frame adapted to support an automobile, means for adjustably pivoting one end of said frame in any one of a plurality of elevated positions, a tension device secured at its upper end to said support and at its lower end to the opposite end of the frame for holding said opposite end of said frame in an elevated position, and means for adjusting the point at which said tension member is connected to said frame with respect to said frame for controlling the elevation of said opposite end of the frame.

16. In a device for supporting an automobile in elevated position, a support, a frame adapted to support an automobile, means for adjustably pivoting one end of said frame in any one of a plurality of elevated positions, a tension device secured at its upper end to said support and at its lower end to the opposite end of the frame for holding said opposite end of said frame in an elevated position, an adjustable strut for securing said opposite end in position and maintaining a tension load on said device, and means for adjusting the point at which said tension member is connected to said frame with respect to said frame for adapting the arms and frame to the adjusted positions of the opposite end of the frame.

17. In a device for supporting an automobile in elevated position, a support, a frame adapted to support an automobile, means for adjustably pivoting one end of said frame in any one of a plurality of elevated positions, a tension device secured at its upper end to said support and at its lower end to the opposite end of the frame for holding said opposite end of said frame in an elevated position, an adjustable strut for securing said opposite end in position, said strut containing a resilient portion for maintaining a tension load on said device, and means for adjusting the point at which said tension member is connected to said frame with respect to said frame for adapting the arms and frame to the adjusted positions of the opposite end of the frame.

18. In combination, a freight car, an automobile loading frame adapted to support an automobile in elevated position, means for pivotally supporting one end of the frame in elevated position in said freight car, and spring means providing a resilient floating support for the opposite end of the frame, said pivotal and spring supporting means being arranged to support said frame in an elevated inclined position.

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