April 25, 1933. T. H. SYMINGTON 1,905,252

RAILWAY CAR TRUCK SPRINGS

Filed July 6, 1931 3 Sheets-Sheet 1

Fig. 1.

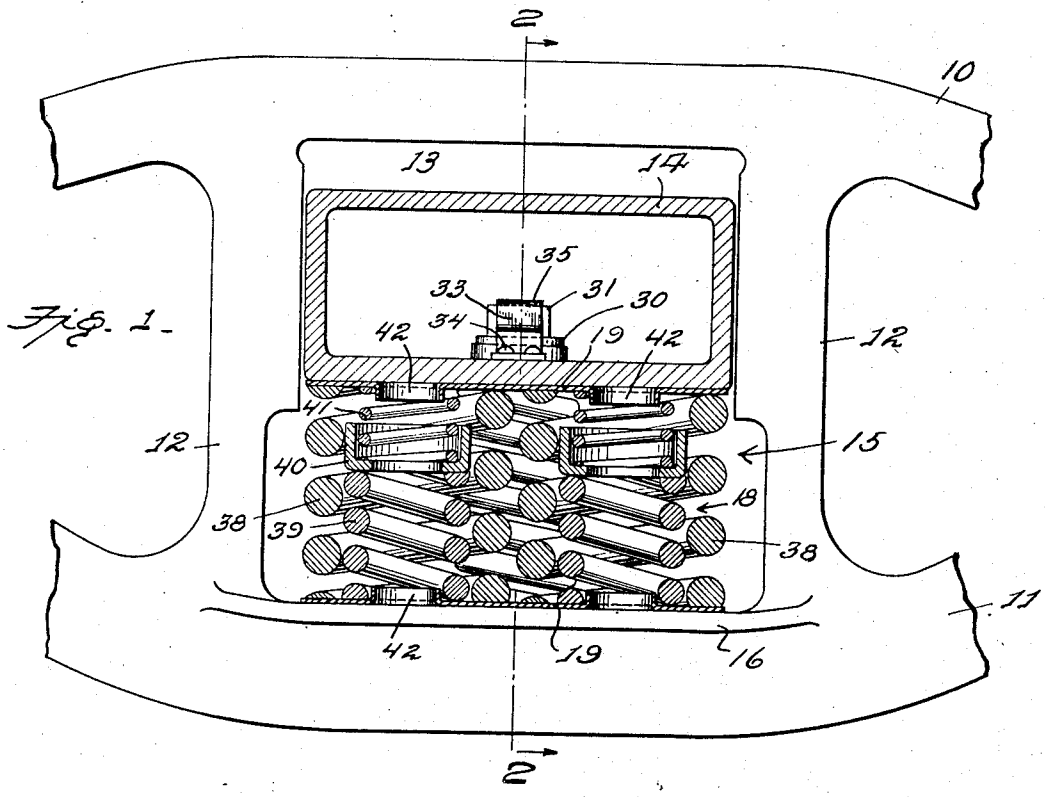
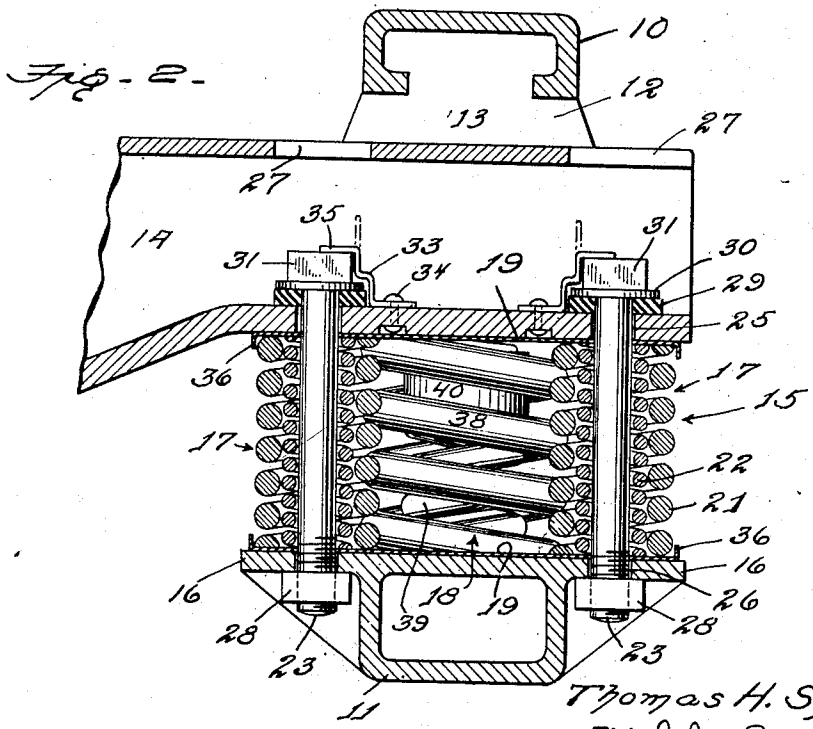


Fig. 2.



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Fig. 3.

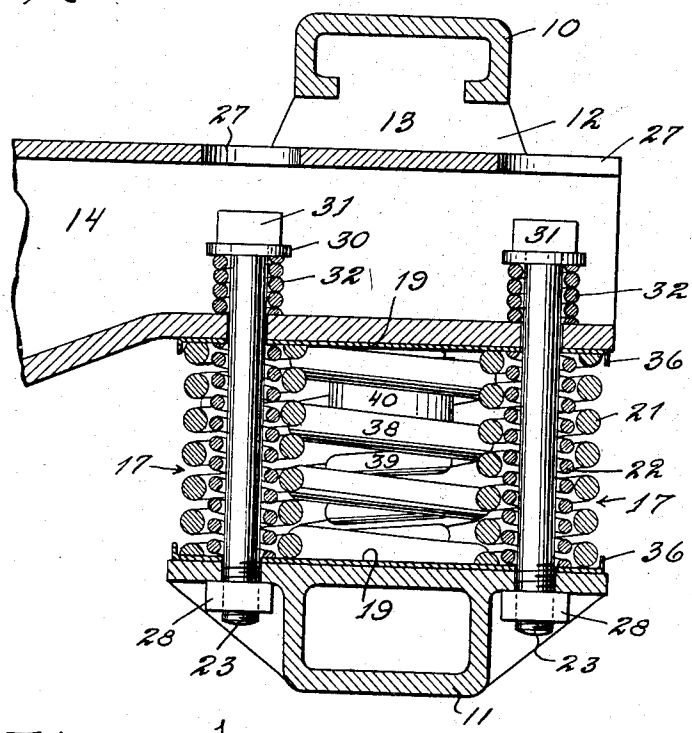


Fig. 4.

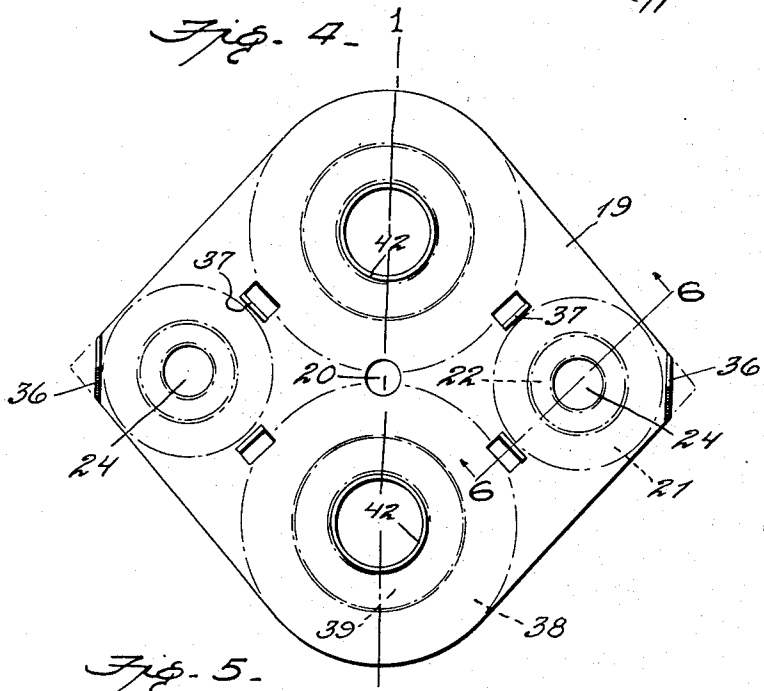


Fig. 6.

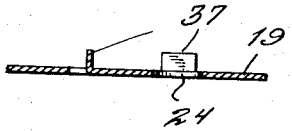
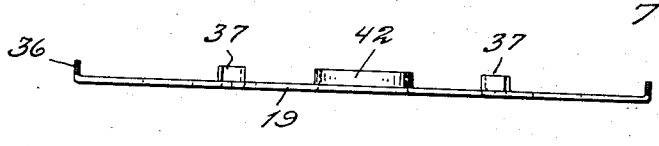


Fig. 5.



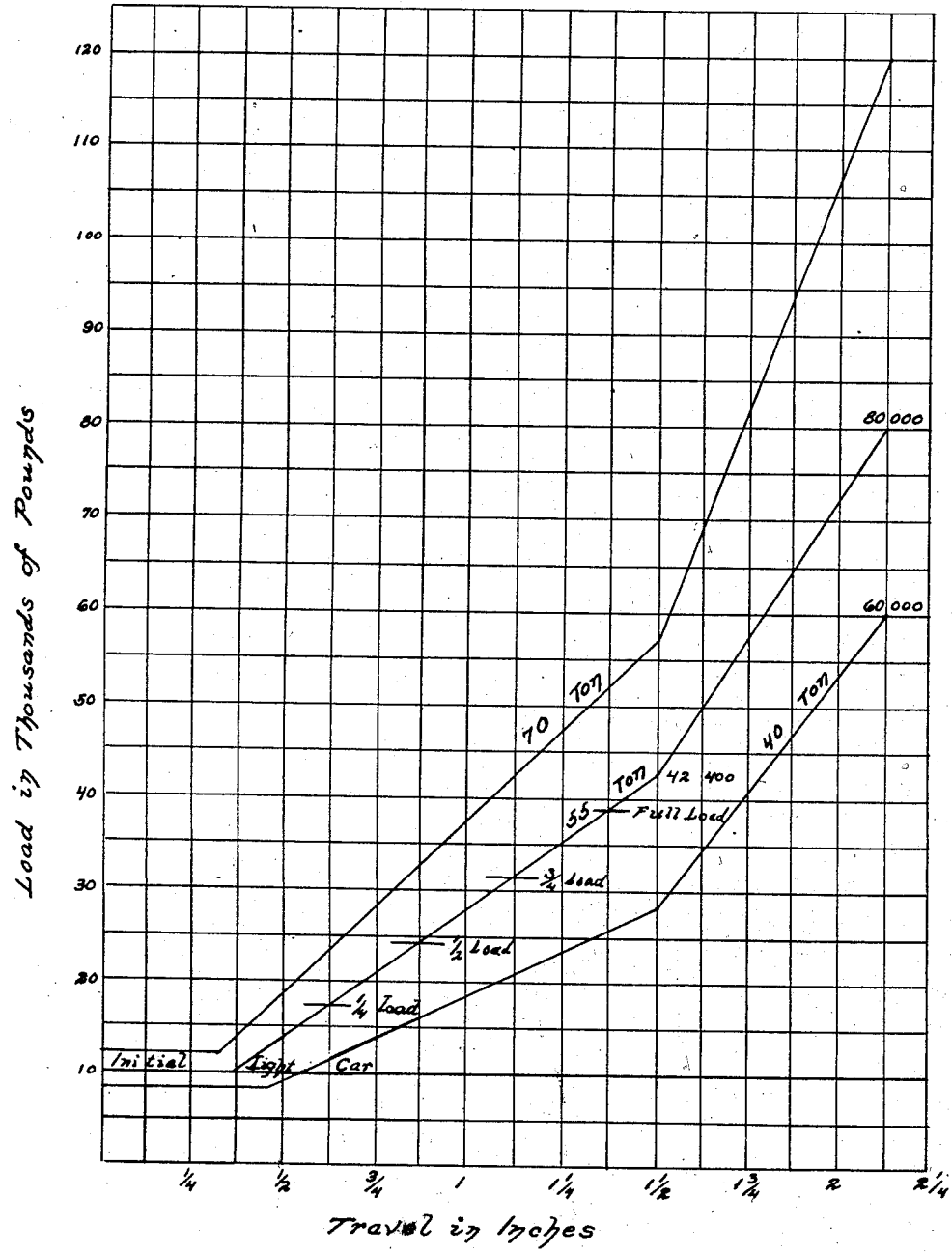
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Fig. 7.



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1,905,252

UNITED STATES PATENT OFFICE

THOMAS H. SYMINGTON, OF BALTIMORE, MARYLAND, ASSIGNOR TO T. H. SYMINGTON & SON, INC., OF BALTIMORE, MARYLAND, A CORPORATION OF MARYLAND

RAILWAY CAR TRUCK SPRINGS

Application filed July 6, 1931. Serial No. 549,050.

The invention relates to railway car springs and has special reference to that type located within the window openings of the side frames for the purpose of yieldably supporting the bolster and of course the load thereon.

The principal object of the invention, generally stated, is to provide a spring assembly, arrangement or combination of such character that either light, intermediate or heavy loads will be adequately supported and vibratory or "jiggling" tendencies checked.

It is well known that whenever a truck bolster is supported upon springs of any standard type there is always a certain tendency of the springs to vibrate vertically or jiggle. When this movement builds up, the effect on the car and its lading is injurious. The vertical jiggle develops to its maximum extent when the natural period of vibration of the springs coincides or is synchronized with the frequency of the jolts or impulses caused by passage of the car wheels over the rail joints. This synchronization occurs at certain substantially definite critical car speeds depending upon the specific characteristics of the particular springs used. In certain types of springs the critical speed may be several miles per hour more or less than with other types. This jiggle is of course affected and checked to a certain extent when the train speed is greater or less than the critical speed but, unfortunately, in the case of long or solid trains the rate of acceleration or deceleration is not rapid and the result is that the destructive jiggle may continue for a considerable length of time, possibly while the train is travelling several miles.

I have discovered by exhaustive tests that by employing a spring nest embodying units of different natural periods of vibration and adapted to become successively energized, that is to say wherein certain units support the load throughout a definite deflection with other units coming into play when the deflection exceeds a certain amount, a snubbing action can be produced which will bring about a change in the period of vibration of the combination and thereby effectually check or break up the objectionable jiggle.

It is with the above facts in view that I have devised the present invention which has for an important object the provision of a spring nest which, considered as a whole, is initially snubbed or maintained under a certain degree of compression, the snubbing means being of a somewhat yieldable character to cushion excessively severe shocks.

Another important object of the invention is to provide a snubbed spring nest embodying units which do not come into play until the load exceeds a certain amount or until the light load supporting springs are deflected beyond a certain predetermined travel, all of the springs of course cooperating to support heavy loads.

A further object is to provide a truck spring assembly in which all of the units are of the helical type and conforming in at least most respects to standard practice as regards pitch, free height, size of stock, etc.

Another and more specific object is to provide a spring assembly including certain units which are positively held to the truck bolster by securing means passing through a portion of the latter, this means being movable with respect to the side frame and being, moreover, cushioned against excessively severe strain.

Still another object is to provide a spring arrangement in which use may be made of a side frame and bolster of the ordinary construction, the only change required being the provision of holes in the seat portion of the side frame and in the bolster for the reception of the bolts which hold certain of the spring units snubbed or under initial compression.

An additional object is to provide a spring assembly which will be simple and inexpensive to make, easy to install, positive in action, efficient and durable in service, and a general improvement in the art.

To the attainment of the foregoing and other objects and advantages, the invention preferably consists in the details of construction and the arrangement and combination of parts to be hereinafter more fully described

and claimed, and illustrated in the accompanying drawings in which:

Figure 1 is a fragmentary elevation of a truck side frame having a bolster supported therein by my spring assembly, the bolster being in section and the spring assembly being a section taken on the line 1—1 of Figure 4,

Figure 2 is a vertical section taken on the line 2—2 of Figure 1,

Figure 3 is a view similar to Figure 2 showing a modification of the snub bolt cushioning means,

Figure 4 is a plan view of the nest,

Figure 5 is an edge elevation of one of the spring caps,

Figure 6 is a detail section taken on the line 6—6 of Figure 4 and showing only the cap in section,

Figure 7 is a diagram showing the working curves for spring nests of different capacities.

Referring more particularly to the drawings, I have shown a portion of a side frame including the usual compression members 10 and tension members 11 connected by the spaced parallel column guides 12 which define a window opening 13 through which extends the bolster 14 supported by my novel spring assembly which is indicated as a whole by the numeral 15 and which is engaged between the underside of the bolster and the spring seat 16 at the bottom of the window opening.

In carrying out my invention I form the assembly 15 as a plurality of units or pairs of units designated as a whole by the numerals 17 and 18 mounted between similar caps 19 centrally apertured as at 20 for the reception of a suitable tie bolt, not shown, which may be used, initially, for the purpose of holding the nest assembled during handling prior to installation in a truck. The reason why this tie bolt is not illustrated is because the assembly is shown in situ, the tie bolt being necessarily removed.

Each assembly or unit 17 comprises outer and inner coils 21 and 22, respectively, which may normally be of standard height and uniform pitch. In actual practice the outer coil 21 may be the same as a standard Class G inner coil though there is not necessarily any restriction in this respect. The innermost coil 22 is made of smaller stock and in some instances may be omitted if desired, depending upon the capacity of the car beneath which the assembly is to be used. The two units 17, which are similar, are intended to be snubbed down or held under a certain predetermined initial compression by means of bolts 23 which extend axially through the coils 22, through openings 24 in the spring caps, and through openings 25 and 26 in the bottom of the bolster and the spring seat 16, respectively. The top of the bolster is shown as provided with openings 27 facilitating insertion of these snub bolts. Beneath the spring seat 16 the bolts carry nuts 28 by means of which the degree of the snubbing action may be varied and made to accord with what is found in practice to be most desirable under the circumstances. As there is considerable strain on these bolts upon recoil, that is to say upward movement of the bolster after deflection has occurred, I find it desirable to cushion them. In Figure 2 I have consequently illustrated rubber pads 29 located between the bottom wall of the bolster and washers 30 which are located immediately under the bolt heads 31. Of course there is no particular limitation as to the use of rubber pads as other means might be provided such for instance as the springs 32 shown in Figure 3, these springs being initially compressed to their maximum extent as clearly indicated.

To prevent turning movement of the bolts, to prevent them from having any looseness or jiggling and to insure that they will move with the bolster and slide through the openings 26 in the spring seat, I preferably provide retaining elements 33 in the nature of clips secured, for instance by rivets 34, to the top of the bottom wall of the bolster and extending along the faces of the bolt heads 31, these clips being initially in the position shown by dot and dash lines in Figure 2 and being bent over as shown by full lines in the same figure to overlie the tops of the bolt heads as at 35.

If the inner springs 22 are used, as illustrated in the drawings, the engagement of the bolts through them and the location of these springs within the outer springs 21 will operate to maintain all of the springs in their proper positions as they cannot become laterally displaced in any direction. However, in case the inner springs 22 are not used it becomes necessary to provide some other centering means. This is readily accomplished by pressing down diagonally opposite corners of the caps 19 to form tangs 36 and stamping out of the caps other tangs 37, the tangs 36 and 37 being in embracing relation to the endmost coils of the outer springs 21.

Each unit 18 comprises an outer coil 38 of standard free height, for instance eight inches and which may be actually a standard Class G outer spring formed of stock suitable for the capacity of the car beneath which the nest is used. Within each outer spring 38 is an inner spring 39 which may be the same as a standard Class G inner spring but of much less free height. Seated upon each inner spring 39 is a cup-like follower 40 urged downwardly and preventing rattling by a light spring 41 engaged therein and bearing against the underside of the top cap. Both caps are formed with bosses 42, one entering each spring 39 and the other entering each

spring 41 for centering purposes so that the units 18 as a whole and the component parts thereof cannot become laterally displaced in any direction. The height of the springs 39 and the followers 40 is such that the upper edges of the latter are disposed considerably below the bolster so that the springs 39 do not become energized until the units 17 and the springs 38 have been compressed to a considerable degree.

In the use of a spring nest, constructed as disclosed for fifty-five ton cars, it will be seen that the entire nest is under an initial compression amounting in travel to 3/8 inch, with an equivalent load capacity of 10,000 pounds. This is always the initial starting point on the curve disclosed in Figure 7. From this point, the curve rises in a distance of 1 and 1/8 inches to a point where the short coils 39 of the units 18 come into action. The added capacity thus picked up causes the line to rise more abruptly to a total capacity of substantially 80,000 pounds. In other words, the spring units 17 and the outer springs 38 of the units 18 support all ordinary loads and have a travel of 1 and 1/2 inches whereas the short springs 39 have a travel of 5/8 of an inch. When the car is riding along on all of the springs with the exception of the short springs, if there develops any jiggling tendency the springs 21, 22 and 38 will become deflected beyond a travel of 1 and 1/2 inches whereupon the bolster will strike against the followers 40 and compress the springs 39 which, having a different natural period of vibration and added to the capacity, will immediately snub or check the vibration and prevent the dangerous jiggle.

Referring still further to the graph, it will be observed that five different car loads have been laid out. The light car is under the 10,000 pounds initial load and may of course be expected to ride rather roughly but this is immaterial as there is no lading to be protected. However, if the force is built up in magnitude to about 20,000 pounds they will break through the snub and retard any further jiggling. When the next load is reached, which is about one quarter capacity, the spring may vibrate downwardly and upwardly one-fourth inch each way. On the up vibration the springs will be abruptly snubbed by the bolts 23. For the next load, approximately one-half it will be noted that the car may vibrate downwardly and upwardly approximately one-half inch each way before the upward snub is reached. If the upward snub fails to check the vibration, it will be checked when it reaches the break in the spring line. At about three-fourths load, the springs will have to be closed substantially 3/8 inches before being checked by the pick-up in capacity caused by the break in the line. If this were to fail and the spring were to oscillate through this point it would again be checked by the upward jump on the bolts 23. The same is true for the full load limit of the car, but in so far as these masses are gradually increasing it is advisable to decrease the distance through which these masses travel before they strike some means for checking synchronous vibration of the springs. If a line were projected beyond the 42,400 pound load in the graph it will be observed that the angle subtended between this line and the final closure curve will be about 22°. This will correspond to about an eight or ten mile change in critical speed. It is this change in critical speed which should and will break up harmonics and the greater this angle is the greater is the possibility of accomplishing the desired result.

It will of course be necessary to make some modification of the spring assembly to take care of cars of different capacities so that the performance will be in accordance with the graph, Figure 7, and this can be readily done by changing the size of the stock from which the various springs are formed. For a forty ton car the coils 38 may be of 1 and 1/4 inch stock whereas for the fifty-five ton and seventy ton 1 and 1/2 inch stock will be more suitable in order that adequate protection may be had against excessive loads. In forty ton equipment the springs 22 may be omitted if desired but it is preferable that they be in place for the fifty-five ton car and certainly present for the seventy ton equipment. In forty ton cars the springs are initially held under less than 10,000 pounds compression whereas for seventy ton cars the pressure is initially greater. However, the disclosure is merely intended to be illustrative of the basic scheme.

From the foregoing description and a study of the drawings it will be apparent that I have provided a very simply constructed spring nest or assembly which may be used to replace the ordinary designs and which may be mounted in identically the same manner, the only difference being the provision of the holes in the bolster and the spring seat for the accommodation of the snub bolts. Such holes may be bored in already existing equipment without any great amount of labor so that the cost of installation will be but slight. Adequate provision has been made for cushioning the strains upon the snub bolts so that they will not be liable to breakage. The working curve of the spring will be effectually broken as clearly indicated on the graph so that the development of any vertical jiggle to a dangerous extent will be prevented. It is thought that the construction, operation and advantages should be readily apparent to one skilled in the art without further explanation.

While I have shown and described the preferred embodiments of the invention, it

should be understood that the disclosure is merely an exemplification of the principles involved as the right is reserved to make all such changes in the details of construction as will widen the field of utility and increase the adaptability of the device provided such changes constitute no departure from the spirit of the invention or the scope of the claims hereunto appended.

Having thus described the invention, I claim:

1. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly including a plurality of units certain of which are operable in sequence with respect to the others, and means connecting the side frame and the bolster for maintaining the first operating ones of the units under initial compression.

2. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of units certain of which are adapted to become energized subsequently to the others, and means connected with the side frame for maintaining the others of the units under initial compression.

3. A car truck including a side frame having a window opening, a bolster extending into the opening, a spring assembly within the opening for supporting the bolster, said assembly comprising a group of units bearing against the underside of the bolster and a group spaced below the bolster, and means connected with the side frame for maintaining the first named group of units under initial compression.

4. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coil springs of A. R. A. standard height bearing against the underside of the bolster and other springs of less height, and means connected with the bolster for maintaining the first named springs under initial compression.

5. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coil springs certain of which are of standard height and the others of less height, and means connected with the bolster and the side frame for maintaining the standard height springs under initial compression.

6. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a group of coil springs of standard height enclosing other springs, and a group of separate springs of less unrestricted height, means connecting the bolster and the side frame for maintaining the first named group under predetermined initial compression, and means for cushioning said connecting means.

7. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coil springs, means connecting the bolster and the side frame for maintaining certain of the coils under predetermined initial compression and means for cushioning said connecting means located within the bolster.

8. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coil springs of standard free height and a group of less free height, means connecting the bolster and the side frame for maintaining the first named springs under predetermined initial compression, and means for cushioning said connecting means located within the bolster and operating upon recoil of the assembly to relieve the strain on said connecting means.

9. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coil springs, means connecting the bolster and the side frame for applying initial compressive force upon certain of the springs, and means for restraining said connecting means against movement with respect to the bolster.

10. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coil springs, and means connected with the bolster and slidably connected with the side frame for maintaining certain of the springs under initial compression.

11. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of units of standard height and a plurality of shorter units, and bolt means connecting the bolster and the side frame for maintaining the first units under initial compression while unaffecting the shorter units.

12. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bol-

ster, said assembly comprising a plurality of units of standard height and others of less height, bolt means connecting the bolster and the side frame for maintaining the first named units under initial compression with the units of less height unconfined, and cushioning means reacting against the bolt means and the bolster.

13. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of units, bolt means connecting the bolster and the side frame for maintaining certain of the units under initial compression, and cushioning means reacting against the bolt means and the bolster and located within the latter.

14. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coils springs, bolt members connecting the bolster and the side frame and movable with respect to the latter, said bolt members maintaining certain of the coil springs under initial compression, and means for cushioning said bolt members.

15. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coil springs, bolt members connecting the bolster and the side frame and movable with respect to the latter, said bolt members maintaining certain of the coil springs under initial compression, means for cushioning said bolt members, and means for preventing rotation of the bolt members.

16. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coil springs, bolt members connecting the bolster and the side frame and movable with respect to the latter, said bolt members maintaining certain of the coil springs under initial compression, means for cushioning said bolt members, and means carried by the bolster and located therewithin for preventing rotation of the bolt members.

17. A car truck including a side frame having a window opening, a bolster extending into the opening, and a spring assembly within the opening for supporting the bolster, said assembly comprising a plurality of coil springs, bolt members connecting the bolster and side frame and passing through the assembly for maintaining certain of the coil springs under preliminary compression, means within the bolster reacting against said bolt members for cushioning the same on recoil, and means within the bolster for preventing rotation of the bolt members.

18. A car truck including a side frame having a window, a bolster extending into the opening, a spring nest assembly within the opening for supporting the bolster, said assembly comprising a plurality of standard springs and a group of separable superposed helical coils of varying heights, and means connecting the bolster and side frame so as to hold the standard springs under initial compression.

In testimony whereof I affix my signature.

THOMAS H. SYMINGTON.