April 29, 1952 A. R. CRIPE 2,594,734

RAILWAY TRUCK

Filed Feb. 28, 1947 3 Sheets-Sheet 1

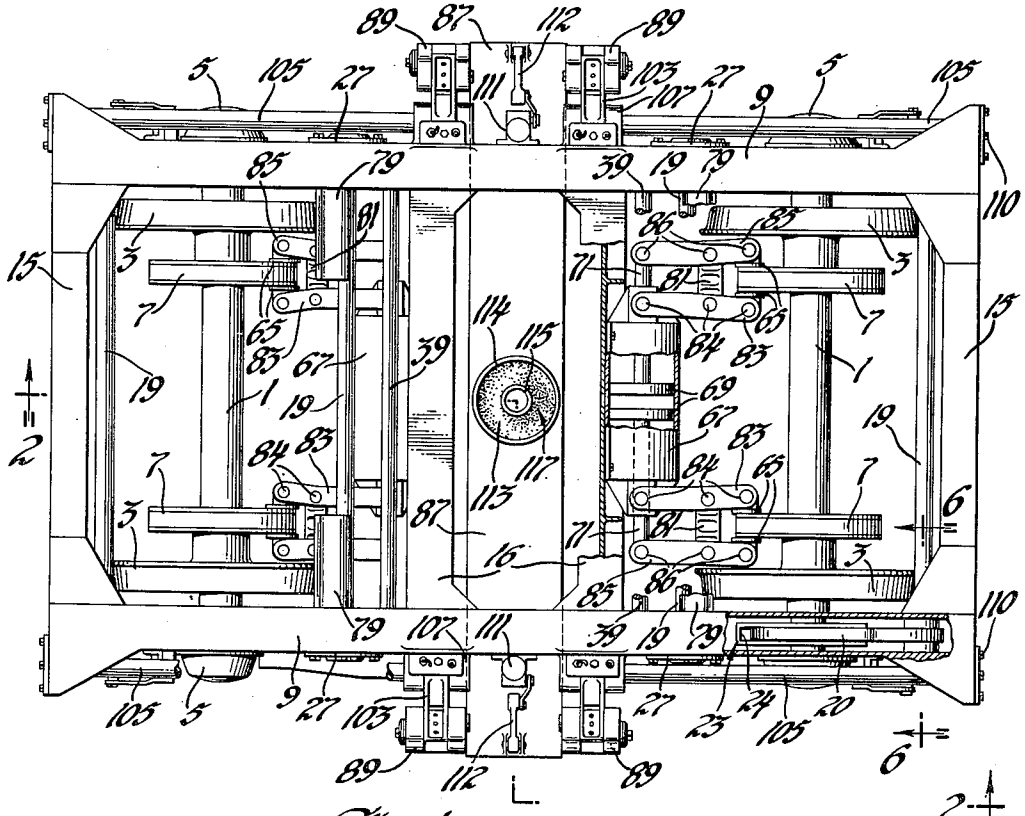


Fig. 1

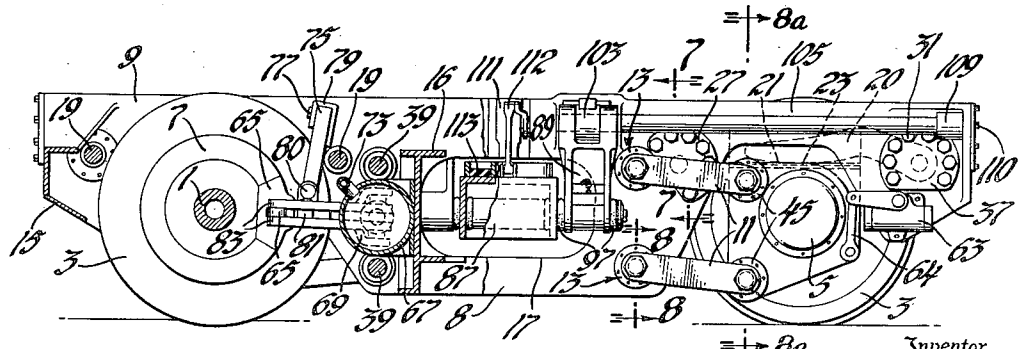


Fig. 2

Inventor
Alan R. Cripe

By
Spencer, Willits, Helwig & Baillio
Attorneys

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RAILWAY TRUCK

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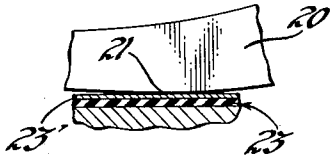
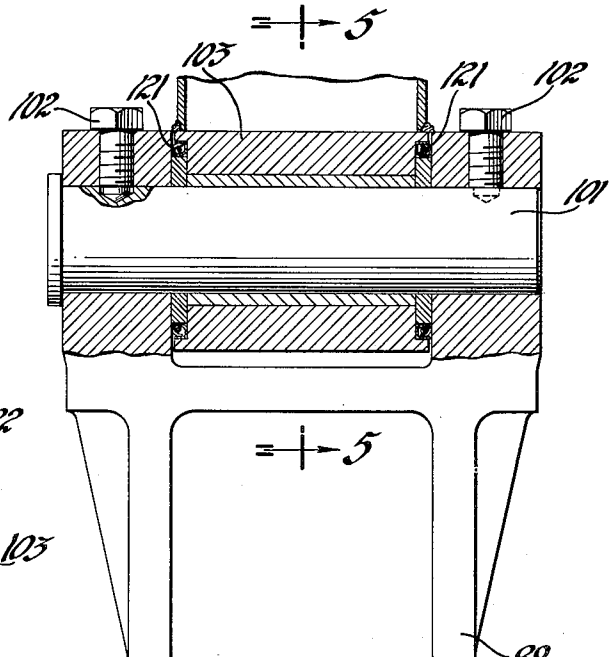


Fig. 2a



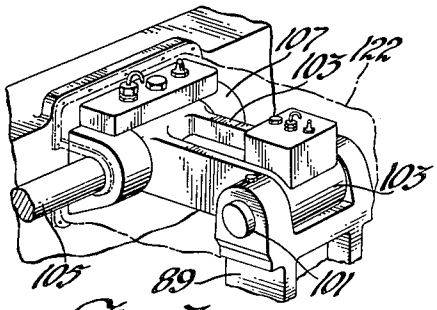


Fig. 3

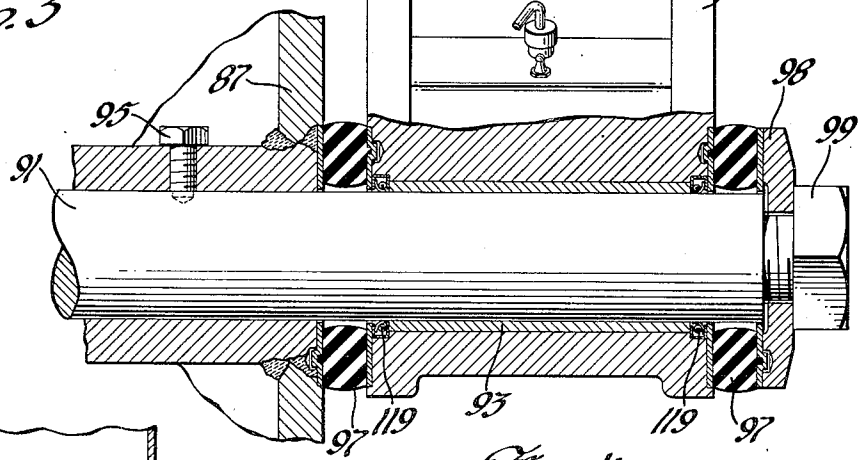


Fig. 4

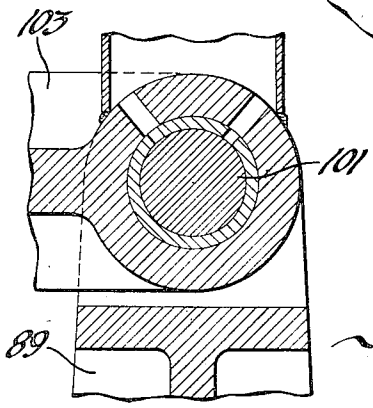


Fig. 5

Inventor
Alan R. Cripe

By Spencer, Willitts, Helwig & Padillo
Attorneys

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RAILWAY TRUCK

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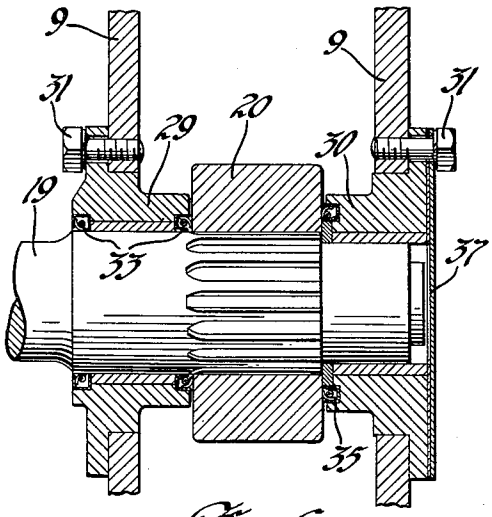


Fig. 6

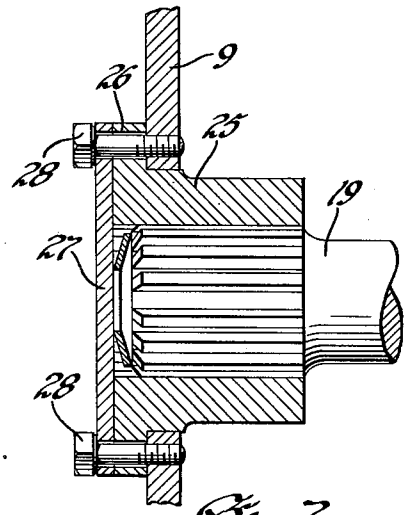


Fig. 7

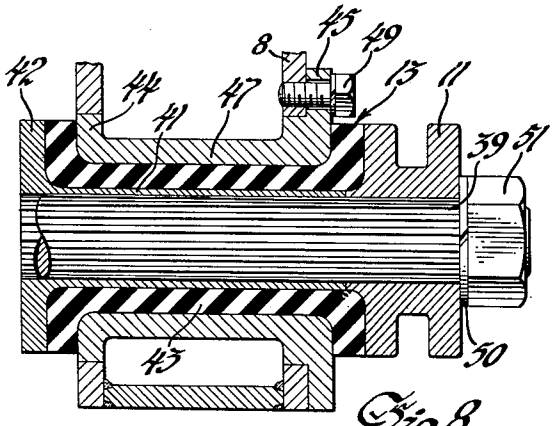


Fig. 8

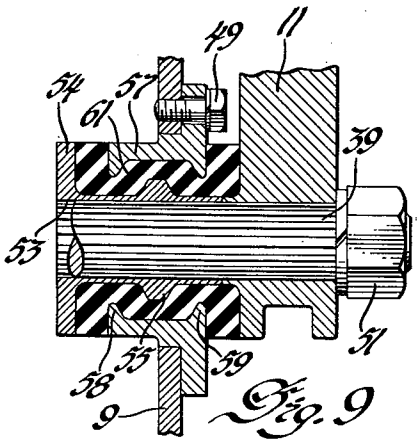


Fig. 9

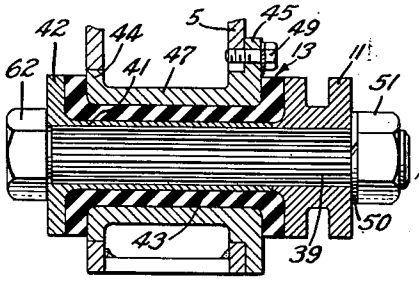


Fig. 8a

Inventor
Alan R. Cripe
By
Spencer, Willits, Helwig & Baillie
Attorneys

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UNITED STATES PATENT OFFICE

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RAILWAY TRUCK

Alan R. Cripe, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application February 28, 1947, Serial No. 731,525

6 Claims. (Cl. 105—182)

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This invention relates to means for cushioning shocks between the unsprung and sprung members of railway trucks.

The principal object of the invention is to provide a lightweight truck including articulated suspension and brake applying means having few rubbing surfaces and suitable cushioning and damping means located adjacent the point of application of the vertical transverse and longitudinal forces in the unsprung and sprung truck elements and therebetween in order to provide satisfactory ride stability under free running conditions and braking conditions.

This and other objects of the invention will become apparent by reference to the following detailed description and drawings illustrating a railway truck incorporating means and the arrangement thereof by which these objects are accomplished.

Figure 1 of the drawings is a top plan view of the truck with parts broken away.

Figure 2 is a side elevation with parts broken away.

Figure 2*a* is an enlarged side elevation view of certain parts shown in Figure 1 with parts broken away.

Figure 3 is a perspective view of the central portion of one side of the truck showing a portion of the bolster linkage with parts broken away.

Figure 4 is an enlarged view similar to Figure 2 of a detail of the bolster linkage with parts broken away and in section.

Figure 5 is an enlarged sectional view taken on line 5—5 of Figure 4 with parts broken away.

Figure 6 is an enlarged sectional view taken on line 6—6 of Figure 1 with parts broken away.

Figure 7 is an enlarged sectional view taken on line 7—7 of Figure 2 with parts broken away.

Figure 8 is an enlarged sectional view taken on line 8—8 of Figure 2 with parts broken away.

Figure 8*a* is an enlarged sectional view taken on line 8*a*—8*a* with parts shown in section.

Figure 9 is a view similar to Figure 8 of a modified structure.

As best illustrated in Figures 1 and 2 of the drawings, the truck includes a pair of tubular axles 1 each having a pair of flanged wheels 3 secured thereto adjacent the end journal portions, on which journal boxes 5 are supported, and a pair of brake discs 7 secured thereto intermediate the wheels.

Each journal box 5 is articulated to opposite ends of dropped center portions 8 of truck side frame members 9 of inverted U-shape form by

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means of parallel longitudinal radius links 11 and cushion assemblies generally indicated at 13. Transverse end sill members 15 are secured between adjacent ends of the side frame members 9 and transom members 16 are also secured between the dropped center portions 8 of the side frames 9 on either side of central bolster openings 17 therein.

The truck frame is resiliently supported on the journal boxes 5 by four main transverse torsion bar springs 19 located alongside and within each of the end sills 15 and alongside and without each of the transoms 16. A longitudinal lever 20 is splined on each main transverse torsion spring 19 adjacent one end and this lever is provided with a cam face 21 on the outer end which engages with a cushion assembly indicated generally at 23 and located in a longitudinal depression 24 in the upper face of a journal box 5. The cushion assembly 23, as best shown in Figure 2*a*, comprises an upper cam plate 23' which is contacted by the cam face 21 of the lever 20 and having a rubber cushion vulcanized to the underside of the cam plate and in contact with the bottom of the journal box depression 24. These cam faces of the levers 20 and cushion assemblies 23 are protected from cinders and dirt and therefore wear by being located in the space between the top and sides of the inverted U-shaped side frames.

As best illustrated in Figures 1, 2 and 7, one end of each main torsion bar spring 19 is splined and is adapted to be inserted in one of four internally splined anchors 25 adapted to be anchored in different angular positions in transverse openings in the side frames 9 at diagonally opposite ends adjacent the end sills 15 and on diagonally opposite ends of the dropped center portions 8 thereof outside and adjacent the transoms 16, each of the anchors being provided with an outer flange 26 and an outer cover plate 27 through which studs 28 extend and are threaded in openings in the side frames.

The opposite ends of each torsion bar spring 19 is rotatably mounted in a pair of bearing members 29—30 located in aligned openings in the side frame opposite each anchor 25 and on either side of the lever 20 shown splined thereon in Figure 6. Each of the bearing members 29—30 are provided with a flange through which studs 31 extend and threaded in the side member. The inner bearing member 29 is provided with a bushing having lubricant seals 33, one between the bearing member and main torsion spring 19 and the other seal between the bearing member 29

and inner face of the lever 20. The outer bearing member 30 is provided with a bushing having a lubricant seal 35 between it and the outer face of the lever 20 and an outer cover plate 37 secured thereto by the studs 31.

The inner ends of each of the eight radius links 11 on directly opposite sides of the side frame are nonrotatably connected by torsion equalizer bars 39 as best shown in Figures 1 and 2. Each of the four torsion equalizer bars 39 have splined end portions each of which, as best illustrated in Figure 8, extend through openings in the side frame and an internally splined bushing 41 forming the inner member of a cushion assembly 13 and also through an internally splined opening in the inner end of a radius link 11 so that each pair of bushings 41 and radius links 11 on directly opposite sides of the truck frame are connected by a torsion bar equalizer 39. The inner bushing member 41 of the cushion assembly 13 is provided with an external flange 42 on the inner end and a rubber bushing 43 is vulcanized to the inner face of the flange 42 and outer surface of the bushing 41 and is also vulcanized to the internal surface and outer faces of external end flanges 44—45 of a bushing 47 forming the outer member of the cushion assembly 13. The end flanges 44—45 of the outer bushing are located in openings in the opposite sides of the side frames 9 and secured therein by studs 49 extending through an extension of the outer flange 45 and threaded in openings in the side frame. The opposite ends of each torsion equalizer bar 39 are threaded and a lock washer 50 and nut 51 therein is provided to draw the links on opposite sides of the truck frame into tight contact with the outer end of the inner bushings 41 and compress the end portion of the rubber bushings 43 between each of the links 11 and the outer flanges of the outer bushings 47 of the cushion assemblies in the opposite side frames. The above cushion assembly is also adapted to be mounted in similar openings in each journal box 5 for cushioning the outer ends of the links 11, as best illustrated in Figure 8*a*.

Figure 9 is a modified cushion assembly comprising an internally splined inner bushing 53 having an external inner end flange 54 and an external central flange 55, an outer bushing 57 having internal end flanges 58—59 and a rubber bushing 61 vulcanized between the bushings. This cushion assembly is also adapted to be mounted in openings in the side frames 9 and journal boxes by studs 49. Either of the above described cushion assemblies when mounted in openings in the journal boxes 5 are connected to the outer end of a radius link 11 by means of an externally splined bolt 62 having a lock washer 50 and a nut 51 thereon, shown in Figure 8*a*, serve to draw the inner face of the outer end of a link into tight contact with the outer end of the inner bushing 41 or 53 to compress the outer end of the rubber bushings 43 or 61 between the inner face of the link and outer face of the flanges 45 or 59 of the cushion assemblies shown in Figures 8 or 9 in a similar manner to that described when the cushions are located in openings in the truck side frames 9.

With the radius links 11 connected between the side frames 9 and journal boxes by the cushion assemblies 13 it will be apparent that longitudinal, transverse, vertical and torsional forces therebetween will be cushioned thereby and the rubber bushings yield to allow relative universal movement between the truck frame, links 11 and

journal boxes 5. When the truck frame is loaded and operating on straight track the radius links 11 extend upwardly and inwardly from the journal boxes 5, as best shown in Figure 2. When on curved track additional load is imposed on the side frame on the outside of the curve and less load is imposed on the inner side frame. The angle of the links with respect to the horizontal on the outside of the frame will accordingly be reduced and the truck base on this side will be increased and the angle of the links on the inside of the frame will be greater and the truck base on this side will be reduced. The axles will accordingly be steered in the proper direction for the curvature of the track. The cushion assemblies 13 and torsion equalizer bars 39 act in torsion, the bars acting to oppose this relative angular movement of the links on opposite sides of the truck and corresponding roll of the truck frame about its longitudinal center line with respect to the axles and thereby serve as cross equalizing anti-roll members. The cam face of the levers 20 on the main torsion springs 19 may be formed to provide variable rate springing necessary to take care of variable loads and thereby also reduce roll of the truck frame relative to the axles. The only rubbing surfaces so far mentioned are those of the bearing members 29—30 in which the outer ends of the main torsion bar springs 19 are rotatably supported. A double acting hydraulic shock absorber 63 is connected by a link 64 directly between the outer end of each journal box 5 and the adjacent end of the side frame to damp out relative vertical movement therebetween.

The transverse shock forces between the axles 1 and truck frame due to curved track and also by the normal tendency of the axles to freely oscillate transversely of the frame on tangent track, by reason of the conical tread surface of the wheels 3, are absorbed by the cushion assemblies 13 located directly between the radius links 11 and the truck frame and journal boxes 5. Brake applying means on the truck frame are provided to maintain equal and opposite pressure on brake shoes 65 on opposite sides of the brake disks 7 on each axle when transverse shocks and movement of the axles relative to the frame occur with little resulting shock being imposed on the frame. As best illustrated in Figures 1 and 2 each axle brake applying means comprises a brake cylinder 67 secured transversely on the outside of each transom 16 and having opposed pistons 69 therein with attached piston rods 71 extending out of the opposite ends of the cylinder which is provided with an air pressure inlet opening 73 therein between the pistons 69. Brake hanger links 75 are pivotally supported at the upper ends by transverse pins 77 in brackets 79 secured to the side frames 9 inside and in the plane of each axle brake disc 7. Each hanger link extends downwardly and outwardly toward a brake disc and is pivotally connected at the lower end by a transverse pin 80 to a transverse link 81. A pair of vertically spaced longitudinal links 83 are pivoted intermediate their ends to the inner end of each transverse link 81 and pivoted at their inner ends to one end of the brake cylinder 67 and at their outer ends to a brake shoe 65 adjacent the inner face of a brake disc 7 by means of vertical pins 84. Another pair of vertically spaced longitudinal links 85 are pivoted intermediate their ends to the outer end of each transverse link 81 and at the inner ends to a piston rod 71 and at their outer ends to a brake shoe 65 on the outside of a

brake disc 7 and directly opposite the shoe on the links 83 by means of vertical pins 85. It will be evident that with the above described brake linkage that equal and opposite pressures are applied by the shoes 65 to opposite sides of each axle brake disc 7 and this linkage permits free transverse movement of the axle relative to the truck frame as transverse movement of the axles 1, discs 7 and shoes 65 is transmitted through the linkage directly to each of the opposed pistons 69 tending to move them in the same direction in the brake cylinder 67 and only the slight frictional force between the pistons and cylinder is applied to the cylinder and truck frame due to this transverse axle movement. The brake applying means described includes linkage providing equal pressure to the brake shoes and air pressure equalization in each of the pistons connected thereto. Vertical movement of the brake discs 7 relative to the shoes 65 causes relative vertical as well as angular sliding movement therebetween and the reaction from this movement is transmitted through the hanger links 75 to the brackets 79 secured on the side frames 9 close to the transome 16. With the brake shoes 65 applied to the discs 7 the brake reaction forces applied to the brackets 79 on opposite sides of the transoms are equal and opposite and little torque is imposed on the truck frame and little longitudinal tilting or dive of the frame with respect to the axles occurs.

A bolster 87 is located between the transoms 16 with the ends projecting outwardly through the bolster openings 17 in the opposite side frames 9 as best shown in Figures 1 and 2. As best shown in Figures 3, 4 and 5 each end of the bolster 87 is pivotally connected to swing links 89 on either side thereof by a pin 91 extending longitudinally through an opening in the bolster and openings in the lower ends of the swing links 89 provided with bushings 93 therein. The pin 91 is prevented from turning in the bolster by set screws 95 extending into openings therein. Annular rubber cushion assemblies 97 are located on the pin 91 either side of the swing links 89 and compressed longitudinally by washers 98 and nuts 99 on opposite ends of the pins 91. The swing links 89 supporting opposite ends of the bolster extend upwardly and inwardly and each is pivotally connected by means of a pin 101 extending longitudinally through the upper bifurcated end thereof and secured thereto by set screws 102 and through a bushed opening in the outer end of a transverse lever 103 secured at its inner end on the splined inner end, not shown, of a longitudinal torsion bar bolster spring 105 rotatably supported in bushed openings on either side of the lever in a bearing member 107 secured to the side frame 9. The outer ends of each of the four torsion bolster springs 105 are splined and insertable in splined anchors 109 in longitudinal openings in the end portions of the side frames 9 of the end sills. The anchors 109 are similiar to those previously described and may be also secured by studs 110 to the side frames in different angular positions.

As best shown in Figures 1 and 2 double acting hydraulic shock absorbers 111 are secured to both side frames 9 above the end of the bolster and pivotally connected by links 112. The bolster is provided with a center plate 113 having concentric upstanding flanges 114 and 115 between which is located a cushion assembly shown generally at 117 and comprising an upper wear plate and lower rubber cushion on which the car body, not shown, is pivotally mounted.

Suitable lubricant seals 119 are provided in either end of the bushing 93 in the lower ends of the swing links 89 to prevent leakage of lubricant along the pin 91. The bushed openings in outer ends of the levers 103 are also provided with lubricant seals 121 to prevent leakage of the lubricant between the lever and bifurcated upper end of the swing links 89. The bushed openings in the bearing members 107 for the inner ends of the torsion bolster springs 105 are also provided with lubricant seals, not shown, and suitable lubricant reservoirs having filling and vent openings are provided to lubricate each of the above mentioned bushings. If desired flexible boots 122 such as shown in dotted lines in Figure 3 may be used to exclude dust and dirt from these pivoted joints. The bearing members 29 and 30, in which the main torsion springs 19 are supported, are also lubricated from a reservoir, not shown, having filling and vent openings. The relatively few above mentioned rubbing surfaces are thus conveniently and adequately lubricated.

The angularly adjustable anchors 25 and 109 for the main transverse torsion springs 19 and longitudinal bolster torsion springs 105 provide means for varying the angularity of the longitudinal levers 20 and transverse levers 103 and the rate of the springs to which they are attached and thereby the riding height of the truck frame above each of the journal boxes 5 and for varying the riding height of the bolster center plate 113 with respect to the truck frame for different loads supported.

As the bolster swing links 89 on opposite sides of the truck frame are normally inclined upwardly and inwardly toward each other, the bolster 87 tends to seek the lowest position with reference to the truck frame. When on curved track the angularity of the swing links on the outside of the curve increases with respect to the vertical tending to raise the end of the bolster on this side and the angularity of the swing links on the inside decreases, with respect to the vertical, lowering of the end of the bolster on this side. This causes proper banking of the bolster and body supported thereon when rounding curves. Also as the angularity of the swing link on the outside increases, the effective lever arm distance of the transverse lever 103 is decreased and the rate of the longitudinal torsion springs is increased. Conversely the decrease in angularity of the swing links on the inside decreases and the effective lever arm length of the transverse levers 103 on the inside increases and the rate of the longitudinal torsion springs decreases. The above described bolster suspension thus provides a variable spring rate opposing roll of the bolster and car body and likewise causes proper banking of the bolster and car body on turns and the shock absorbers 111 between the ends of the bolster and side frames damps out any oscillations of the bolster thereby providing a stable ride on tangent or curved track.

For freight cars sufficient transverse cushioning is provided by the cushion assemblies 13 between the truck frame links 11 and journal boxes 5 so that the bolster may be integral with the frame and the above described bolster suspension may be dispensed with.

I claim:

1. In a railway truck longitudinally spaced wheeled axles having end journals, journal boxes on the axle journals, a truck frame having side

frame portions intermediate the axles, longitudinally extending parallel guiding links for the journal boxes, resilient bushings in the truck frame side portions and journal boxes acting in torsion, shear and compression with respect to the transverse axes of the frame and journal boxes, means pivotally connecting the opposite ends of the guiding links in the bushings of the frame and journal boxes for cushioned movement therein, transverse anti-roll torsion bars interconnecting the inner ends of the guiding links on opposite sides of the side frame portions, torsion bar springs on the frame and a lever secured to each spring and engaging a journal box, said springs and levers normally positioning the pivoted outer ends of the parallel guiding links below the inner ends thereof.

2. In a railway truck longitudinally spaced wheeled axles having end journals, journal boxes on the axle journals, a truck frame having side frame portions intermediate the axles, longitudinally extending parallel guiding links for the journal boxes, resilient bushings in the truck frame side portions and journal boxes acting in torsion, shear and compression with respect to the transverse axes of the frame and journal boxes, means pivotally connecting the opposite ends of the parallel guiding links in the bushings of the frame and journal boxes for cushioned movement therein, transverse anti-roll torsion bars interconnecting the inner ends of the guiding links and pivoted in the bushings of the opposite side frame portions, torsion bar springs on the frame and a lever secured to each spring and engaging a journal box, said springs and levers normally positioning the pivoted outer ends of the parallel guiding links below the inner ends thereof.

3. In a railway truck longitudinally spaced wheeled axles having end journals, journal boxes on the axle journals, each of said journal boxes having a resilient cushion thereon and a cam plate on the cushion, a truck frame having side frame portions intermediate the axles, longitudinally extending parallel guiding links for the journal boxes, resilient bushings in the truck frame side portions and journal boxes acting in torsion, shear and compression with respect to the transverse axes of the frame and journal boxes, means pivotally connecting the opposite ends of the guiding links in the bushings of the frame and journal boxes for cushioned movement therein, transverse anti-roll torsion bars interconnecting the inner ends of the guiding links pivoted in the bushings of the opposite side frame portions and also cushioned in said bushings, torsion bar springs on the frame and a lever secured to each spring and provided with a cam surface engaging a journal box cam plate, said springs and levers normally positioning the pivoted outer ends of the parallel guiding links below the inner ends thereof.

4. In a railway truck longitudinally spaced wheeled axles having end journals, journal boxes on the axle journals, each of said journal boxes having a resilient cushion thereon and a cam plate on the cushion, a truck frame having side frame portions intermediate the axles, each of said side frame portions having end projections covering the journal boxes, longitudinally extending parallel guiding links for the journal boxes, resilient bushings in the truck frame side portions and journal boxes acting in torsion, shear and compression with respect to the transverse axes of the frame and journal boxes, means

pivotally connecting the opposite ends of the guiding links in the bushings of the frame and journal boxes for cushioned movement therein, transverse anti-roll torsion bars interconnecting the inner ends of the guiding links pivoted in the bushings in the opposite side frame portions and also cushioned in said bushings, torsion bar springs on the frame and a lever secured to each spring and provided with a cam surface engaging a journal box cam plate, said springs and levers normally positioning the pivoted outer ends of the parallel guiding links below the inner ends thereof.

5. In a railway truck longitudinally spaced wheeled axles having end journals, journal boxes on the axle journals, each of said journal boxes having a longitudinal groove in the upper portion, a resilient cushion member and a cam plate supported thereon and located in the journal box groove, a truck frame having side frame portions intermediate the axles, longitudinally extending parallel guiding links for the journal boxes, resilient bushings in the truck frame side portions and the journal boxes acting in torsion, shear and compression with respect to the transverse axes of the frame and journal boxes, means pivotally connecting the opposite ends of the guiding links in the bushings of the frame and journal boxes for cushioned movement therein, transverse anti-roll torsion bars interconnecting the inner ends of the guiding links pivoted in the bushings of the opposite side frame portions and also cushioned in said bushings, transverse torsion bar springs on the frame and a lever secured to each spring and provided with a cam surface extending into the longitudinal groove of a journal box and engaging the cam plate therein, said springs and levers normally positioning the pivoted outer ends of the guiding links below the inner ends thereof.

6. In a railway truck longitudinally spaced wheeled axles having end journals, journal boxes on the axle journals, each of said journal boxes having a longitudinal groove in the upper portion, a resilient cushion and a cam plate supported thereon and located in each journal box groove, a truck frame having side frame portions intermediate the axles, said side frame portions having end projections covering the journal boxes, longitudinally extending parallel guiding links for the journal boxes, resilient bushings in the truck frame side portions and the journal boxes acting in torsion, shear and compression with respect to the transverse axes of the frame and journal boxes, means pivotally connecting the opposite ends of the guiding links in the bushings of the frame and journal boxes for cushioned movement therein, transverse anti-roll torsion bars interconnecting the inner ends of the guiding links pivoted in the bushings of the opposite side frame portions and also cushioned in the bushings, transverse torsion bar springs on the frame, each of said springs having one end adjustably secured to one side frame portion and the other end rotatable in the opposite side frame portion and a lever secured to the rotatable end of each spring and provided with a cam surface extending into the longitudinal groove in each journal box and engaging the cam plate therein, said springs and levers normally positioning the pivoted outer ends of the guiding links below the inner ends thereof.

ALAN R. CRIPE.

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