April 28, 1953 C. L. EKSERGIAN 2,636,450

RAILWAY TRUCK

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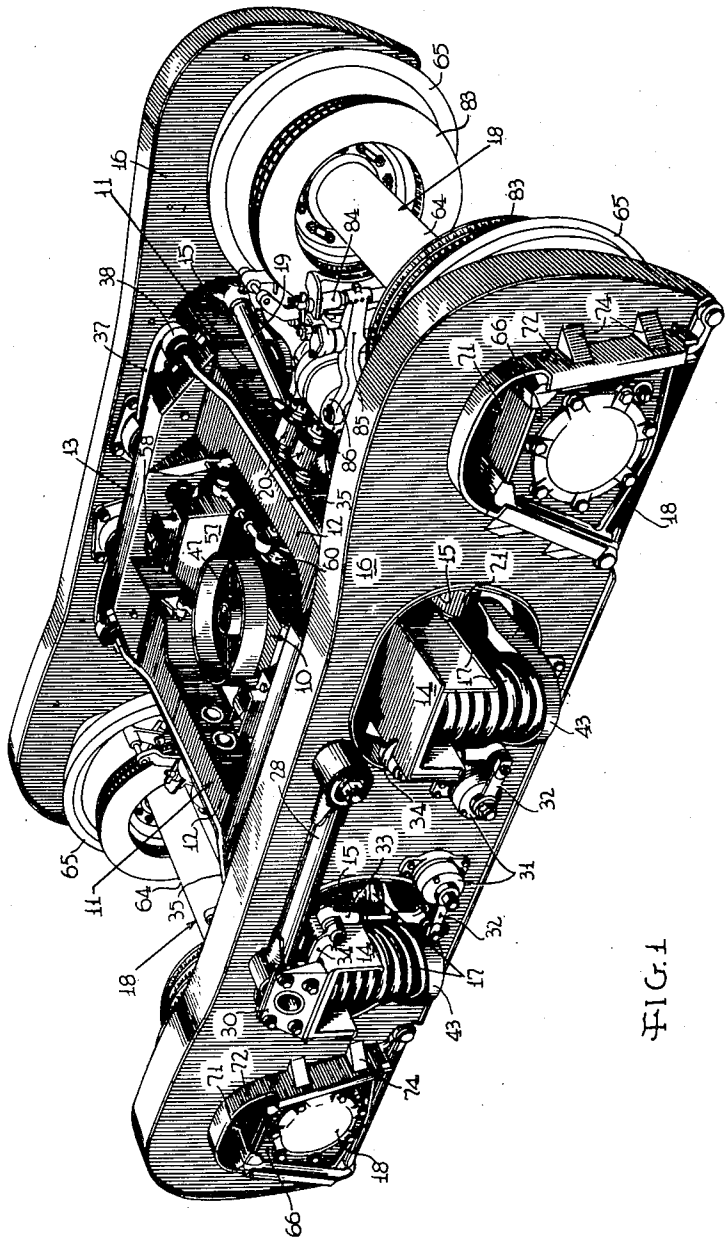


FIG. 1

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RAILWAY TRUCK

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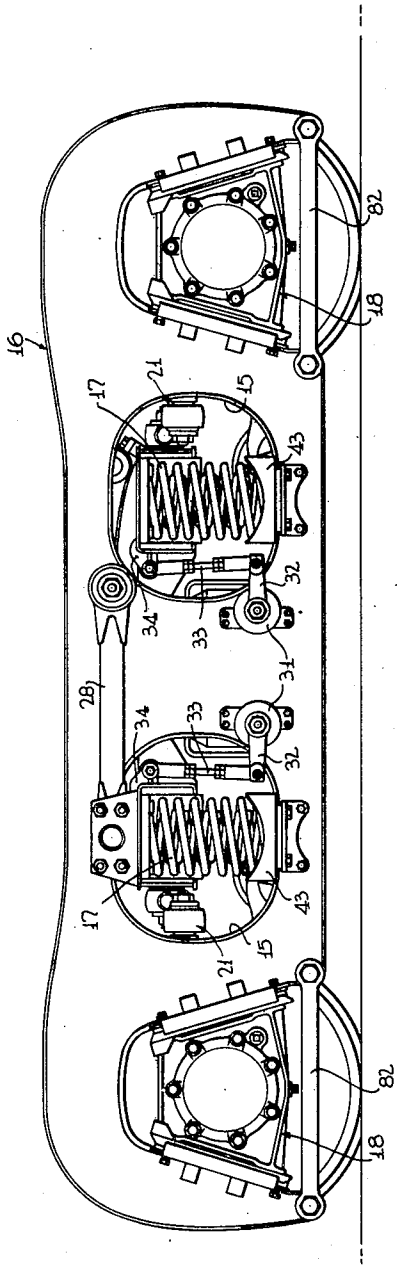


FIG 2

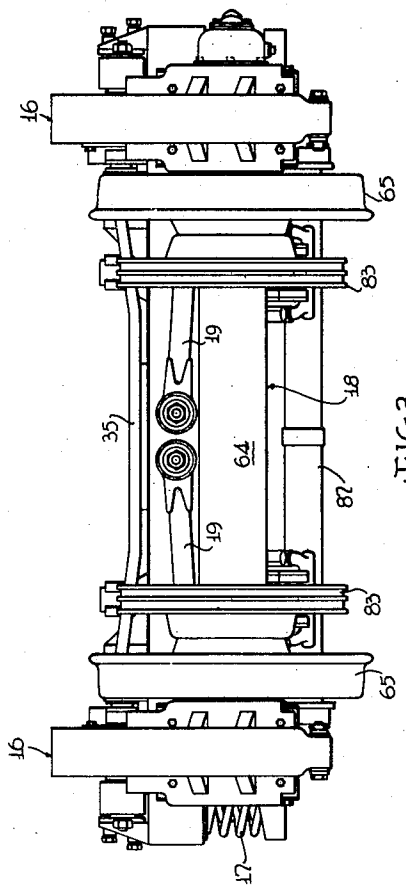


FIG 3

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RAILWAY TRUCK

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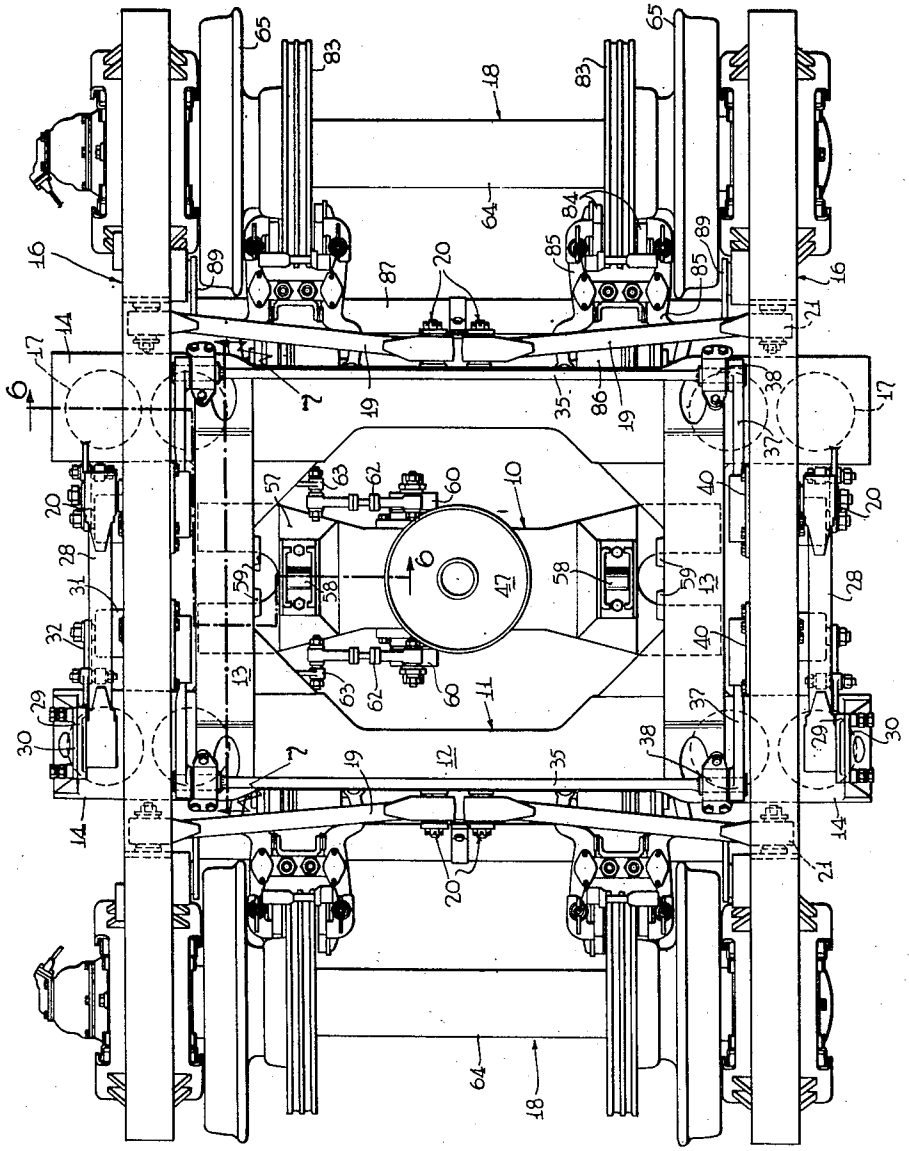


FIG 4

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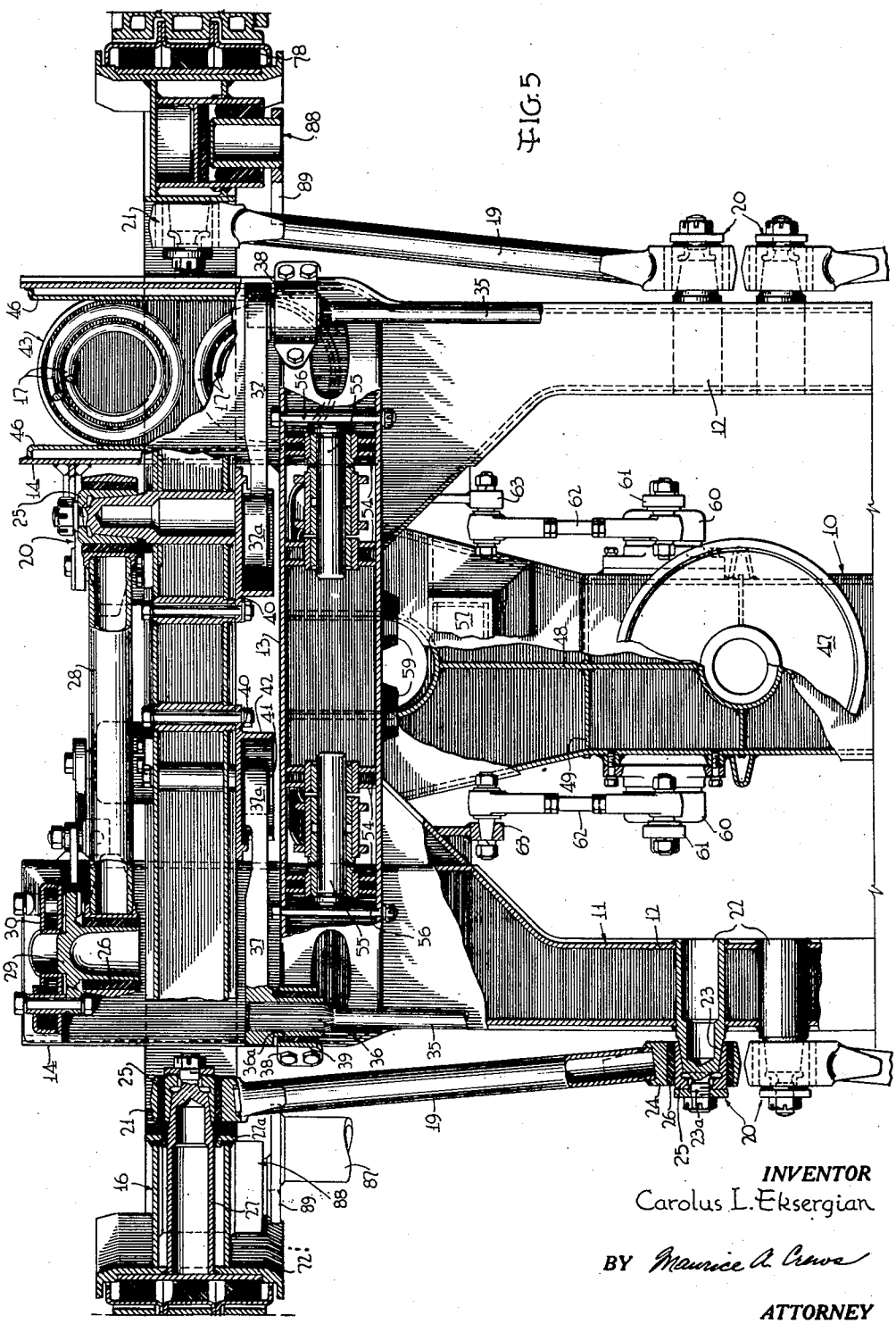
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RAILWAY TRUCK

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FIG. 5



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RAILWAY TRUCK

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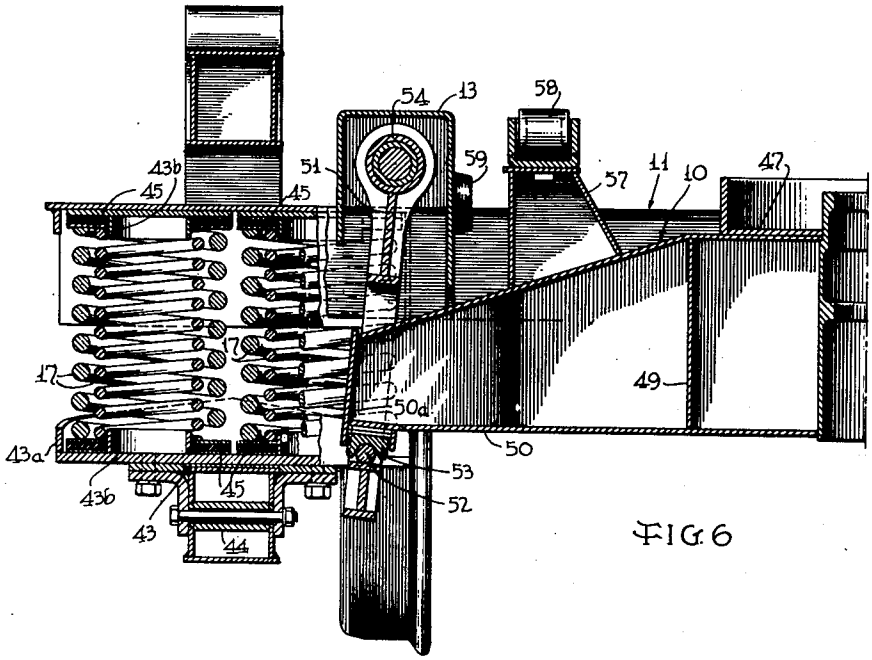


FIG. 6

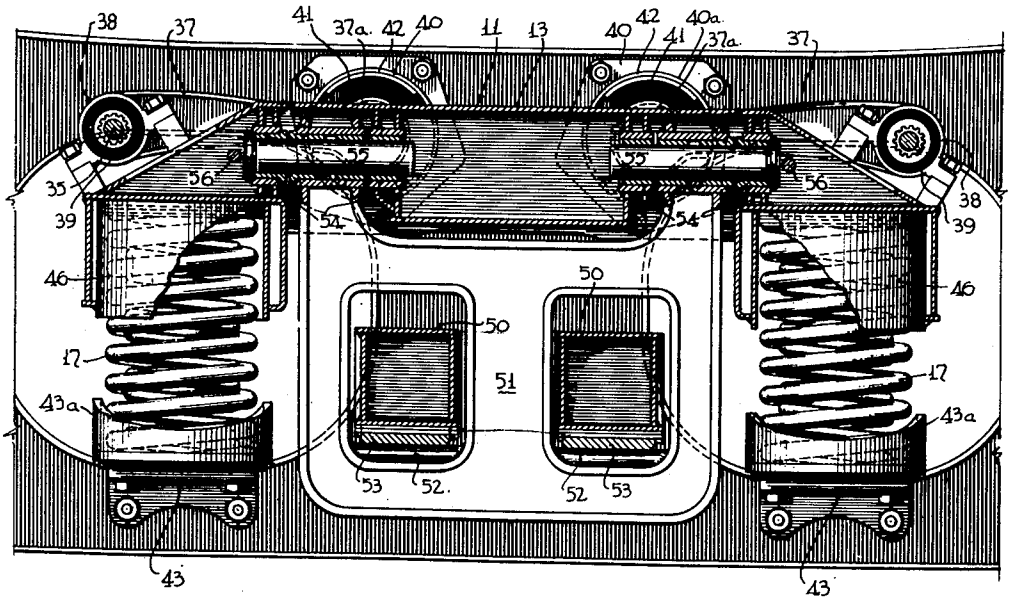


FIG. 7

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UNITED STATES PATENT OFFICE

2,636,450

RAILWAY TRUCK

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Application June 4, 1947, Serial No. 752,521

9 Claims. (Cl. 105—190)

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The invention relates to a railway truck, and more particularly to a light-weight such truck adapted for modern high-speed passenger car service.

It is among the objects of the invention to provide a truck structure which has a high strength-weight ratio, easy riding qualities, quietness in operation and simplicity of construction.

Simplicity is attained by making the entire truck of a relatively few main parts or subassemblies, such parts comprising two spaced wheel and axle assemblies, flexibly supporting at their ends two laterally spaced side frame or equalizer members which are free to tilt relatively to each other in their longitudinal vertical planes to follow the track irregularities. These side frame members are preferably vertically deep box section members having longitudinally spaced openings therethrough, these openings being arranged to receive the projecting end extensions of a rectangular transverse frame mounted on coil springs disposed in said openings. This rectangular frame is thus relatively free to rotate about horizontal transverse and horizontal longitudinal axes with respect to one or both said side frames, but its horizontal movement with respect thereto is restrained transversely by strong transversely extending restraining members disposed at the opposite ends, lengthwise of the truck, of said transverse frame and interconnecting the side frames with the central portion of the transverse frame and longitudinally, by similar longitudinally extending restraining members outside the side frames and interconnecting the transverse frame with spaced joints on the longitudinal side frames. All these restraining members are resiliently mounted to allow the relative vertical springing movements of the transverse frame and the side frames and the relative tilting movements about horizontal transverse and longitudinal axes but restraining their relative transverse and longitudinal movements in a horizontal plane.

The bolster is supported from said transverse frame by swing hangers which provide a wide support of the bolster from the transverse frame allowing movement of the bolster with respect to said frame substantially only in a transverse direction, except for the slight tilting of the bolster about an axis lengthwise of the truck due to the inclination of the swing hangers. Thus the car underframe, bolster and transverse frame move as a unit in the same relative relation to each other, independent of the irregularities of the track, thereby insuring easy riding qualities. The wide support of the bolster from the transverse frame insures the transmission of the longitudinal forces between them through the swing hanger suspension avoiding the rubbing of the bolster against wear plates on the transverse member.

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Other and further objects and advantages and the manner in which they are attained will become apparent from the following detailed description when read in connection with the drawings forming a part hereof.

In the drawings,

Figure 1 is a perspective view of the improved truck of the invention;

Figure 2 is a side elevational view thereof;

Figure 3 is an end elevational view thereof;

Figure 4 is a plan view thereof;

Figure 5 is an enlarged fragmentary plan view of a central portion of the truck with parts broken away and shown in section;

Figure 6 is a fragmentary vertical transverse sectional view taken substantially along the line 6—6 of Fig. 4; and

Figure 7 is a fragmentary vertical longitudinal sectional view taken substantially along the line 7—7 of Fig. 4.

Referring to Figs. 1 to 4 inclusive, the truck is shown as comprising a bolster 10 having a large diameter center plate 47 adapted to receive a corresponding body center plate for supporting the car body load. The bolster 10 is supported for transverse movement only adjacent its ends, in a manner to be more fully described later on, from a transverse load-carrying frame or transom 11 which is of substantially rectangular form in plan and comprised of spaced transverse members 12, 12 interconnected by end longitudinally extending members 13, 13, the transverse members being extended laterally by end extensions 14, 14 projecting laterally beyond the truck sides.

As clearly appears from Figs. 1, 2 and 4, these extensions 14 pass loosely through large openings or windows 15, 15 in the respective side frames 16, 16 and transmit the load thereto through nests of coil springs 17, 17 interposed between the end extensions 14 and the bottoms of the respective openings 15. These coil springs form substantially the sole springing for the load, and in combination with the large center plate 47 on the bolster, make it possible to maintain the frame 12 at all times parallel to the body underframe, thus avoiding pitching or galloping of said frame and insuring easy riding.

The side frames 16, in turn, are mounted

through cushioned connections (to be more fully described hereinafter) adjacent their ends upon a pair of longitudinally spaced wheel and axle assemblies 18, 18 with freedom for slight cushioned vertical and lateral movements with respect thereto, so that the side frames serve also as equalizers. It will thus be seen that the truck is of the utmost simplicity of construction, consisting in the main of a bolster 10, a transverse frame or transom 11, separate side frames 16 and wheel and axle assemblies 18.

To restrain the main transverse load-carrying frame 11 against relative transverse and longitudinal movement in a horizontal plane with respect to the side frames 16 and to transmit horizontal forces between them, suitable restraining or guiding means are provided between the transverse frame 11 and the side frames 16, these restraining means being arranged to permit relatively freely the bodily vertical springing movement of the frame 11 as well as its tilting movement about transverse and longitudinal axes to follow the movements of the body underframe supported thereby.

Relative transverse movement is restrained by pairs of transversely extending tension and compression taking members, such as rods or tubes 19, arranged along the fore and aft faces of the frame 11, the inner ends of said tubes 19 being connected by a cushioned connection 20, Figs. 4 and 5, adjacent the longitudinal central portion of the frame and their outer ends being connected by a similar connection 21 to the adjacent wall of the opening 15 in the adjacent side frame 16. These tubes 19 are preferably arranged to extend slightly upwardly and inwardly under light or no loads and their outer ends are connected to the side frames 16 adjacent the center of their vertical height and in the vertical central plane thereof to minimize any tendency to turn the side frames about their longitudinal axes.

The specific cushioned connection is shown most clearly in Fig. 5 as comprising an anchor member 22 rigidly secured as by welding to the opposite walls of the hollow transverse member 12 of the frame 11, said member being formed with a tapered seat 23 on the part thereof projecting beyond the member 12 and a reduced screw-threaded extension 23a beyond said seat. The adjacent end of the tube 19 is provided with an eye 24 strongly welded thereto, and a cup-shaped element 25 holds a rubber bushing 26 under compression in said eye. This cup-shaped member has a tapered portion adapted to slip onto the tapered seat on the anchor member 22 and is secured to said seat by a washer and nut screwed onto the reduced screw-threaded end 23a of the anchor member 22.

The connection to the side frame member is similar to the above except that in this case the anchor member 27 is strongly connected as by welding to opposed walls 27a, 72, of the hollow side frame 16. This connection of the member 19 permits ready assembly and disassembly thereof. The rubber bushings 26, while strongly resisting any appreciable transverse movement by acting in compression, impose less resistance to vertical movements of the frame 11 by acting in torsional shear.

Relative longitudinal movement between the transverse frame 11 and the side frames 16 is constained by longitudinally extending restraining members or tubes 28 connected at one end to the respective side frame by a cushioned connection 20 in all respects similar to the connection 20 of the transverse rods or tubes 19 to the frame 11, see Fig. 5, and at its opposite end to an end extension 14 of the transverse frame 11. This connection differs in that a cup-shaped inner or anchoring member 29, receiving a rubber bushing 26 between it and the adjacent eye of the member 28, is bolted directly to a vertical bracket 30 on the adjacent end extension 14.

To further control the movements of the load-carrying transverse frame 11, and to dampen the too free return of the coil springs 17, shock absorbers 31 may be arranged between the extensions 14 of the frame 11 and the respective side frames 16, see Figs. 1 and 2. These shock absorbers may be a usual hydraulic rotary type each having its body bolted to the adjacent side frame 16 and its movable arm 32 connected by an adjustable link 33 to a bracket 34 on the adjacent extension 14. Preferably, this link is universally connected to both the arm and the bracket to prevent binding strains.

To prevent excessive lateral tilting of the transverse frame 11 about an axis longitudinally of the truck, suitable stabilizing means are provided to oppose such tilting. Such means may comprise a pair of torsion rods 35, one arranged above each transverse member 12 of the frame 11. The enlarged ends of these rods are non-rotatably secured as by splined connections 36, see Fig. 5, to elongated sleeve hub portions 36a on arms 37 extending longitudinally inwardly toward the center of the truck. The ends of the rods and the elongated hub portions are mounted in suitable brackets 38 bolted to the adjacent part of the frame 11. Preferably this mounting is cushioned by a rubber bushing 39. Vertical movement of the free ends of the arms 37 is restrained by brackets, as 40, bolted to the adjacent side frame 16. Rubber cushions 41 are disposed between an enlarged parti-cylindrical end 37a, Fig. 7, of the respective arm 37 and the top and bottom portions of the cylindrical inward extension 42 of the associated bracket 40, the extension 42 having an opening at one side to receive the arm 37. These rubber cushions thus resist vertical movement of the arm 37 in compression but impose less resistance to horizontal movement because they are stressed in this movement mainly in shear. With this arrangement, it will be seen that lateral tilting of the frame 11 is resisted mainly by the torsion in the rods 35, the shocks being softened by the rubber cushions.

At this point it may be said that, in order to lighten the overall truck structure, without sacrifice of the necessary strength, the main structural members, such as the bolster 10, the main load-carrying frame 11 and the side frames 16, are preferably fabricated of metal plates welded together into hollow box section structures and it will be observed from the foregoing description that these box section members are reinforced at numerous points by transverse connections between their walls which connections have additional functions.

By reference to Figs. 1, 2, 5 and 6, it will be seen that each transverse opening 15 in the respective side frames 16 has secured to its bottom face a transversely widened spring seat 43 secured in place by bolts extending through spacer sleeves 44, Fig. 6, in the lower part of the side frame. The coil springs 17 are symmetrically arranged with respect to the central longitudinal vertical plane of the adjacent side frame 16 and comprise two sets of nesting coil springs engaging through

their lower ends, through rubber cushion sandwiches 45, the spring seat 43 and through their upper ends, through similar rubber cushion sandwiches 45, the upper face of the adjacent hollow section end extension 14 of the load-carrying frame 11. The spring seat 43 is surrounded by an upwardly extending spring retaining and stiffening flange 43a which increases in depth toward the central plane of the side frame, see Fig. 6. In the region of the spring nests the bottom wall of the extension 14 is cut away and the side walls of the downwardly open channel so formed are reinforced by plates or spring retaining cars 46 spaced in their bodies from the side walls of the channel and welded thereto in their margins, see Figs. 5 and 7. Central spring guides, as 43b, Fig. 6, retain the springs in position on their respective seats.

With this arrangement of the springs it will be seen that the loads are transmitted from the transverse frame 11 to the side frames in balanced relation with respect to the central longitudinal vertical planes thereof.

The bolster 10 carrying the large diameter center plate 47 is also a hollow box section structure preferably fabricated of sheet metal plates welded together in their margins. It is suitably reinforced (Fig. 5) by a central longitudinal plate, as 48, and transverse plates 49 welded to the outer walls of the bolster and to each other where they cross. These reinforcing plates serve to make the bolster a stiff cellular structure. The top of the bolster slopes downwardly and outwardly from adjacent the center plate, see Fig. 6, and its end portions are bifurcated, forming two hollow-section longitudinally spaced arms 50 closed at their ends by plates 50a welded thereto. These arms project through spaced openings in a swing hanger structure 51 strong in shear and are supported on cylindrical bearings 52, so as to have no endwise movement thereon, at the bottom of the respective openings through engagement of cooperating parti-cylindrical bearings 53 on the arms with the respective bearings 52. The swing hangers are supported through widely spaced bearings 54 each pair being spaced apart to receive between them a bearing at the adjacent end of the hanger. These bearings are disposed within the hollow longitudinally extending members 13 of the frame 11, being supported by transverse braces secured as by welding to the bearings 54 and the outer walls of the hollow members 13. Removable pins, as 55 (see Figs. 5 and 7), extend through the adjacent aligned bearings on the swing hanger and the adjacent member 13 and can be withdrawn endwise through openings in the inclined ends of the adjacent member 13, this member being disposed above the transverse members 12, Fig. 7. The pins may be locked in place by a locking pin or bolt as 56. The swing hangers are normally inclined downwardly and outwardly as shown in Fig. 6 and this tends, due to the load on the bolster, to hold it central. It can, however, swing laterally to a limited extent, or until the vertical projections 57 thereon carrying the roller side bearings 58, Fig. 6, engage one or the other of the buffers 59 carried by the respective longitudinal side members 13 of the frame 11. These buffers may be made of rubber to cushion the shock, if the bolster is swung laterally to its extreme position.

To dampen the transverse movement of the bolster on the swing hangers, suitable shock absorbers 60 are provided between the bolster and the frame 11. As shown, in Fig. 5, two such shock absorbers are preferably provided one at each side of the bolster, and these may be the well known hydraulic shock absorbers having their main bodies 60 secured to the sides of the bolster 10 and their movable arms, as 61, secured through adjustable links 62 to respective brackets 63 on the frame 11. Preferably the links are connected through universal joints to the arms and brackets.

With the bolster thus supported from the frame through widely longitudinally spaced seats on the swing hangers, and the swing hangers 51 themselves supported through widely longitudinally spaced bearings 54 of generous lengths from the frame 11, it will be seen that the bolster is firmly held against substantial movement lengthwise of the truck and the longitudinal forces acting on the center plate 47 are taken through the shear resistant swing hangers and bearings 54 to the frame 11 without other frictional engagement of the bolster with the frame. This permits a freer lateral swinging of the bolster under the control of the shock absorbers, than with a construction where the longitudinal forces are transmitted directly from the bolster to the transom through the usual wear plates.

The ends of the side frames 16 are tied together transversely with slight yielding movement and carried by the wheel and axle assemblies 18. Each wheel and axle assembly may comprise a tubular axle 64 mounting the wheels 65 adjacent its opposite ends. On each end of axles 64 is mounted a journal box 66.

The end of the side frame 16 receiving the journal box is formed with a pedestal opening 71 having downwardly diverging side walls or jaws. To secure a wide interengagement between the pedestal jaws and the box, the inner walls 72 of the pedestal jaws are flanged and widened to extend a considerable distance from the opposite sides of the inner and outer walls of the side frames and are firmly secured thereto throughout the extent of the opening by welding. The laterally extended portions of the pedestal jaw walls 72 are strongly buttressed to the adjacent side frame 11 by the braces 74 securely welded in place.

Cushioned support of the side frame 16 from the journal box 66, permitting limited restrained relative movement between these parts in vertical, lateral, and longitudinal directions, is obtained in the present construction by inserting yielding pads 78 of rubber or the like between the opposed inclined faces of the box and jaw parts 72. The journal box may be readily inserted between the opposed jaws. After the journal box is in place, the bridging bar 82 is secured in place bridging the jaws 72, as by the bolts shown in Fig. 2.

The brakes applied to the truck form no part of this invention. Suffice it to say they may be of the disc type, one brake rotor 83 (Fig. 4) being associated with each wheel and cooperating with brake stators as 84 and actuating means therefor, as the levers 85 and actuating cylinder 86, all carried by a transversely extending brake frame 87 yieldingly supported through arms 89, as shown at 88 (Fig. 5), through flexible joint structures, by the side frames or equalizers 16.

While the invention has been herein described in detail in a specific embodiment thereof, it will be understood that changes and modifications may be made by those skilled in the art without departing from the main features of the invention, and such changes and modifications are intended to be covered in the appended claims.

What is claimed is:

1. In a railway truck, a transversely spaced pair of side frames or equalizers supported adjacent their ends by wheels, said side frames each having a pair of spaced transverse openings therethrough arranged longitudinally spaced from each other on opposite sides of the transverse central vertical plane of the truck, spring seats in said openings, a transverse frame extending between said side frames in the restricted zone between the wheels and supported through coil springs seated on said spring seats, means independent of said springs restraining said transverse frame against transverse movement with respect to said side frames comprising at least a pair of transverse tension and compression transmitting members having cushioned connections at their outer ends with the respective side frames and at their inner ends with the central portion of the transverse frame, means independent of said springs restraining said transverse frame against relative longitudinal movement with respect to said side frames and comprising a longitudinally extending tension and compression transmitting member at each side of the truck having cushioned connection at one end thereof with the adjacent side frame and at the other end with said transverse frame, said restraining means permitting bodily vertical movement of said transverse frame with respect to said side frames and tilting movement thereof about longitudinal and transverse axes, and a bolster supported from said transverse frame by swing hangers constraining movement of the bolster with respect to said transverse frame to substantial movement in transverse direction only and designed to transmit substantially all longitudinal forces between said bolster and said transverse frame.

2. In a railway truck, a transversely spaced pair of side frames or equalizers supported adjacent their ends by wheels, said side frames having longitudinally spaced openings or windows therethrough, spring seats carried by the bottoms of said openings, a rectangular transverse frame having transverse and longitudinal members with the transverse members extended through the respective openings in the side frames and supported by coil springs seated on said spring seats, means independent of said springs restraining said transverse frame against longitudinal and transverse movement but permitting bodily vertical movement with respect to said side frames and tilting movement about transverse and longitudinal axes, and a bolster supported independently of springs from the longitudinal members of said transverse frame, said support comprising a wide shear-resisting swing hanger for each end of the bolster on which the respective end of the bolster has a wide fore and aft bearing, the swing hanger in turn having widely longitudinally spaced bearing engagement with the adjacent longitudinal member whereby the bolster is relatively free to move transversely but is constrained by the swing hangers against movement lengthwise of the truck and against rotary movement about a transverse axis.

3. In a railway truck, a transversely spaced pair of side frames or equalizers supported adjacent their ends by wheels, said side frames having longitudinally spaced transverse openings therethrough, spring seats carried by the bottoms of said openings, a unitary transverse frame extending between said side frames, disposed longitudinally between the wheels at the opposite ends of the truck and supported thereon through coil springs seated on said spring seats, means independent of said springs for restraining said transverse frame against longitudinal and transverse movements but permitting bodily vertical movement thereof with respect to said side frames and tilting movement thereof about transverse and longitudinal axes, said transverse movement restraining means comprising at least a pair of compression and tension members having cushioned connection at their inboard ends with said transverse frame and at their outboard ends with the respective side frames in substantially the vertical longitudinal planes thereof.

4. In a railway truck, a transversely spaced pair of side frames or equalizers supported adjacent their ends by wheels, said side frames having longitudinally spaced transverse openings therethrough, spring seats carried by the bottoms of said openings, a unitary transverse frame extending between said side frames and supported thereon through coil springs seated on said spring seats, and means independent of said springs for restraining said transverse frame against longitudinal and transverse movements but permitting bodily vertical movement with respect to said side frames and tilting movement thereof about transverse and longitudinal axes, said transverse movement restraining means comprising at least a pair of distance rods extending generally horizontally and having cushioned connection at their inboard ends with said transverse frame and at their outboard ends with the respective side frames in substantially the vertical longitudinal planes thereof and vertically about midway between the tops and bottoms thereof.

5. Means for connecting two structures with each other, particularly for connecting a side frame or equalizer with a transversely extending frame of a railway truck, said means comprising: a tension- and compression-transmitting member removably attachable as a unit through its opposite ends to spaced anchor means provided the structures to be connected with each other, the ends of said member including rubber bushings assembled as a unit therewith, said bushings being tensioned in compression upon relative movement of the connected structures in the direction of the axes of said bushings and tensioned in torsional shear upon relative movement of the connected structures transversely to the axes of said bushings, at least one of the connected structures having an anchor member provided with a conical seat and a reduced screw-threaded extension beyond said seat, a sleeve fitting said conical seat and secured in place thereon by a nut screwed onto said screw-threaded extension, an eye on said tension and compression member surrounding said sleeve, and said rubber bushing being compressed between said eye and sleeve.

6. In a railway truck, side frame members supported adjacent their ends by wheels, a transom comprising a rectangular frame formed by longitudinally and transversely extending hollow members connecting, and spring-supported on, said side frames, a bolster disposed in the space formed by said rectangular frame and supported by swing hangers pivoted at their upper ends within the hollow of said longitudinally extending members, said longitudinally extending members having their bodies disposed in a plane above the plane of the transverse members and being provided with end openings horizontally aligned with the pivotal connections of the swing hangers associated therewith so as to afford

ready access through said openings to said connections.

7. In a railway truck, a transversely spaced pair of side frames or equalizers supported adjacent their ends by wheels, a transverse frame extending between said side frames and spring-supported therefrom at spaced points lengthwise of the respective side frames, means restraining said transverse frame against longitudinal and transverse movements but permitting bodily vertical movement thereof with respect to said side frames and tilting movement thereof about transverse and longitudinal axes, and means restraining said tilting movement about a longitudinal axis comprising a torsion rod mounted on said transverse frame and having longitudinally extending arms non-rotatably secured to its ends, the free ends of said arms having cushioned connection with the respective side frames.

8. In a railway truck, a transversely spaced pair of side frames or equalizers supported adjacent their ends by wheels, a transverse frame extending between said side frames and spring-supported therefrom at spaced points longitudinally of the respective side frames, means restraining said transverse frame against longitudinal and transverse movement but permitting bodily vertical movement thereof with respect to the side frames and tilting movement thereof about transverse and longitudinal axes, and means restraining said tilting movement about a longitudinal axis comprising a pair of torsion rods spaced longitudinally of the truck and mounted on the opposite sides of said transverse frame, said torsion rods having longitudinally extending arms non-rotatably secured thereto at their ends and extending inwardly along each side frame toward the central vertical plane of the truck, and rubber cushioned connections for the respective arms to their associated side frames.

9. In a railway truck, a pair of separate side frames independently rotatable about a horizontal axis and supported by wheels adjacent their ends, a transom spring-supported for vertical movement from said side frames, a lateral motion bolster supported without springing from said transom, and restraining means connecting said transom to said side frames so as to prevent substantially all relative movement between said transom and said side frames in a horizontal plane but permitting the vertical springing movement and limited relative rotation of the transom with respect to said side frames about transverse and longitudinal axes, said restraining means comprising a longitudinally extending distance rod at each side of the truck pivotally connected at one end to the adjacent side frame and at the other end to said transom, at least one of said pivotal connections comprising a rubber sleeve placed in torsional shear in the vertical movement of said transom and thereby imposing some restraint upon tilting of the transom about a longitudinal axis, and a transverse torsion rod mounted on the transom and having arms extending from its ends and engaging the respective side frames for imposing additional restraint upon such tilting of the transom.

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