March 31, 1959 C. EKSERGIAN 2,879,718

RAILWAY CAR TRUCKS

Filed March 15, 1956 4 Sheets-Sheet 1

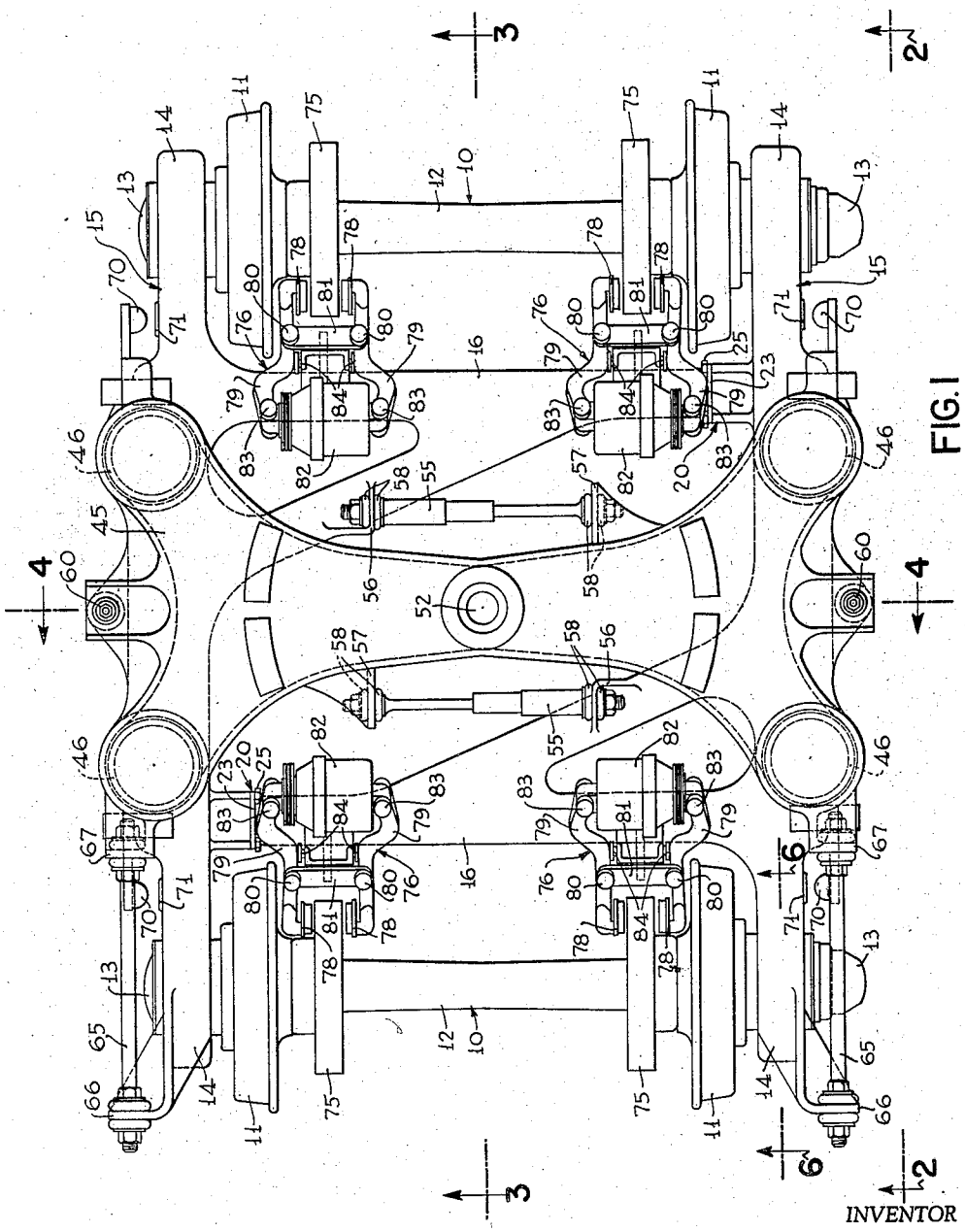


FIG. 1

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RAILWAY CAR TRUCKS

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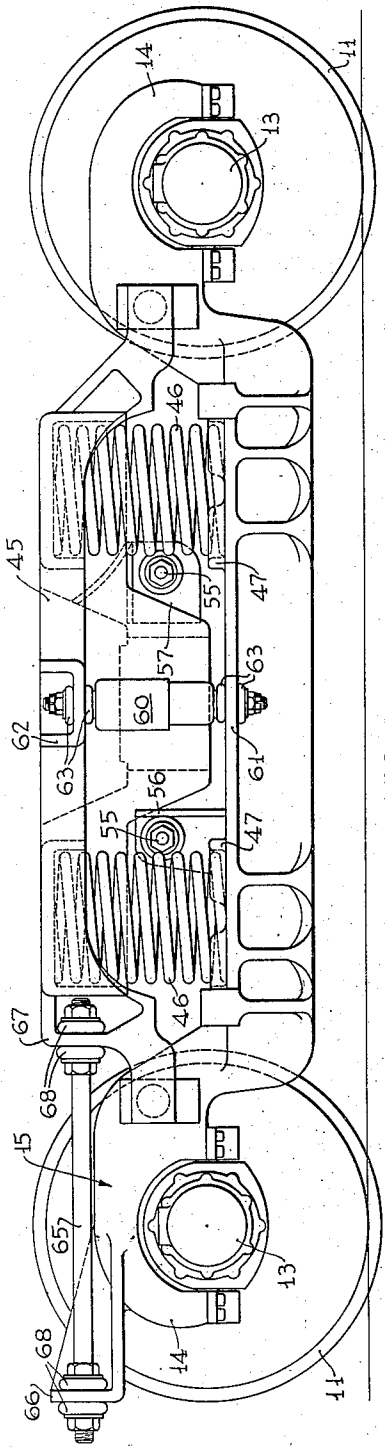


FIG. 2

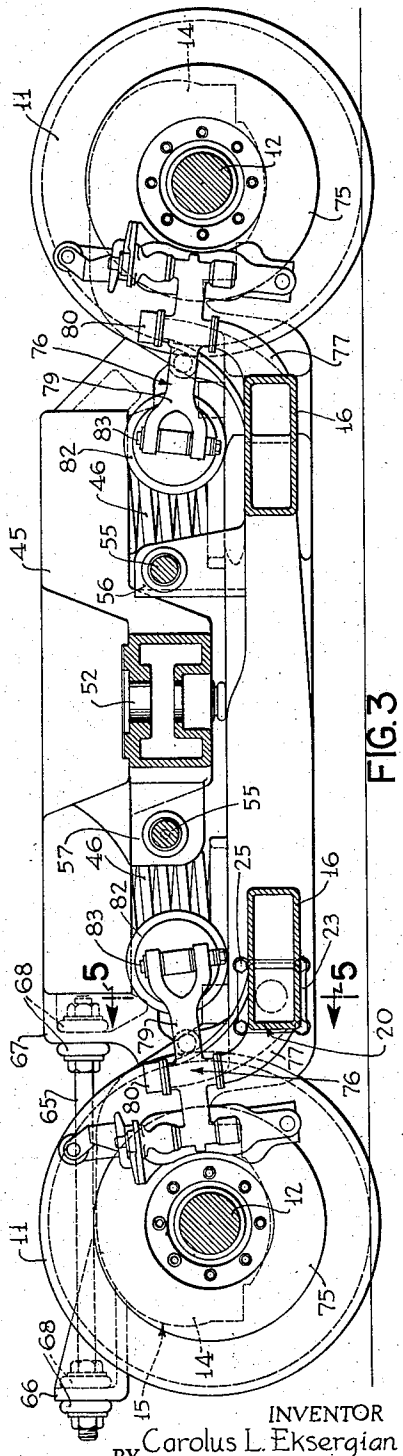


FIG. 3

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RAILWAY CAR TRUCKS

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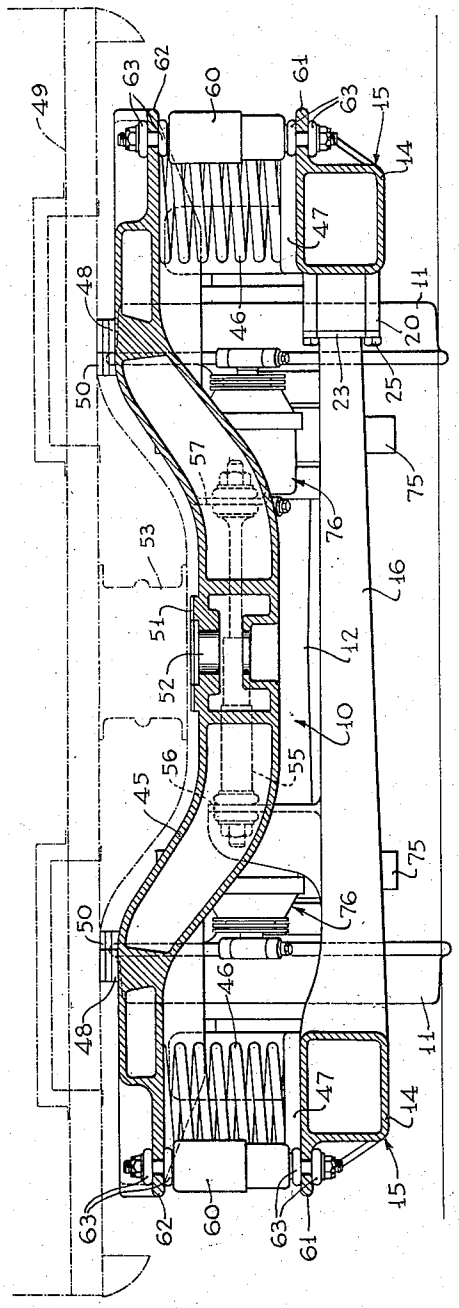


FIG. 4

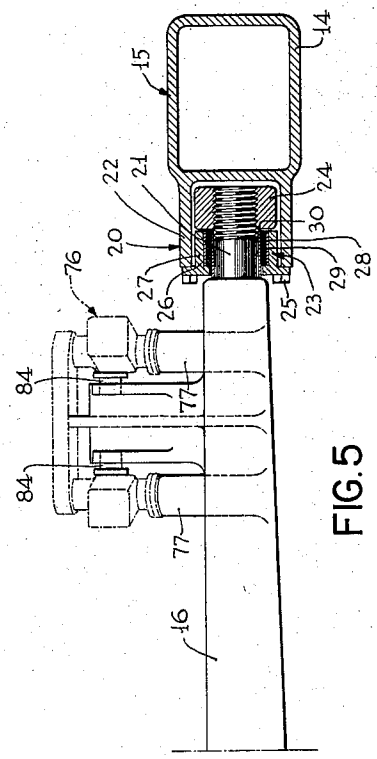


FIG. 5

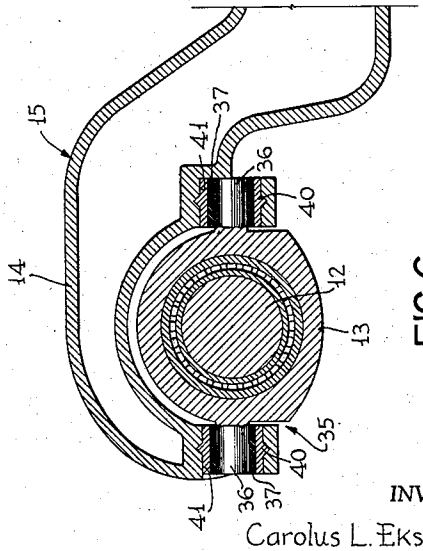


FIG. 6

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RAILWAY CAR TRUCKS

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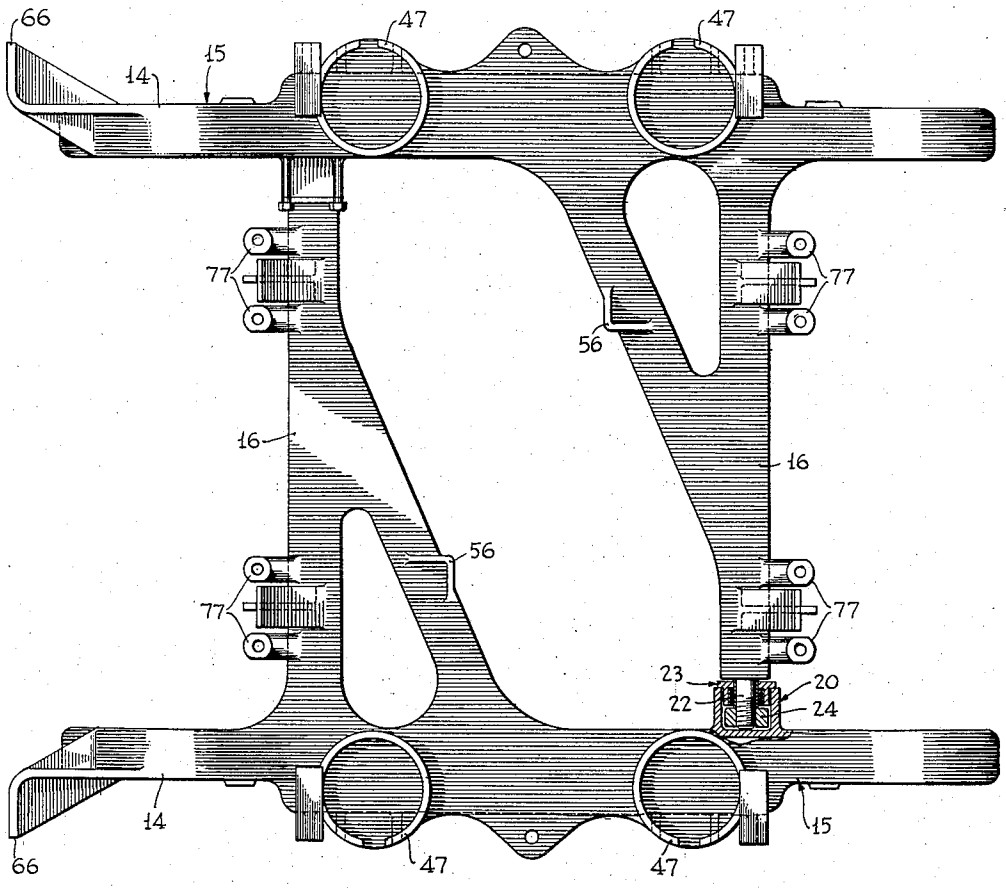


FIG. 7

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2,879,718

RAILWAY CAR TRUCKS

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Application March 15, 1956, Serial No. 571,666

3 Claims. (Cl. 105—185)

This invention relates to railway car trucks and has for an object the provision of improvements in this art.

One of the particular objects of the invention is to provide a truck formed of few and simple parts which will furnish a ride surpassing that provided by trucks which are much more complex in construction.

Another object is to provide side frames which are free to move in a vertical plane but which do not twist in the connections between them in a horizontal plane and hence maintain a right-angle relationship with the axles and do not take an oblong parallelogram form.

Another object is to provide a truck which comprises only two frame elements—an articulated side frame assembly and bolster—and a single spring support system, the springs being located at each side between the bolster and side frames.

Another object is to provide an articulated underframe which comprises independent T-members which form wheel journal mounts and cross transoms.

Another object is to provide such T-members which are similar or identical in shape so they may be used interchangeably on either side.

Another object is to provide yieldable joints between transoms and side frame elements which take the reaction of the transoms acting as cantilevers and which take the shear when the side frame elements and axles tend to take an oblong parallelogram shape, but which provide for rocking movement of the side frame elements in a vertical plane. The joints are also adequate to take the loadings imposed by placing the springs at a distance transversely from the wheels.

Another object is to provide rigid connection between transom and side frame opposite the respective yieldable ends, which rigid connection takes shear and horizontal bending incident to preventing parallelogramming of the frame, also shear and transverse bending incident to lateral reactions between car body and truck frame, and also shear and vertical bending incident to offset of outboard springs.

The purpose of preventing parallelogramming or maintaining right-angle relationship between axles and truck longitudinal center line is to inhibit the steering tendencies of the axle brought about by mismatching rolling radii incident to instantaneous lateral position on rail head of the axle-connected mating wheel conical treads. Such steering action is conductive to the phenomenon known as "nosing," and by maintaining tram nosing is inhibited.

Another object is to place the body support and springs at a high elevation and spaced far apart to increase resistance to roll.

Another and important object is to provide a vertically

fixed frame base with respect to the rail head which makes possible taking the lateral reactions of the car body at any predetermined elevation desired; accomplished by providing sufficient height to vertical element of side frame to take the lateral load connection between body and frame at the desired elevation. By making possible such choice of elevation, the rolling moment of the car—as determined by the height of its C.G. above the lateral connector—can be varied to suit, so that the optimum may be arrived at between minimum roll on the one hand and minimum lateral disturbance occasioned by dissimilar vertical movement of the truck side on the other hand.

Another object is to provide necessary lateral load connection—as may be accomplished with lateral links—which, while taking the lateral reactions of the car body, will not restrict its vertical movement.

Another object is to provide in said lateral connector the desired degree of lateral resiliency in order to properly cushion lateral reactions to the car body—as may be accomplished with a steel or air spring with properly damped action provided by suitable shock absorber.

Another object is to provide a truck having offset T-shaped side frames in which the transverse transoms are located near the axles for greatest strength against the truck frame taking an oblong shape.

Another object is to provide a truck having offset T-shaped side frames to which the transverse transoms are connected near the axles in order that they can support the brake operating mechanism most advantageously and at the same time take the brake torque and also maintain necessary alignment between shoe and disk—with respect to both relative face alignment as well as concentricity.

Another object is to carry the vertical load of the car body on pads or bearers which are well spaced laterally and longitudinally about the bolster center; the bolster center pin serving purely to locate the truck with respect to the car body longitudinally and transversely and at the same time permit truck turning about this point. The gain of such wide-spaced bearers is three-fold:

(*a*) Reduction in weight and size of truck bolster and car bolster.

(*b*) Deliberate increase in resistance to truck turning occasioned by a larger turning arm; this resistance being the optimum between that for restricting nosing tendencies, on the one hand, and freedom of wheel flanges to navigate curves, on the other hand. With the larger turning arm, required resistance is obtained by selection of a pad material possessing necessary friction.

(*c*) By spacing the pads longitudinally as well as transversely, oscillation of the frame about the transverse axis is prevented so that pitching and the attending longitudinal disturbance inherent with the conventional equalizer truck is prevented; thereby capitalizing on one of of the fundamental potential virtues of the single-spring system type of truck.

Another object is to provide a resilient journal box mounting which will provide necessary twist of the side frame in a vertical plane about a transverse axis and also about a longitudinal axis but which will resist movement between the axle and side frame along the axis of the axle and also will resist twist of the frame about a vertical axis.

The above and other objects and advantages of the

invention will be apparent from the following description of an exemplary embodiment, reference being made to the accompanying drawings, wherein:

Fig. 1 is a plan view of a truck embodying the invention;

Fig. 2 is a side elevation taken on the line 2—2 of Fig. 1;

Fig. 3 is a vertical longitudinal section taken on the line 3—3 of Fig. 1;

Fig. 4 is a vertical transverse section taken on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged partial vertical transverse section taken on the line 5—5 of Fig. 3;

Fig. 6 is an enlarged partial vertical transverse section taken on the line 6—6 of Fig. 1; and

Fig. 7 is a plan view of the truck frame alone, some parts being shown in section.

As shown in the drawings, the truck comprises a wheel-axle unit **10**, including wheels **11**, axle **12** and journal boxes **13** mounted in the side frame elements or wheel pieces **14** of the truck frame.

The elements **14** comprise part of side frame members **15** which are in general in the shape of the capital letter T but with the stem offset toward one end of the top bar. This may be characterized as an off-center T. The transverse element or stem forms a transom **16** which is located near one of the two axles of the truck. The transverse elements are generally of Y-shape with the fork of the Y formed integrally with or welded to the side frame proper and a side and stem of the Y forming the transom, as mentioned. The side members are identical, or substantially identical, so as to be interchangeable and are assembled together in reversed fashion so that there is a transom disposed near each axle. The edge of the transom which faces the axle is parallel thereto.

As shown in Figs. 1 and 5, the side frame members **15** are secured together at two diagonally opposite joints **20**, the end of the transom of one member being connected to the side element or wheel piece of the other. The transverse location of these frame joints relative to the side frame, inboard or outboard or in the plane of, will vary with the design details and are here shown in an inboard location. The joint comprises a shaft projection **21** on the transom which is embraced by a housing projection **22** on the side element. A retainer member **23** is secured on the shaft projection **21** by a nut **24**, the member **23** having a platelike facing member which is secured to the housing projection **22** by bolts and nuts or set screws **25**. A resilient element or unit **26** is interposed between the projection **23** and the interior of an inner tubular projection **27** on the retainer member. The resilient element or unit **26** is formed as an annular sandwich with a rubberlike center sleeve **28** bonded to an outer metal liner **29**, which is force-fitted in the inner projection **27**, and to an inner metal liner **30** which is clamped against a shoulder on the shaft projection **21** by the nut **24**. This resilient unit provides torque and axial resistance while permitting limited turning and twisting movements. One such resilient unit is known commercially as "silent-bloc."

Such connections provide for turning movement of the side frame elements in a vertical plane about a horizontal transverse axis. When the side frame element on one side turns, it imposes twist in both joints against the resilient liner. It also changes the elevation of the end of the transom of the other side frame and thus tends to tilt the other side frame about a longitudinal axis while its own transom element tends to tilt the other side frame in the opposite direction. The resilient units in the joints accommodate all these movements. At the same time the connections resist all twisting movement of the frame in a horizontal plane.

There is twisting movement between the side frames and axles in the vertical planes of the axles. To accommodate this movement with resilient resistance while fully opposing twist in the horizontal plane, the connections **35** between the journal boxes **13** and the side frame elements **14** comprise longitudinal stub shafts **36** on the journal boxes which are carried in longitudinal resilient torque units provided on the side frames. These resilient units are annular sandwiches of the "silent-bloc" type and comprise a rubberlike annulus **37** tight on the shaft or bonded thereto, and an outer liner **40** bonded to the rubber annulus **37** and clamped in a longitudinal tubular element **41** carried by the side frame.

The underframing, thus formed of two articulated T-shaped side frames and resiliently mounted axle units, is free to weave to any extent required but almost completely inhibits twist in a horizontal plane. A slight resiliency against shock entailed by a tendency to twist in a horizontal plane is provided by the connections **20** between the T-shaped frames and the connections **35** between the side frames and the axle journal boxes.

A bolster **45** is supported on springs **46** carried on seats **47** formed on the side frame members **15**. Herein there are two springs on each side, that is, at the two ends of the bolster, and these springs comprise the only spring system of the truck. The bolster has side bearers **48** which support the car body **49** (shown in broken lines) by pads **50** near the outer sides of the car. The bolster turns about a center plate **51** and king post **52** carried by the center sill **53** of the car.

The vertical load on the center plate is small and the king post and center plate connection serves largely for a turning point for the bolster beneath the car and for taking shear loadings in a horizontal plane. The main vertical loading is taken through the side bearers and springs directly into the side frames and wheel journals. The high outboard location of the side bearers and springs minimizes roll of the car body.

Transverse movement between the bolster and side frames is damped by stay rod and shock absorber units **55** secured between brackets **56** and **57** provided on the transoms **16** and bolster **45**, respectively, rubberlike doughnuts **58** being interposed to provide restrained swinging movement of the shock absorbers relative to the brackets in all directions. These stay rods will be located at such height and at such inclination as the general design requirements dictate.

Vertical movement between the bolster and side frames is damped by stay rod and shock absorber units **60** secured between brackets **61** and **62** on the side frame elements **14** and the bolster **45**, respectively, rubberlike doughnuts **63** being interposed to provide restrained swinging movement of the shock absorbers.

Longitudinal movement between the bolster and side frames is restrained by stay rods **65** secured between brackets **66** and **67** on the side frame elements **14** and the bolster **45**, respectively, rubberlike doughnuts **68** being interposed to provide restrained swinging movement of the stay bars.

Transverse movement between the bolster and side frames is limited by resilient bumpers **70** carried by the bolster which are adapted to engage pads **71** provided on the side frame elements **14**.

Brakes of the disk type are provided for the truck, the braking means comprising disks **75** carried by the wheels and braking units **76** carried on brackets **77** secured to the transoms **16**.

The braking units comprise shoe mountings **78** carried on brake levers **79** which are pivoted on axes **80** carried by a frame **81** secured to the brackets **77**, the levers being operated by power units **82** mounted on pivots **83** at the outer ends of the levers. Stops **84** are provided for the levers **79** to limit the outward movement of the brake shoes away from the brake disks. With this mounting the brake shoes follow almost completely

the movements of the disks as the axles turn in a vertical plane. This is true because the transoms are almost the same length as the axles, have their adjacent faces approximately parallel, and because there is substantially no vertical movement between the axle journal bearings and the side frames, such out-of-plane movement as may exist between brake shoe faces and disk faces being taken by the yieldable backing provided for the shoes (see Patents 2,451,326 and 2,451,329, for example).

It is thus seen that the truck provides, with a single-spring system of support, practically all of the functions and advantages of trucks using more complex structure and spring systems; that a simple frame comprising two mating offset-T frame members is provided; that the cross transoms of the T-shaped side frame members are used as supports for brake mechanism; that the frame is very strong against twisting or parallelogramming in a horizontal plane while allowing all necessary weave to accommodate track irregularities; and that an unusually wide and high spring base is provided, thus minimizing roll.

Because the cross transom takes the vertical bending load introduced by the couple resulting from locating the bolster spring outboard, the truck per se imposes no limitation on spring base, the spread being restricted only by right-of-way clearance. The transom also takes the lateral bending load. By making the cross transom integral with the wheel piece on one side, the entire brake torque from one axle is taken through one transom and one wheel piece without locking the other wheel piece and thereby restricting its ability to "see-saw."

Since the bolster spring rides on "top" of the wheel piece—and therefore is relatively high—and since the clearance line at this elevation sweeps outward, it follows that by virtue of the relatively high position of the bolster spring foot, a wider than normal spring base can be effected, with attending improvement in roll resistance.

The entire truck can be quickly and easily disassembled. The two-part frame can be taken apart by removing two nuts at the flexible joints between them; the brake mechanisms are carried on top of the transoms and can be removed by taking out a few bolts; and the bolster and springs rest on top of their supports where they can be readily taken off.

The vertical load on the truck bolster is carried on two side bearers instead of at the center plate, as in conventional constructions, the center plate in the present construction serving purely as a shear connection for longitudinal and transverse loadings. Thus "redundancy" which now exists with the standard bolster, with respect to proportionality of load carried between center plate and conventional side bearers, no longer exists and turning resistance can be predetermined. The load-carrying side bearers now become, in effect, an extended center plate, lying outboard of the usual center plate location but inboard of the usual side bearer location.

The arrangement of anchor rods and bolster, connecting the bolster and wheel pieces, is of advantage in permitting the center plate to move laterally with respect to the truck, this condition resulting from the lateral or transverse movement of the bolster with respect to the truck frame in turning. Consequently, the lateral movement does not produce longitudinal lunge on either car or truck. The anchor rod installation illustrated herein shows the rods for both sides to be located at the same end of the truck. The side frames therefore lack full correspondence to each other only in their connection brackets. Where the rods are oppositely located or where four rods are used, the side frames will be identical.

Aside from simplicity and reduction in cost and weight, an outstanding advantage of the present truck in taking part of the laterals through the bolster spring lies in the fact that the lateral reactions on the bolster occur at spring perch height, the distance below the center of gravity of the car being much less than in the case of the conventional swing hanger wherein the laterals occur slightly above rail height. Accordingly, the imposed rolling moment is greatly reduced. Indeed, with the present truck the spring perch height may be varied to control the roll as desired.

Herein the vertical shock absorbers are shown as directly connecting the bolster to the wheel pieces, but if this should transmit high-frequency vibrations, the shock absorbers can be adjusted to leave a short length of the springs free, the absorber bridging only the remaining length of the spring movement.

With the present truck, not only is the tendency to roll and nose inhibited, but pitching is almost completely eliminated because there is no free mass mounted between spring sets as in the frame of the conventional truck. Herein the truck bolster cannot pitch since it bears at all times against the car bolster, and the frame is not spring supported.

While one embodiment of the invention has been specifically described for purposes of illustration, it is to be understood that there may be various changes and modifications within the general scope of the invention.

What is claimed is:

1. A railway car truck, comprising in combination, a frame formed of two reversely arranged offset rigid T-shaped units, each unit including a longitudinally extending side frame element, which forms the head of the T, and a transverse transom element, which forms the offset stem of the T, extending completely across the frame to the opposite side frame element, one transom element being disposed near each end of the frame leaving a considerable intermediate longitudinal space between transoms, turning connections having horizontal transverse axes retainably securing the end of each stem or transom element to the opposite side frame element, wheel-axle units supporting the frame at the ends of the side frame elements beyond the transom elements, and means for resiliently supporting a car body on said frame.

2. A railway car truck, comprising in combination, a frame formed of two reversely arranged offset rigid T-shaped units, each unit including a longitudinally extending side frame element, which forms the head of the T, and a transverse transom element, which forms the offset stem of the T, extending completely across the frame to the opposite side frame element, one transom element being disposed near each end of the frame leaving a considerable intermediate longitudinal space between transoms, turning connections having horizontal transverse axes retainably securing the end of each stem or transom element to the opposite side frame element, wheel-axle units supporting the frame at the ends of the side frame elements beyond the transom elements, brake disks carried by said wheel-axle units, means for resiliently supporting a car body on said frame, said transom extending parallel to a wheel-axle unit, and brake units mounted on said transom for braking action with said brake disks.

3. A railway car truck, comprising in combination, a frame formed of two reversely arranged offset rigid T-shaped units, each unit including a longitudinally extending side frame element, which forms the head of the T, and a transverse transom element, which forms the offset stem of the T, extending completely across the frame to the opposite side frame element, one transom element being disposed near each end of the frame leaving a considerable intermediate longitudinal space between transoms, turning connections having horizontal transverse axes retainably securing the end of each stem or transom element to the opposite side frame element, wheel-axle units supporting the frame at the ends of the side frame elements beyond the transom elements, and means for resiliently supporting a car body on said frame, said turning connections between the ends of the stems or transoms and the side frame elements including transverse horizontal shaft projections or journals extending

from the outer ends of the stems or transoms and bearings therefor surrounding said journals, and resilient mountings for said bearings carried by the opposite side frame element providing limited horizontal and vertical movement.

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