Dec. 27, 1955

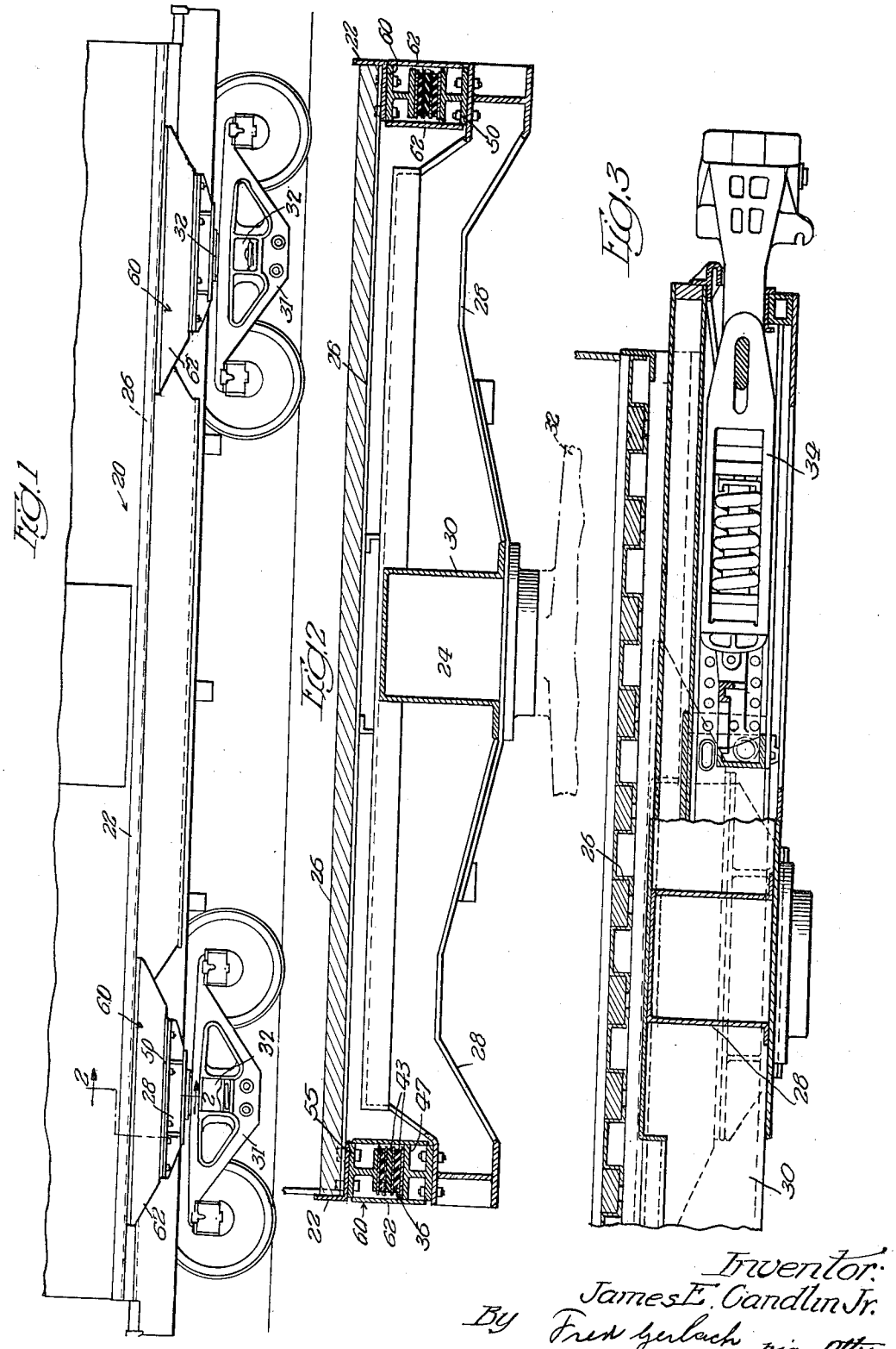
J. E. CANDLIN, JR

2,728,305

RAILWAY CAR UNDERFRAME SUPPORT

Filed Feb. 2, 1950

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

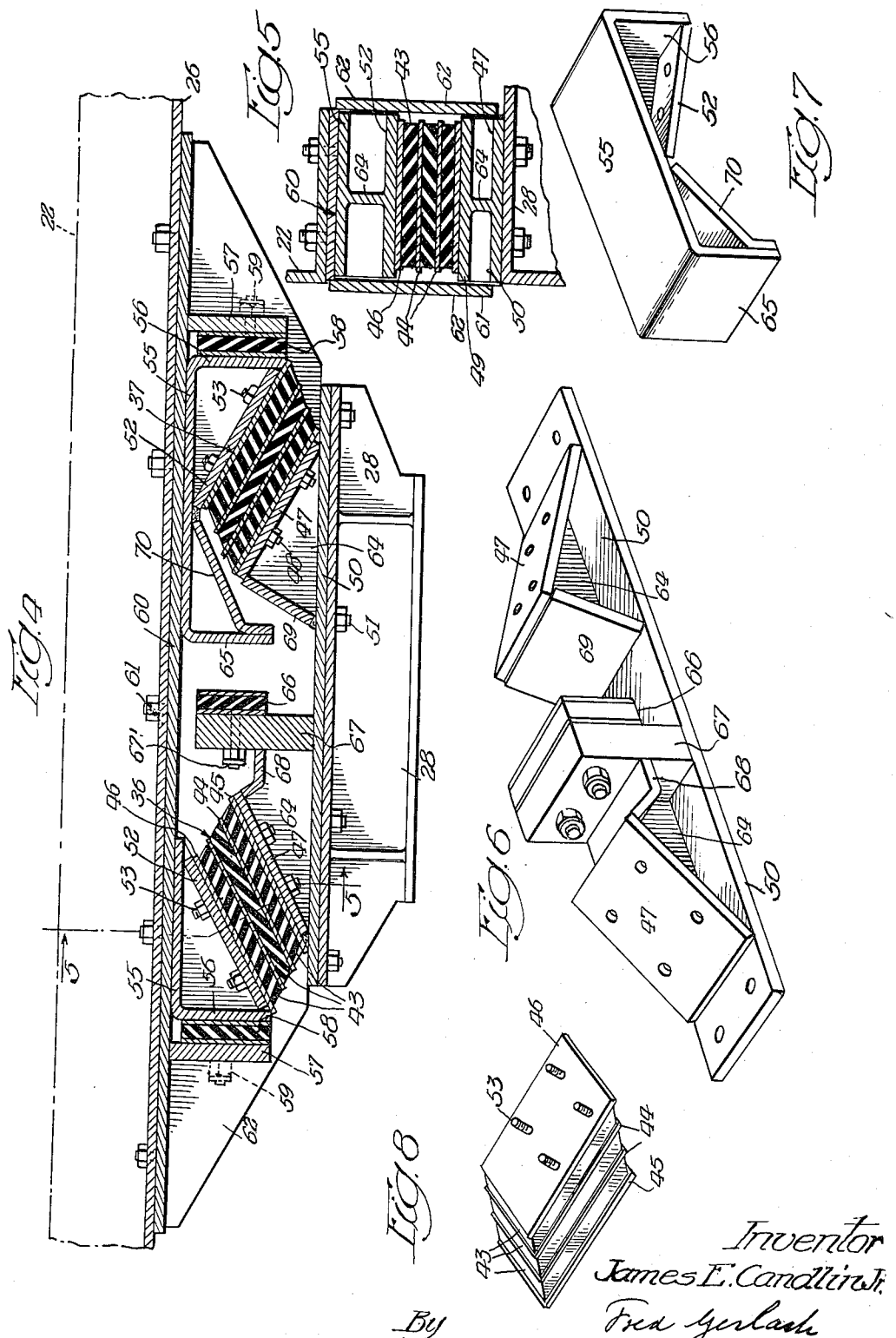

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

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4 Sheets-Sheet 3

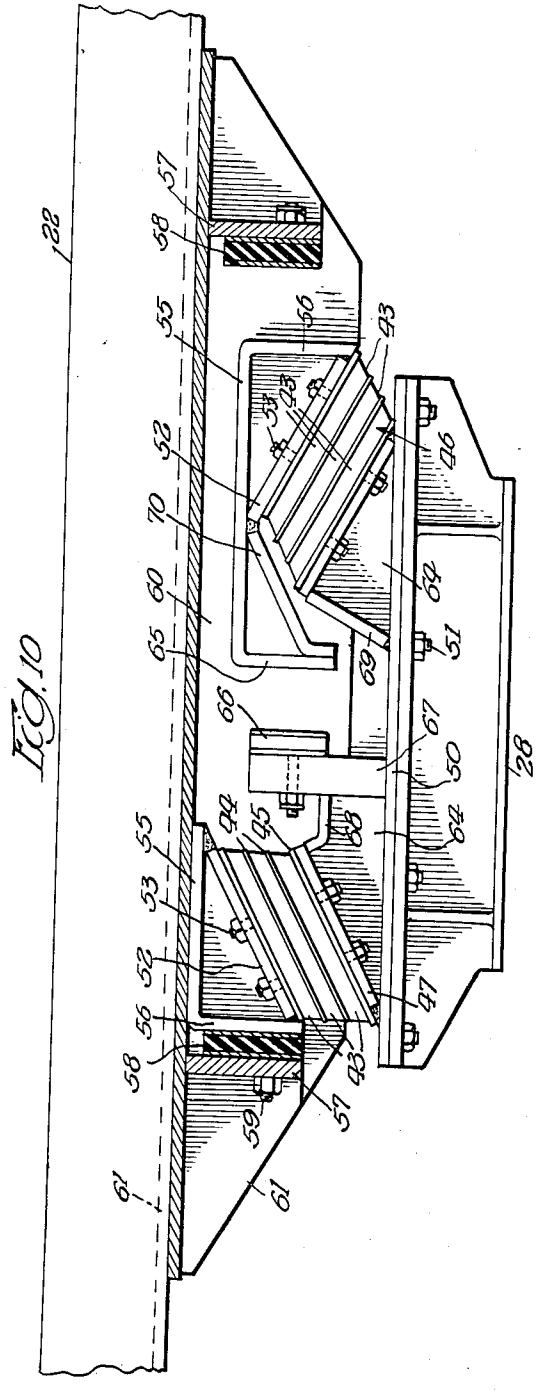

FIG. 10

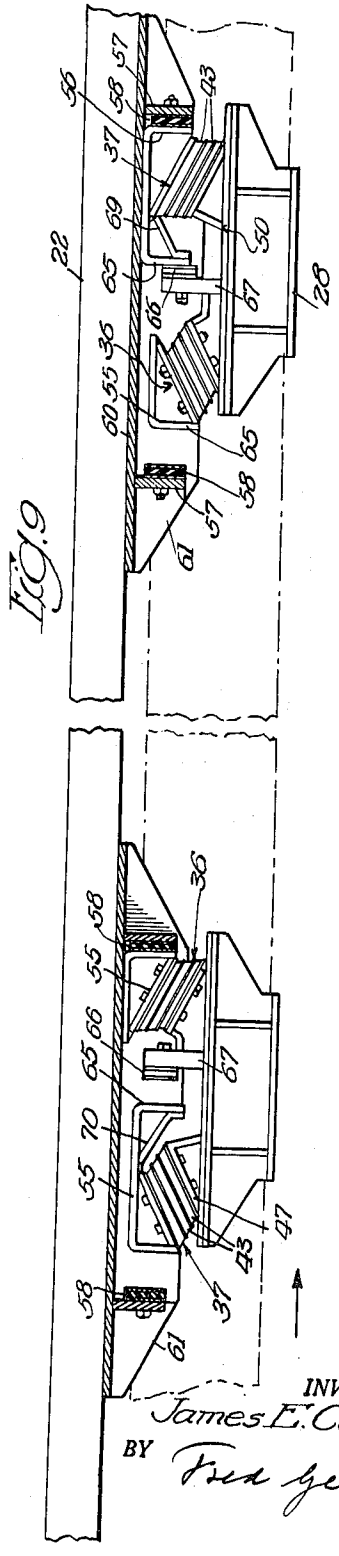

FIG. 9

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4 Sheets-Sheet 4

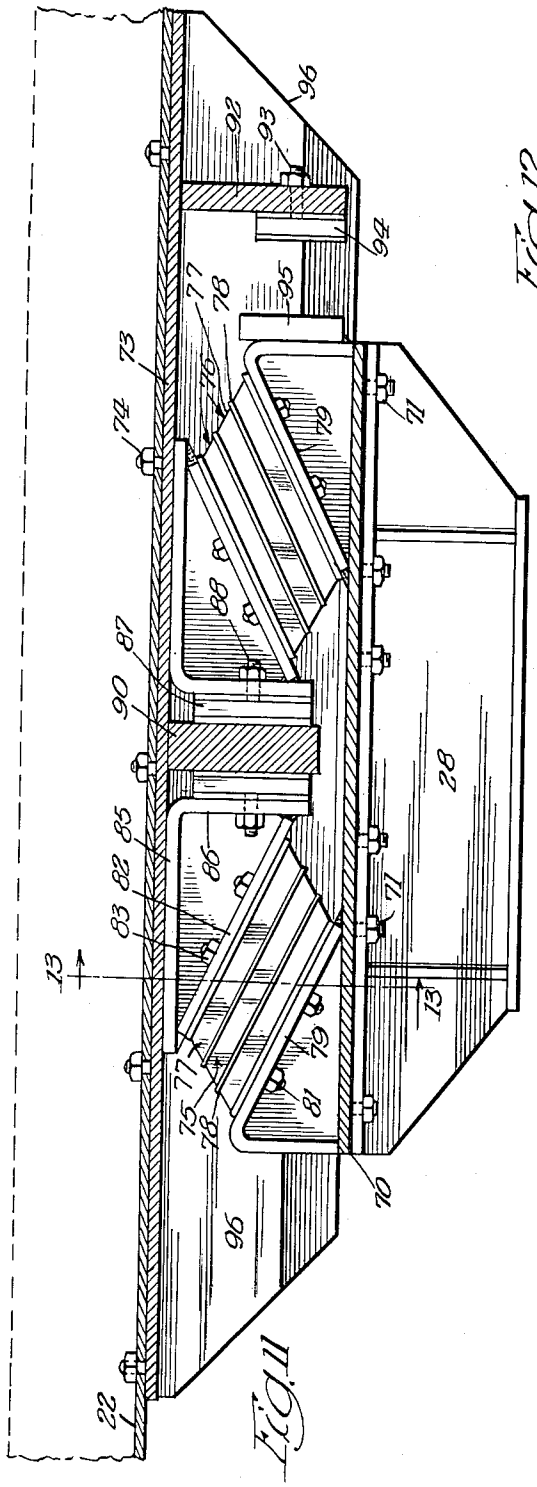

FIG. 11

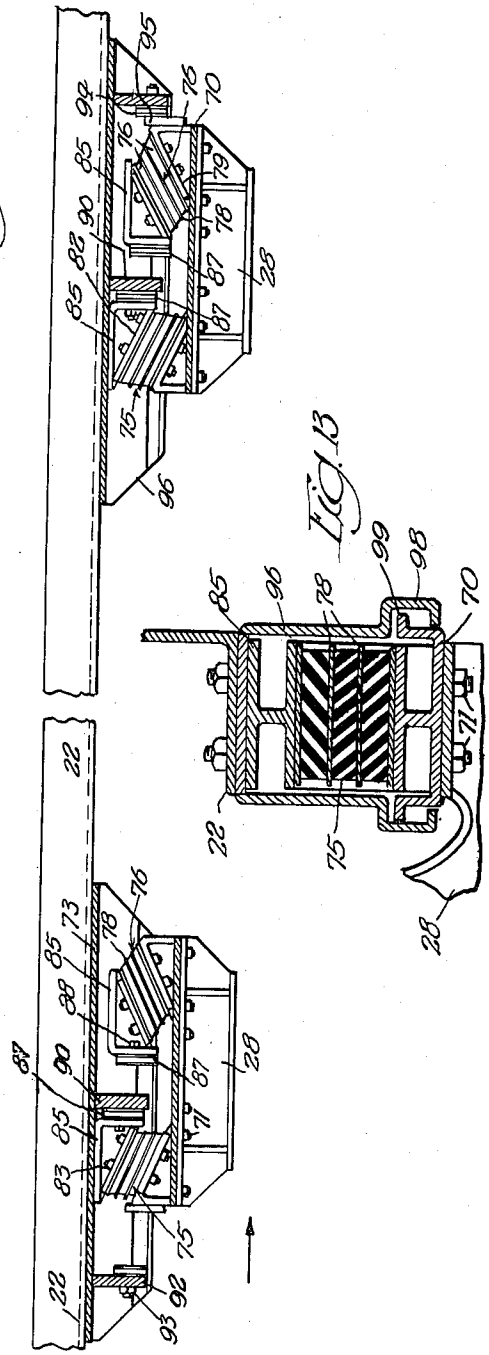

FIG. 12

FIG. 13

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United States Patent Office 2,728,305 Patented Dec. 27, 1955

2,728,305

RAILWAY CAR UNDERFRAME SUPPORT

James E. Candlin, Jr., Chicago, Ill., assignor to Pullman-Standard Car Manufacturing Company, Chicago, Ill., a corporation of Delaware

Application February 2, 1950, Serial No. 142,069

21 Claims. (Cl. 105—454)

The invention relates to railway cars of the type in which the car body is cushioned on the underframe which is supported on the wheeled trucks and to which the draft rigging is connected.

One object of the invention is to provide a railway car with resilient cushioning devices responsive to movement of the underframe relatively to the car body produced by operating forces or impact and means controlled by the cushioning action of said devices for lifting the car body against gravitational acceleration.

Another object of the invention is to provide a railway car with cushioning devices in which resilient pads of elastic material are actuated by movement of the underframe relatively to the car body produced by operating forces or impact, for lifting the car body against gravitational acceleration.

Another object of the invention is to provide a railway car with cushioning devices between the underframe and the car body in which elastic pads are subjected to combined compression and shear, the pads including sections of elastic material, such as rubber, and plates interlaid between the sections for increasing the resistance against both shear and compression.

Another object of the invention is to provide cushioning units between the underframe and the car body, embodying elastic pads actuated responsive to relative movement of the underframe and the car body in opposite directions.

Another object of the invention is to provide cushioning units between the underframe and the car body which can be readily installed and are efficient in operation.

Another object of the invention is to provide cushioning and lifting devices between the underframe and the car body which embody inclined elastic pads and wedge devices for lifting the car body.

Another object of the invention is to provide a railway car with combined cushioning and lifting devices between the car body and the underframe whereby the ends of the car body will be differentially lifted against gravitational acceleration.

Another object of the invention is to provide a railway car with cushioning and lifting devices between the underframe and the car body which include elastic pads with inclined elements to which the upper and lower faces of the pads are secured, the pads being deformable by compression and shear for lifting the car body responsive to relative movement of the underframe and the car body produced by impact or operating forces.

Another object of the invention is to provide a railway car with cushioning units between the underframe and the car body which include inclined elastic or resilient pads having upper and lower faces and wedge devices engaging and separable from the car body, and means for shifting the wedge devices responsive to deformation of the pads.

Other objects of the invention will appear from the detailed description.

The invention consists in the several novel features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a side elevation of the lower portion of a railway car exemplifying the invention;

Fig. 2 is a transverse section taken on line 2—2 of Fig. 1, the bolster being shown in elevation;

Fig. 3 is a longitudinal section illustrating the draft rigging applied to the underframe at one end of a railway car;

Fig. 4 is a view of one of the cushioning units between the underframe and the car body, the elastic pads being illustrated in their normal or assumed position when the underframe is normally positioned relatively to the car body;

Fig. 5 is a transverse section taken on line 5—5 of Fig. 4;

Fig. 6 is a perspective view of the bracket which is secured to the body bolster and provided with inclined bearings for the lower faces of the elastic pads;

Fig. 7 is a perspective of the bearing which is secured to one of the upper faces of one of the elastic pads of each cushioning unit;

Fig. 8 is a detail perspective of one of the elastic pads;

Fig. 9 is a side elevation, parts being shown in section, of the cushioning units at one side of the car, in the position assumed when actuated by impact which moves the bolsters on the underframe in one direction relatively to the underframe of the car body;

Fig. 10 is a similar view of one of the cushioning units in the position assumed when actuated by impact which moves the bolsters in the opposite direction relatively to the car body;

Fig. 11 is a longitudinal section, parts being shown in elevation, of a modified form of the invention;

Fig. 12 is a longitudinal section, parts being shown in elevation, of the cushioning units at one side of both ends of the car of the construction shown in Fig. 11, in the position assumed when actuated by impact which produces movement of the bolsters relatively to the car body in one direction; and

Fig. 13 is a section taken on line 13—13 of Fig. 11.

The invention is exemplified in a railway freight car comprising a car-body, generally designated **20**, which includes side-sills **22** which are angular in cross-section, and a floor **26** of any suitable construction, with suitable cross-bearers and reinforcement, all suitably secured together.

The car comprises an underframe which includes a longitudinal center sill **30** and bolsters **28** fixed to said sill adjacent the front and rear ends of the underframe. The bolsters **28** are supported on wheel-equipped railway trucks **31** of any suitable construction. Each truck includes a spring-supported bolster **32** on which a bolster **28** of the underframe is mounted for pivotal movement, as well understood in the art. Conventional draft rigging **34** at each end of the underframe includes couplers, yokes, draft gear strikers and back-stops supported on the underframe, as well understood in the art. The car body is movable vertically and longitudinally relatively to the underframe and is supported and cushioned thereon by the devices hereinafter described.

The invention provides cushioning units or devices between the underframe and the car body which cause the car body to be lifted against gravitational acceleration and utilize the weight of the car body and its load in cushioning the parts when subjected to operating stresses or impact. Cushioning units are interposed between the end of the bolsters **28** of the underframe and the car body. The cushioning units at the sides of the car are alike in construction. The units comprise, in the preferred construction, oppositely inclined elastic or resilient pads and devices for subjecting them to compression and shear. When impacts against the bolsters of the underframe are in one direction, the elastic pads of like inclination will be actuated and impacts in the opposite direction will

actuate the oppositely inclined pads. During each actuation of the cushioning devices the pads of one inclination will be unloaded.

The elastic pads which are subjected to shear and compression function to isolate vibrations which will protect the car body and lading against high frequency vibrations originating from wheel and rail contact which are transmitted through truck springs of conventional railway cars to the car body and lading and also to isolate high frequency vibrations due to metal contacts of car components moving longitudinally or laterally. The rubber in shear in the pads augments truck-spring deflection and thereby increases the overall deflection without affecting coupler heights. These elastic pads also function to cushion horizontal shocks applied in lateral or oblique directions. In the operation of these cushioning units, which include oppositely inclined elastic pads, the movement of the underframe relatively to the car body in one direction transfers the vertical bolster reaction to pads having like inclination and subjects said pads to shear and compression while the pads of opposite inclination are unloaded. The unloading of one pad of each cushioning unit relieves the rubber in the pad from stresses and improves the service life of the pad. The unloaded pad is available for cushioning recoil movements which are opposite in direction from those which loaded the actuated pad. The elastic pads are not subjected to undesirable tension.

In the exemplification of the invention shown in Figs. 1 to 10, each cushioning unit includes a pair of oppositely inclined or downwardly divergent elastic pads, generally designated **36** and **37**. Each pad has upper and lower longitudinally and vertically inclined substantially parallel faces and is composed of sections **43** of elastic material, such as rubber of suitable density for supporting and cushioning the load, and plates **44** interlaid between the sections of material, a bottom plate **45** and a top plate **46**. The sections of elastic material and the faces of plates **44**, **45** and **46** are vulcanized together. The plates bonded to the rubber sections increase the resistance to shear and compression during actuation of the pads. The top and bottom faces of each pad formed by plates **45** and **46** are inclined vertically and longitudinally of the car body and substantially parallel.

Relative movement of the upper and lower portions of each pad deforms or actuates the pad for effecting a wedging or camming action which is utilized in lifting the car body against gravitational acceleration. The lower portion of each pad is fixed for movement with a bolster **28** which is rigid with the underframe and the upper portion of each pad has associated therewith means for abutting relation with a part rigidly mounted on the car body, so that when the lower portion of the pad is shifted or deflected by the bolster, relatively to the car body, the abutting means on the upper portion of the pad will impart lifting movement to the car body against gravitational acceleration. This abutting relation is of such character that when one of the pads of each pair is actuated, the other pad will be unloaded. Each of the pair of oppositely inclined pads **36** and **37** is mounted on a bracket **50** which is secured by screw studs **51** to the top of a bolster **28**. The lower plate **45** of each pad is secured by screw studs and nuts **51** to an inclined support or bed **47** which may be formed of plate metal and welded to bracket **50**. A central web-plate **64** and an inclined plate **69** are welded to the plate **47** and to the bracket **50** for each pad **37**. A central web-plate is welded to the plate **47** and bracket **50** and a plate **68** is welded to the plate **47** and a cross-wall **67**, for each pad **36**.

Each cushioning unit also comprises a bracket, generally designated **60**, which is secured by screw studs **61** to the under side of the horizontal flange of a side sill of the car body and overlies the pads **36** and **37**. Side plates **62** may be welded to bracket **60** for housing the elastic pads.

The pads **36** and **37** of each unit have their upper plates **46** secured by screw studs **53** to wedging means which comprises an inclined bearing plate **52** and an element which is fixed to plate **52** and includes a horizontal member **55** which is separable from and adapted to bear against the bracket **60** which is secured to a sill **22** of the car body, and a depending leg or member **56** which is adapted to abut against a cushioned stop **58** which is secured by screw studs **59** to a cross-wall **57** welded to bracket **60**. Each plate **52** and members **55** and **56** function in coaction with the inclined support **47** as wedging or camming means for lifting bracket **60** and the car body by deformation of the inclined pad between inclined plate **52**, and support **47**, which result from deflection of the lower inclined pad-supports **47** which are movable with the bolster relatively to the wedge means on the top of the pad when it is engaged with bracket **60**. The leg **56** is separable from and adapted to abut against a cushioned stop **58** on one end of the bracket **60** which is fixed to the car body. Normally, the pads **36** and **37** and their associated devices are positioned and correlated as illustrated in Fig. 4. The car body is then resiliently supported on the pads. Impact or operating forces applied to a bolster **28** in one direction will cause the pad **36** at the struck end and the pad **37** at the opposite end of the car to be actuated as their associated wedge devices are restrained by the stops **58** on the brackets **60** which are rigid with the car body. This actuation or deformation of the pads will operate said wedge devices to lift bracket **60** and the car body against gravitational acceleration. When shock forces are applied to a bolster **28** in the opposite direction the inclined pad **36** of the cushioning device at one end and the cushioning pad **37** at the other end will be actuated to cause their associated wedge devices to lift the brackets **60** and the car body relatively to the bolster. During the actuation of the pads having the same inclination in the cushioning units, the oppositely inclined pads of each unit will be unloaded. The unloaded pads and their wedge devices are longitudinally movable with a bracket **50**.

Each bracket **50** is provided with a central upstanding cross-wall **67**, which is provided with a cushioned stop or abutment **66** which is secured by screw studs and nuts **67'** to one side of said cross-wall. The member **55** of the wedging device associated with each pad **37** is extended and is provided at its inner end with a depending abutment **65** adapted to engage the cushioned stop **66**. Stops **58** and **66** are preferably composed of sections of elastic material, such as rubber and face plates vulcanized thereto. The stop **65** is adapted to engage and compress the cushioned abutment **66** when the pad **37** is deformed by impact of sufficient magnitude imparted to the associated bolster **28**, as indicated at the right-hand side of Fig. 9. The engagement of abutment **65** and stop **66** restricts the longitudinal movement of the wedging device associated with said elastic pad **37** for restraining the deformation of said pad by its associated stop **58** when the cushioned stop **66** is subjected to compression. When impact occurs the reaction which takes place at the struck end of the car is greatest in magnitude. This impact causes longitudinal tilting of the car body with less reaction at the longitudinal center of gravity of said body. The reaction at the body bolster at the struck end of the car is greatest and the reaction at the body bolster at the opposite end of the car is less in magnitude. In consequence greater vertical force for lifting the car body will be produced by the pads at the struck end of the car while lower lifting forces will be produced by the pads at the opposite end of the car, or result in differential lift at the ends of the car body, depending upon which end the impact is applied. The limit stops **65** and **66** are characterized by coming into action only at the end

of the car which is remote from the impacted end, where lesser stresses due to horizontal forces are delivered to the bolster, while the stops **65** and **66** at the highly stressed bolster at the struck end of the car will not be engaged. This causes the bolster at the struck end of the car to be relieved of positive stop stresses, and the pads at that end of the car to limit the reaction of said bolster. With this construction the stresses in both bolsters are offset. The stresses due to vertical forces at the remote end of the car are diminished, which permits adding stresses to horizontal forces without increase of material in the bolster structure.

The operation of the railway car with the cushioning devices exemplified in Figs. 1 to 10 will be as follows: Normally, the cushioning devices will all be positioned as illustrated in Fig. 4. Brackets **60** on the car body will bear upon the members **55** of the devices for the pads **36** and **37** of the cushioning devices at both ends of the car. The elastic pads will be under compression and resiliently support the members **55** of the wedge devices and vertically cushion the car body resting thereon. The depending members **56** on the pads will engage the cushioned stops **58** on abutments **57**, respectively, on the brackets **60** which are fixed to the car body and horizontally cushion the car body. The oppositely inclined pads of each cushioning unit will cushion the car body vertically and longitudinally and the propelling forces will be transmitted from the bolsters **28** through a pair of pads inclined in the same direction and cushioned stops **58** to the car body. When operating forces or impacts are applied to the bolsters **28** which cause the bolsters to move relatively to the car body, the elastic pads which are inclined in the same direction will be subjected to compression and shear. When operating forces or impacts are applied to the bolsters **28** which will cause them to move relatively to the car body in the direction indicated by the arrow in Fig. 9, the pads **36** of the cushioning units mounted at the struck end of the car will be actuated between their upper wedge devices and inclined supports **47**, at the left-hand side of Fig. 9 and the elastic pads **37** at the right-hand side of Fig. 9 will be similarly actuated. This deformation of the pads will operate the members **55** engaging a bracket **60** and the member **56** engaging a stop **58** to lift the bracket **60** by a wedging or camming action. The elastic pads **37** in the cushioning units at the struck end of the car and the elastic pads **36** at the end of the car remote from the struck end will be unloaded. The movement of the bolsters **28** which are rigidly connected by the center sill **30**, relatively to the car body will subject the elastic pads **36** at one end and the elastic pads **37** at the opposite end to compression and shear stresses between the plates **55** and inclined supports **47** for said pads and deform said pads in degree proportionate to the magnitude of the shock or impact. The actuation or deformation of said pads **36** and **37** will operate their respective upper wedge units to wedge or cam the car body upwardly relatively to the bolster **28** proportionately to the magnitude of the deformation of the elastic pads. The rubber in the actuated pads will be subjected to shear and compression to isolate vibrations for protecting the car body and lading against high frequency vibrations originating from wheel and rail contact and the high frequency vibrations due to metal contacts or car components moving longitudinally or laterally. The rubber-in-shear augments the trucks spring deflection and increases the overall resilient deflection without affecting the coupler heights. The pads are effective in cushioning the car body for shocks applied in horizontal lateral or oblique directions. The unloading of one elastic pad in each cushioning unit relieves the rubber in said pad from stresses. The unloaded pads may cushion the recoil or rebound. When impacts are applied to the bolsters in the opposite direction to that indicated by the arrow in Fig. 9, the pads **37** at the left end and the pads **36** at the right end will be actuated in like manner to lift the car body against gravitational acceleration, and the pads **37** at the right end and the pads **36** at the left end will be unloaded.

Severe impact applied to the bolster at one end of the car tends to increase the reaction of the bolster at the struck end, to decrease the reaction of the bolster at the opposite end which is remote from the struck end, and to longitudinally tilt the car body. This causes the bolster at the struck end to deform the actuated pads at the struck end (left end in Fig. 9) to produce greater lifting stresses on the car body at the struck end, and the deformed pads at said opposite end (right end in Fig. 9) of the car will produce relatively less lifting stresses. The actuated pad **36** at the struck (left) end will not be restricted and the actuated pad **37** at the opposite (right) end of the car will be checked by the abutment **56** and stop **58**. When the impact is applied to the right hand bolster **28** in Fig. 9, the pad **36** at that end will be actuated and the stop **58** at the left hand end will arrest said pad **36** while the stop for the pad **36** at the struck end remains ineffective. This difference in deflection of said pads will cause lift of the car body greater in degree at the struck end than at the opposite end to more efficiently relieve or cushion the bolsters and the car body at the struck end against high stresses due to severe impact reactions.

As an example, but not a limitation, with a predetermined construction of the cushioning units, when the bolsters receive severe coupler impacts of sufficient magnitude to horizontally deflect the bolsters 4¼" relatively to the car body, the pads **36** at the struck end of the car will be deformed, and with an increase of compression of 1/16" in the associated cushioned stops **58**, the upper wedging devices on said pads will be deflected 4 3/16" relatively to their inclined supports **47** on the bolsters. This deflection may effect a lift of 1⅜" of the car body relatively to the bolster at the struck end. At the end of the car (right end of Fig. 9) remote from the struck end, the depending leg **65** on the actuated pad **37** will engage and compress the cushioned stop **66** and arrest the deflection of the pad **37**. With a compression of ¼" in cushioned stop **66** and a compression of ¼" in the cushioned stop **58** associated with said pad, the deflection of the wedge device relatively to the inclined support **47** will be about 3¾". This deflection may effect a lift of 1 5/16" of the car body relatively to the bolster at said remote end of the car. As a result of the differential lift of the car body against gravitational acceleration between the struck end of the car and the end remote therefrom, the cushioning devices at the struck end provide greater and more efficient relief from high stresses due to severe impact reactions by means of greater vertical reactions than those produced by the cushioning devices at the remote end. When the severe impact is in the opposite direction from that indicated by the arrow in Fig. 9, the pad **36** will be deformed as illustrated in Fig. 10 and the pad **37** at the opposite end of the car will be restricted in its deflection to produce lesser lift than the actuated pad **36**.

During the lowering of the car body after it has been lifted, the unloaded pad in each cushioning unit will cushion the rebound of the car body.

In practice, there is some clearance or lateral play between the brackets which are fixed to the bolsters **28** and the brackets which are fixed to the car body. The pads **36** and **37** are deformable in a degree by this relative lateral movement so that they function to cushion the car body laterally as well as vertically and longitudinally.

The action of the cushioning units in lifting the car body augments the truck-spring travel without affecting coupler height, which reduces the overall spring rate and improves the riding qualities of the car. The cushioning

units also function to isolate high frequency vibration originating from the travel of the car wheels on steel rails, and improve the riding qualities of the car. These improved riding qualities will result in substantially decreasing lading damage.

Each cushioning unit, in the modification illustrated in Figs. 11 to 13, includes a pair of elastic pads which are inclined and downwardly convergent and wedge devices which engage an abutment which is movable with the car body and is centrally disposed longitudinally between the pads. This cushioning unit comprises a bracket **70** which is secured to the bolster **28** by screw studs **71**; a bracket **73** which is secured by screw studs **74** to one of the side sills **22** of the car body; a pair of longitudinally and vertically inclined elastic pads, generally designated **75** and **76**, each of which is composed of sections **77** of elastic material and plates **78** interlaid between and on the faces of, and vulcanized to, the elastic sections; an inclined bed or support **79** rigid with bracket **70** and to the top face of which the lower face of a pad is secured by screw studs **81**; a wedging unit for each pad which includes an inclined plate **82** to the top face of which a pad is secured by screw studs **83**, a horizontal member **85** adapted to bear against the underside of bracket **73** and a depending leg or member **86** all fixedly secured or welded together; a cushioned stop **87** for each wedge unit secured by screw studs **88** to the inner face of a depending leg **86**; a crosswall **90** welded or fixed to bracket **73** which functions as an abutment for cushioned stops **87**; and a crosswall **92** integral with or welded to and adjacent one end of bracket **73**, which has secured thereto by screw studs **93**, a cushioned stop **94** which is adapted to be engaged by an abutment **95** on the outer end of inclined support **79** for pad **78**. The bracket **73** is provided with depending side-walls **96** for housing the pads and the wedge units. The side plates **96** of bracket **73** are provided with horizontal channels **98** adjacent their lower ends and bracket **70** is provided with outturned ribs **99** which extend into the said channels, for positively limiting the upward movement of the car body relatively to the bolsters **28**. Stops **87** and **94** are each composed of a section of elastic material having face-plates secured thereon.

The operation of the cushioning devices exemplified in Figs. 11 to 13 will be as follows: Normally, the cushioning devices will be positioned and correlated as illustrated in Fig. 11; bracket **73** will bear upon the horizontal members **85** of the wedge devices for pads **75** and **76** and cushioned stops **87** on legs **86** of the wedge devices will engage opposite sides of abutment wall **90** on bracket **73**. The elastic pads will be under compression and yieldingly support the wedge units and, bracket **73** on the car body will rest on horizontal members **85**. The propelling forces will be transmitted from the bolsters **28** through the inclined elastic pads having the same inclination and the cushioned stop **87** to the car body. The car body will be cushioned vertically and longitudinally. When operating forces or impacts are applied to the bolsters **28** which cause them to move relatively to the car body in the direction indicated by the arrow in Fig. 12, the pad **75** in each cushioning unit inclined in the same direction will be subjected to compression and shear and its associated cushioned stop **87** will be compressed, and their wedge devices, as illustrated in Fig. 12, will lift bracket **73** and the car body against gravitational acceleration. The oppositely inclined pads **76** will be simultaneously unloaded. When impacts or operating stresses are applied in the opposite direction, the oppositely inclined elastic pads **76** will be actuated to operate their wedge devices to lift the car body proportionately to the deflection between the inclined plates **82** and the supporting plate **79** for said pads. When severe impact, such as coupler impacts, are applied to bolsters **28**, in the direction of the arrow in Fig. 12, the pad **75** at the struck end (left) of the car will lift the car body upwardly against gravitational acceleration until the stop **94** engages stop **95** on the bolster at the opposite end of the car and arrests the bolster at the right end. This results in a predetermined increase in the lift of the car body at the struck end and a relatively lesser lift at its opposite end. When the impacts are in the opposite direction, the pads **76** will be actuated to lift the car body until the stop **92** at the end remote from the struck end arrests the longitudinal movement of the bolster at the left end with greater lift of the car body occurring at the struck end than at the right end.

The invention exemplifies a railway car with cushioning devices between the underframe to which the draft forces are applied and a car body movable vertically and longitudinally relatively to the underframe in which the weight of the car body and its load are utilised. The invention also exemplifies a railway car with cushioning elements in which deformable elastic pads are utilized and subjected to compression and shear and which during their actuation lift the car body against gravitational acceleration under operating forces or impact in opposite directions. The invention also exemplifies cushioning units of this type which are adapted to be readily installed between the ends of the body bolsters of the underframe and the car body. The invention also exemplifies cushioning devices of this type which are simple in construction and efficient in shock absorption.

The invention is not to be understood as restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention. While parts have been described in the form of weldments, it is to be understood that other constructions may be substituted.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A railway car comprising an underframe supported by wheeled trucks; a car body overlying and movable longitudinally and vertically relatively to the underframe; cushioning units between the underframe and the car body, each including a pair of oppositely vertically and longitudinally inclined elastic pads deformable by shear and compression, responsive to longitudinal movement of the underframe relatively to the car body produced by operating forces or impact, wedge devices operable by the pads respectively to lift the car body relatively to the underframe, each wedge device including an upper member on which the car body is supported, and an endwise stop-member, and abutment means on the underframe engageable by said end-stops, one of the wedge devices being unloaded when the other is actuated to lift the car body.

2. A railway car comprising: an underframe supported by wheeled trucks; a car body overlying and movable longitudinally and vertically relatively to the underframe; cushioning units between the underframe and the car body, each including a pair of downwardly divergent vertically and longitudinally inclined elastic pads deformable by shear and compression responsive to longitudinal movement of the underframe relatively to the car body produced by operating forces or impact, and wedge devices operable by the pads respectively to lift the body relatively to the underframe, each wedge device including an upper member on which the car body is supported, and stop means between the outer ends of the upper members and the car body.

3. A railway car comprising: an underframe including bolsters supported by wheeled trucks respectively; a car body overlying and movable longitudinally relatively to the underframe; and cushioning units between the car body and the ends of the bolsters respectively, each unit including a bracket on the car body, a bracket on the bolster, a pair of vertically and longitudinally inclined elastic pads deformable by compression and shear responsive to relative movements between the brackets produced by operating forces or impact, inclined beds for the pads secured on the bracket on a bolster, elements substantially parallel with the beds secured on the upper

faces of the pads, wedge devices on the pads for lifting the car body relatively to the underframe, each including a top member on which the bracket on the car body is supported and an end member, and abutments on the bracket on the car body engaged by the end members.

4. A railway car comprising: an underframe including bolsters supported by wheeled trucks respectively; a car body overlying and movable longitudinally and vertically relatively to the underframe; and cushioning units between the car body and the ends of the bolsters respectively, each unit including a bracket on the car body, a bracket on the bolster, a pair of oppositely vertically and longitudinally inclined elastic pads deformable by compression and shear responsive to relative movements between the brackets produced by operating forces or impact, inclined beds for the pads secured on the bracket on a bolster, elements substantially parallel with the beds secured on the upper faces of the pads, wedge devices on the pads, each including a top member on which the bracket on the car body is supported and an end member, abutments on the bracket on the car body engaged by the end member, one pad of each pair being actuated to lift the car body relatively to the underframe by relative movement of the brackets in one direction and the other by opposite relative movement.

5. A railway car comprising: an underframe including bolsters supported by wheeled trucks, respectively; a car body overlying and movable longitudinally and vertically relatively to the underframe; and cushioning units between the car body and the ends of the bolsters respectively, each unit including a bracket on the car body, a bracket on the bolster, a pair of oppositely vertically and longitudinally inclined elastic pads deformable by compression and shear responsive to relative movements between the brackets produced by operating forces or impact, a pair of inclined beds for the pads secured on the bracket on a bolster, elements substantially parallel with the beds secured on the upper faces of the pads, wedge devices on the pads for lifting the car body relatively to the underframe, each including a top member on which the bracket on the car body is supported and an end member, and cushioned abutments on the bracket on the car body engaged by the end members, one pad of each pair being actuated to lift the car body by relative movement of the brackets in one direction and the other by opposite relative movement.

6. A railway car comprising: an underframe supported by wheeled trucks; a car body overlying and movable longitudinally and vertically relatively to the underframe; cushioning units between the underframe and the body, each including a pair of upwardly convergent vertically and longitudinally inclined elastic pads deformable by shear and compression responsive to longitudinal movement of the underframe relatively to the car body produced by operating forces or impact, and wedge devices for actuating the pads respectively, and lifting the car body relatively to the underframe by relative longitudinal movement of the underframe and the body produced by impact or operating forces, each wedge device including an upper member on which the car body is supported and stop means between the inner ends of the upper members and the car body.

7. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including relatively movable members on the underframe and the car body respectively and a resilient element on which the car body is loaded and between said members, said members being provided with coacting means for deforming the resilient element and lifting the car body relatively to the underframe in response to impact and operating stresses applied to the underframe.

8. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including relatively movable members on the underframe and the car body respectively and a resilient element on which the car body is loaded and between said members, said members being provided with coacting means for subjecting the resilient element to compression and shear stresses for deforming it and lifting the car body relatively to the underframe.

9. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including relatively movable members on the underframe and the car body respectively, and a resilient pad on which the car body is loaded and between said members, said members being provided with coacting means for deforming the resilient pad and lifting the car body relatively to the underframe in response to impact and operating stresses applied to the underframe.

10. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including relatively movable members on the underframe and the car body respectively, and a resilient pad on which the car body is loaded and between said members, the pad being composed of sections of elastic material with plates interlaid between the sections, said members being provided with coacting means for deforming the resilient pad and lifting the car body relatively to the underframe in response to impact and operating stresses applied to the underframe.

11. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including relatively movable members on the underframe and the car body respectively and a resilient element on which the car body is loaded and between said members, said members having coacting wedge surfaces for deforming the resilient element and lifting the car body relatively to the underframe in response to impact and operating stresses applied to the underframe.

12. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including pairs of relatively movable members on the underframe and the car body respectively and a resilient element on which the car body is loaded and between the members of each pair, one pair of said members being provided with coactingly arranged surfaces for deforming the intermediate resilient element and lifting the car body relatively to the underframe in response to impact and stresses applied in one direction to the underframe, the other pair of members being provided with coacting surfaces arranged for deforming the intermediate resilient element and lifting the car body in response to impact or operating stresses applied to the underframe in the opposite direction.

13. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including pairs of relatively movable members on the underframe and the car body respectively and a resilient pad on which the car body is loaded and between the members of each pair, one pair of said members being provided with coactingly arranged surfaces for deforming the intermediate pad and lifting the car body relatively to the underframe in response to impact and operating stresses applied in one direction to the underframe, the members of the other pair being provided with coacting surfaces arranged for deforming the intermediate pad and lifting the car body in response to impact or operating stresses applied to the underframe in the opposite direction.

14. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including pairs of relatively movable coacting members on the underframe and the car body respectively and a resilient pad on which the car body is loaded and between the members of each pair, one pair of said members being provided with coacting surfaces arranged for deforming the intermediate resilient pad and lifting the car body relatively to the underframe in response to impact and operating stresses applied in one direction to the underframe, and the members of the other pair being provided with inclined wedge surfaces arranged for deforming the intermediate pad and lifting the car body in response to impact or operating stresses applied to the underframe in the opposite direction.

15. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including pairs of relatively movable members on the underframe and the car body respectively and a resilient element on which the car body is loaded between the members of each pair, each pair of said members being provided with coactingly arranged surfaces for deforming the intermediate resilient element and lifting the car body relatively to the underframe in response to impact and operating stresses applied to the underframe, and the pairs of members having upwardly divergent surfaces arranged for deforming the intermediate resilient elements and lifting the car body in response to impact or operating stresses applied in the opposite directions to the underframe, respectively.

16. A railway car comprising: an underframe supported by wheeled trucks, a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including pairs of relatively movable members on the underframe and the car body respectively and a resilient element on which the car body is loaded between the members of each pair, each pair of said members being provided with coactingly arranged surfaces for deforming one of the resilient elements and lifting the car body relatively to the underframe in response to impact and operating stresses applied to the underframe, and pairs of members being provided with upwardly divergent wedge surfaces arranged for deforming the intermediate resilient element and lifting the car body in response to impact or operating stresses applied in the opposite directions to the underframe, respectively.

17. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including pairs of relatively movable coacting members on the underframe and the car body respectively and a resilient pad between the members of each pair and on which the car body is loaded, each pair of said members being provided with coactingly arranged surfaces for deforming their intermediate resilient pad and lifting the car body relatively to the underframe in response to impact and operating stresses applied to the underframe, the members of one pair being arranged to actuate one of the resilient pads to lift the car body in response to impact applied in one direction to the underframe, the members of the other pair being arranged to deform their intermediate pad in response to impact applied to the underframe in the opposite direction.

18. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and a cushioning unit for the car body including pairs of relatively movable members on the underframe and the car body respectively and a resilient pad on which the car body is loaded and between the members of each pair, the pairs of said members being provided with coacting surfaces arranged for deforming the intermediate resilient pad and lifting the car body relatively to the underframe in response to impact and operating stresses on the underface applied in opposite directions respectively, each pair of members being arranged to unload its pad when the other pair is actuated to lift the car body.

19. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and cushioning units for the car body between the underframe and the car body adjacent the ends of the car respectively, each unit including a pair of coacting relatively movable members on the underframe and the car body respectively and a resilient element between said members and on which the car body is loaded, each pair of said members being provided with coacting means arranged to deform the resilient element and lift the car body relatively to the underframe in response to impact and operating stresses applied to the underframe, and means for limiting the deformation of the resilient elements on one end of the car relatively to the resilient element at the other end of the car for producing differential lift of the ends of the car body.

20. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and cushioning units for the car body between the underframe and the car body adjacent the ends of the car respectively, each unit including a pair of relatively movable coacting members on the underframe and the car body respectively and a resilient element between each pair of said members and on which the car body is loaded, each pair of members being provided with coactingly arranged means for deforming the resilient element between them and lifting the car body relatively to the underframe in response to impact and operating stresses applied to the underframe, and means for limiting the actuation of the pair of members and the resilient element on one end of the car relatively to actuation of the members and the resilient member at the other end of the car for producing differential lift of the ends of the car body.

21. A railway car comprising: an underframe supported by wheeled trucks; a car body movable longitudinally and vertically relatively to the underframe; and cushioning units for the car body between the underframe and the car body adjacent the ends of the car respectively, each unit including a pair of relatively movable coacting members on the underframe and the car body respectively and a resilient element between each pair of said members and on which the car body is loaded, each pair of members being provided with coactingly arranged means for deforming the resilient element between them and lifting the car body relatively to the underframe in response to impact and operating stresses applied to the underframe, and means for limiting the actuation of the unit at the end of the car remote from the end receiving the impact for producing differential lift of the ends of the car body.

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