

[54] **EMPTY LOAD DEVICE FOR
RAILROAD CARS**

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[22] Filed: **Oct. 15, 1970**

[21] Appl. No.: **81,028**

[52] U.S. Cl. **188/195, 303/22 R**

[51] Int. Cl. **B60t 8/18**

[58] Field of Search **188/195; 303/22 R**

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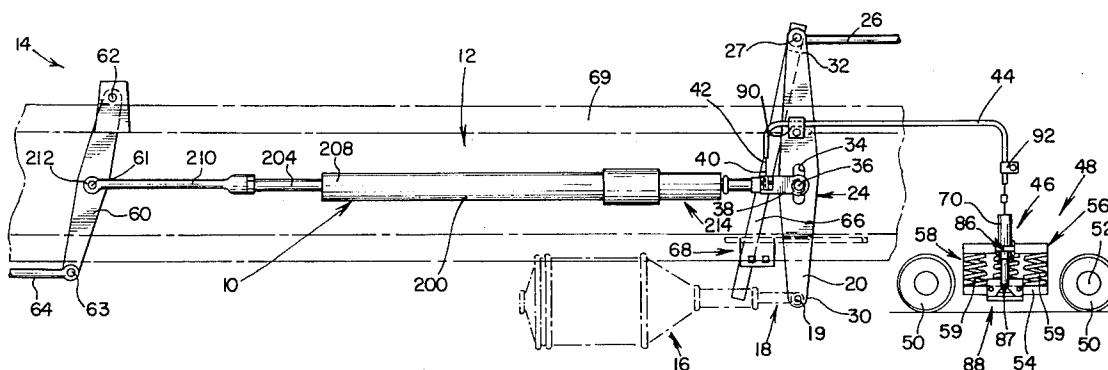
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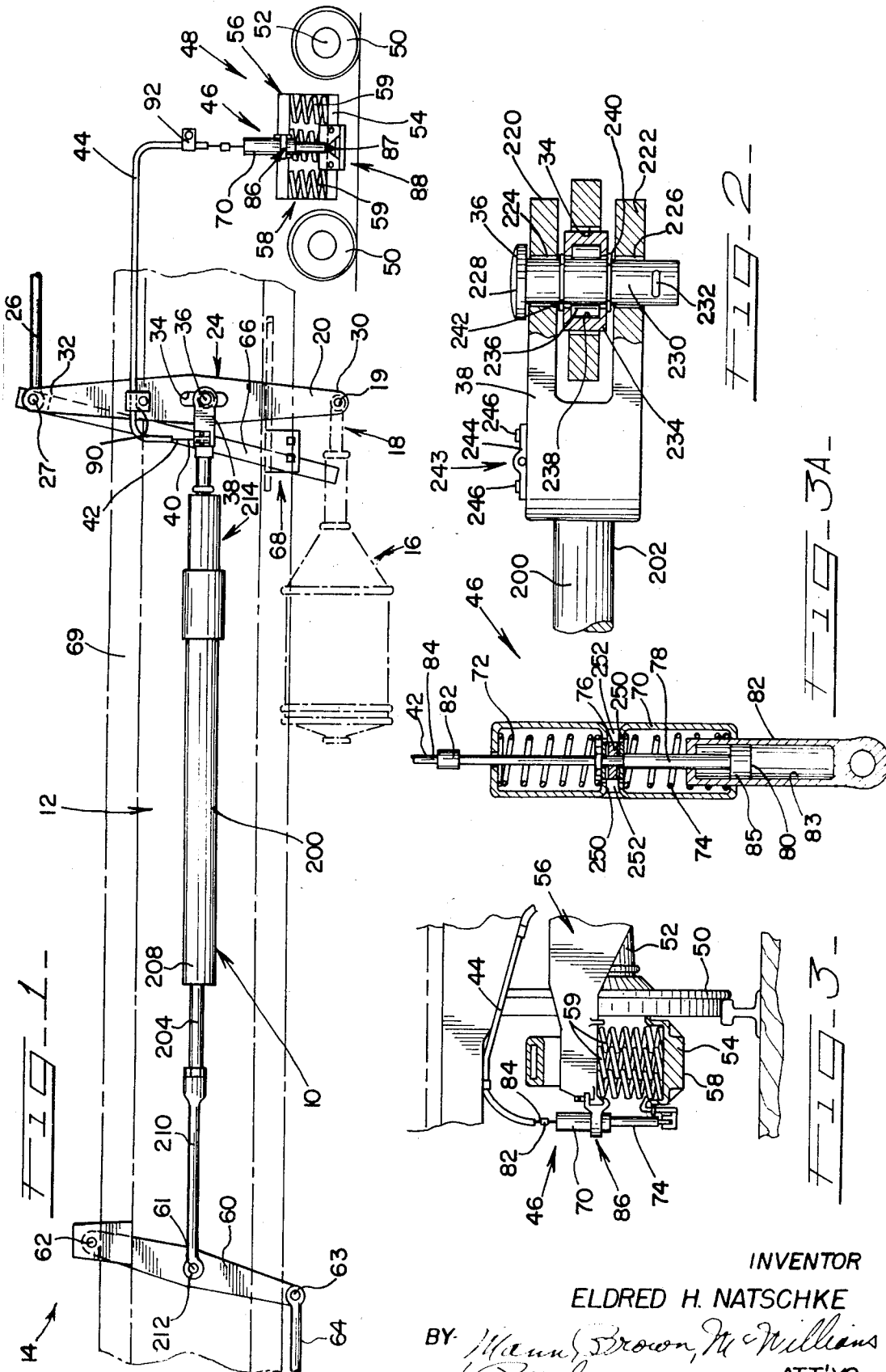
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[57] **ABSTRACT**

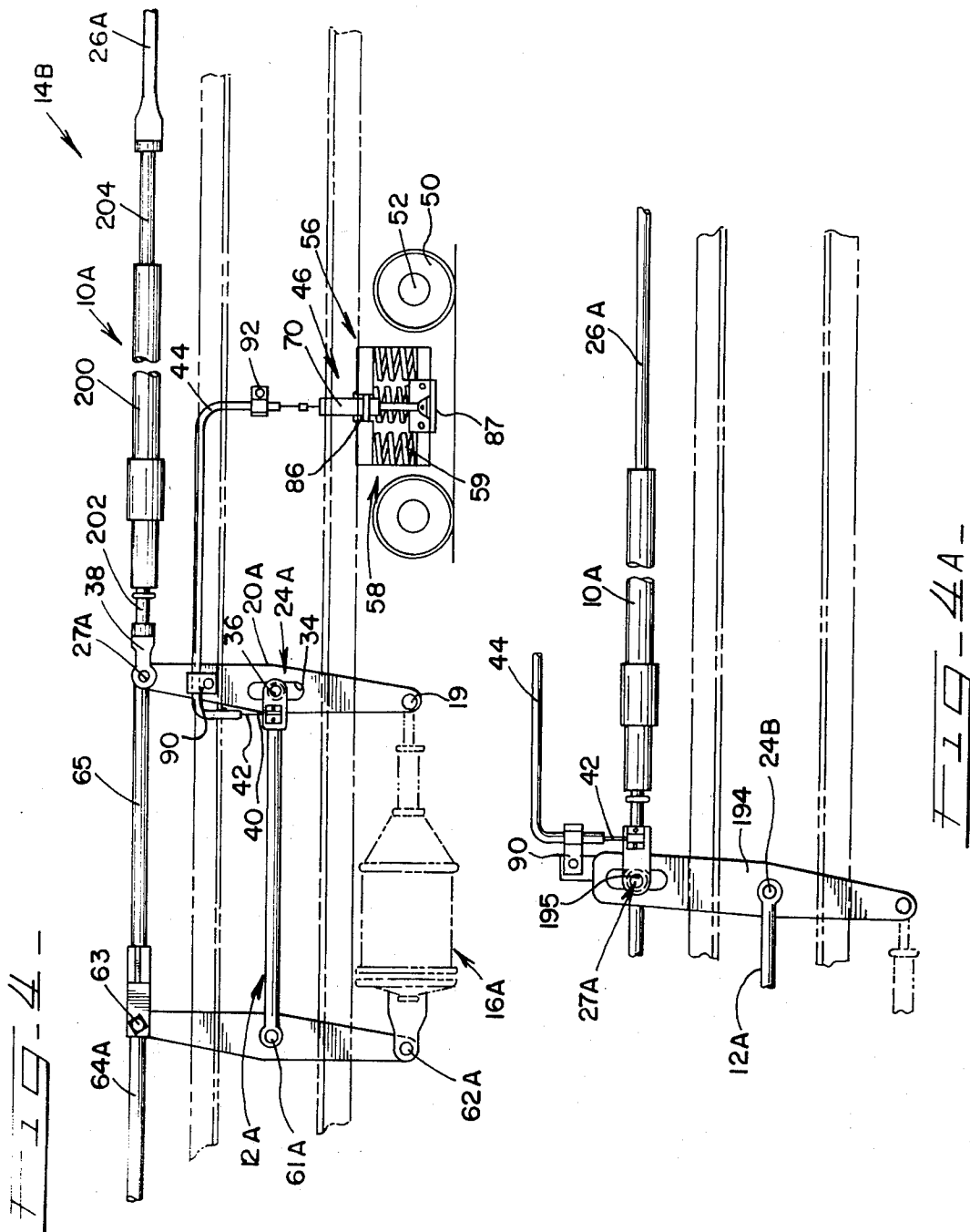
An empty load device for railroad cars in which the fulcrum employed to transmit braking forces to the car trunk, for instance, the brake rigging cylinder lever pivot pin, is mounted relative to the cylinder lever for shifting movement longitudinally thereof, and a cable is connected between the pivot pin and a movable member that is moved by means for sensing the load weight changes on the car to shift the pivot pin as required to maintain braking forces applied to the car wheels below that which will cause locking of the wheels.

3 Claims, 14 Drawing Figures





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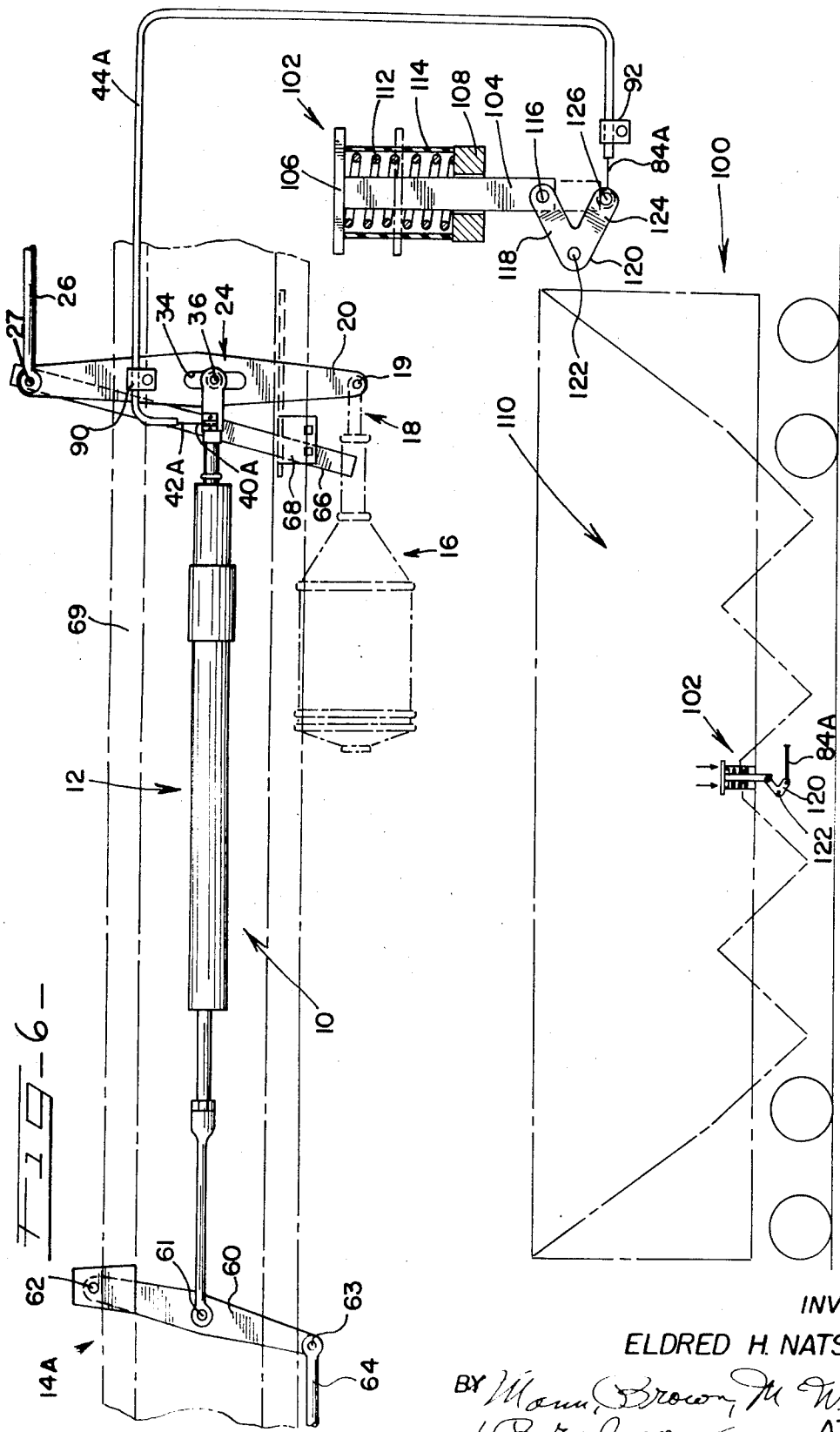
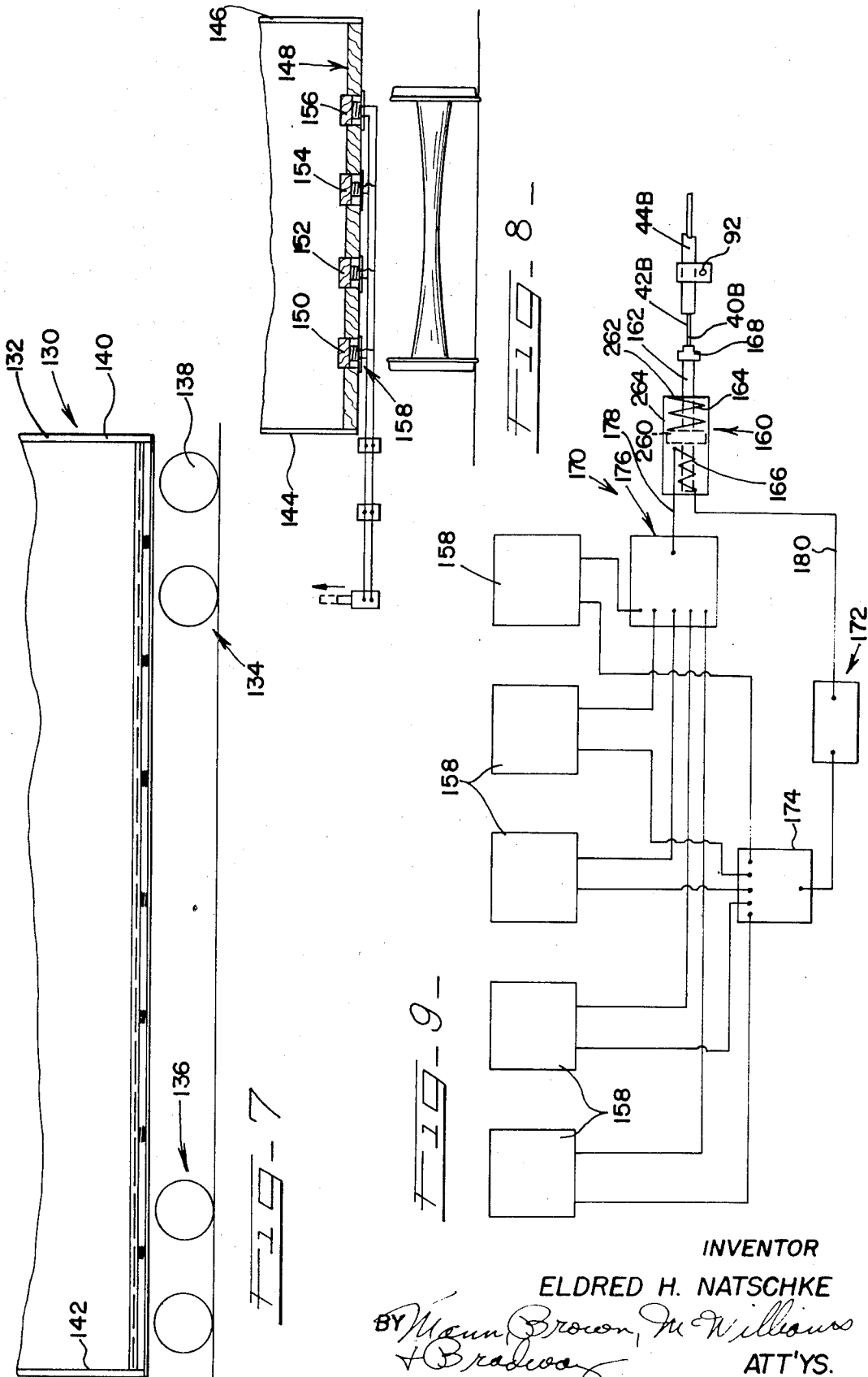
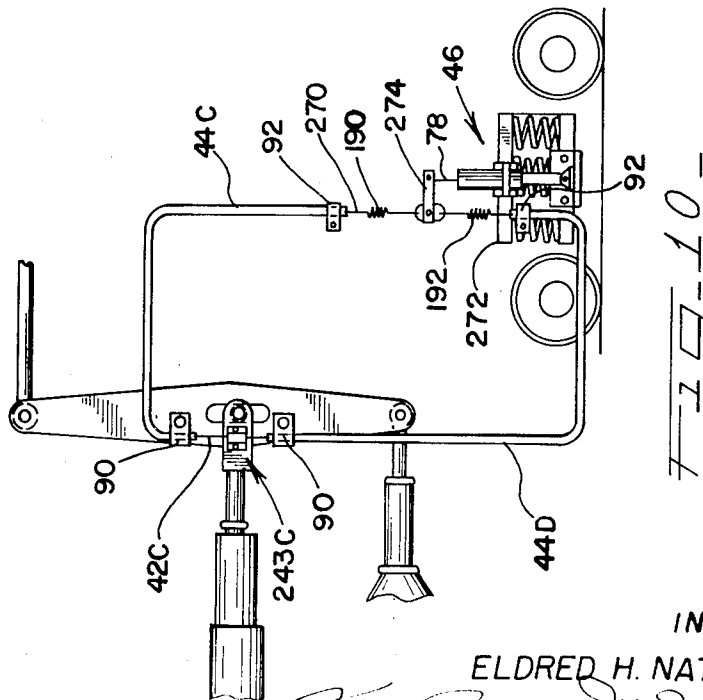
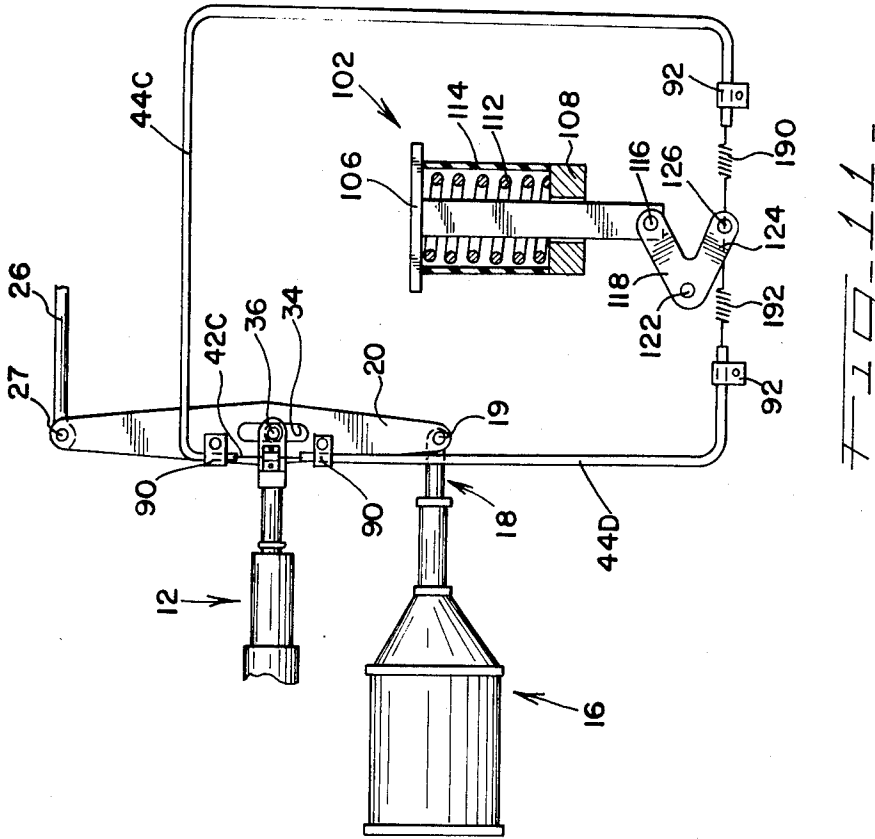


FIG. 5-

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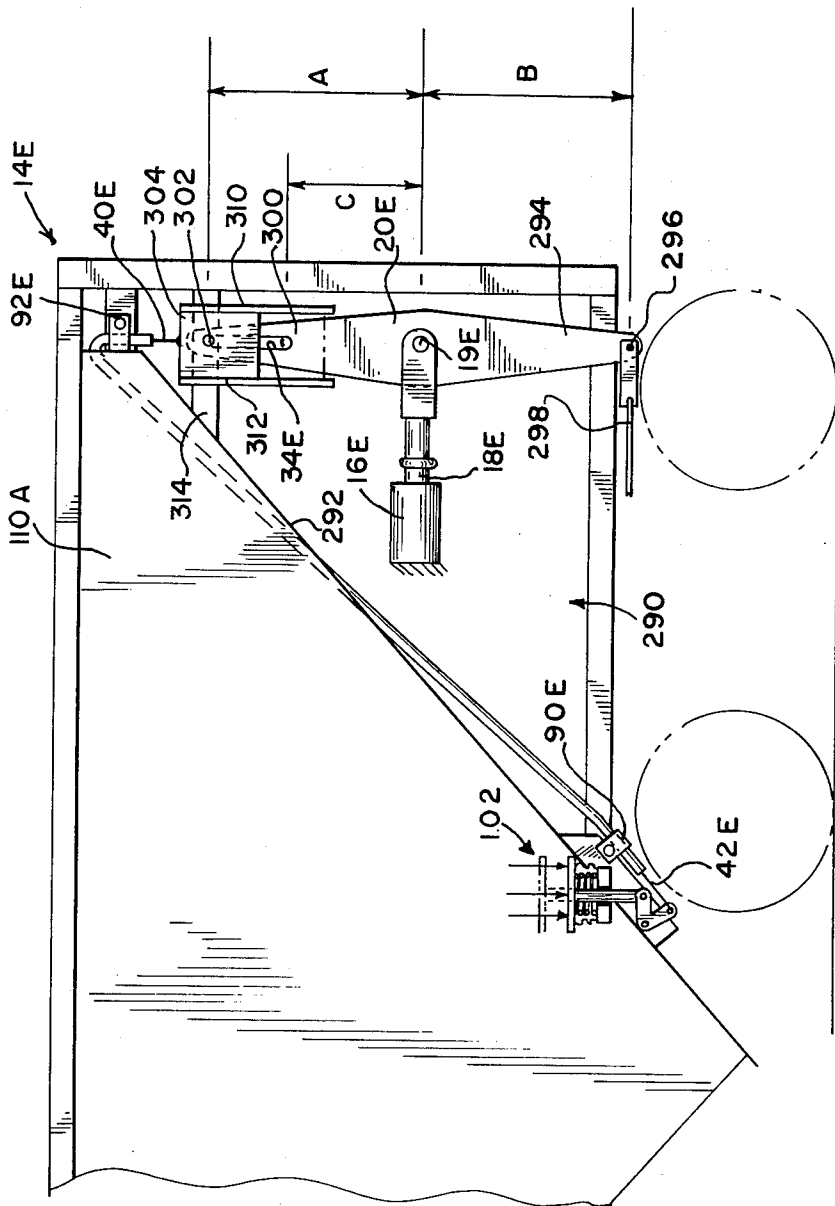


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Fig. 12-



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EMPTY LOAD DEVICE FOR RAILROAD CARS

This invention relates to an empty load device for railroad cars, and more particularly to a device which insures that the braking forces applied to the car wheels will be below the levels which cause locking of the wheels.

A long standing problem in the railroad field relates to the difficulty of insuring that car wheels have adequate braking force applied to same in both the loaded and unloaded conditions without causing wheel locking when the car is empty. Wheel locking occurs when the car is in route empty and the car and the car brakeshoes are applied to the wheels with the force either at or near that required to properly brake the car when loaded, which results in the brakes locking against the wheels that in turn results in the wheel sliding along the track rails with consequent wear and going out of round.

The problem has become particularly acute in connection with modern high cube cars which frequently will be of relatively light weight when empty, but which have a weight many times their empty weight when loaded. For instance, some aluminum hopper cars weigh only about 25 tons when empty but will weigh on the order of 90 tons when fully loaded. And while the fully loaded vs. empty ratio of ordinary box cars may be relatively low, the contrary is frequently true in railroad cars equipped to carry freight containers or piggyback equipment, depending on the size of the load, the type of lading carried and whether or not the container involved is fully loaded.

A principal object of this invention is to provide a brake force adjusting device that is simple in nature and operates automatically, and independently of the air supply system of the car, to keep brake shoe forces acting on the car wheels when braking well below those that will result in locking of the wheels against rotation.

Another principal object of the invention is to provide an empty load device for railroad cars that operates on changes of the weight in the load the car carries to modify the braking force transmitted to the car wheels so as to avoid wheel locking.

Other objects of the invention are to provide an empty load device for railroad cars that is uniformly applicable to a wide variety of car types, that is adaptable to a number of different ways of sensing load changes to insure the braking force changes that are desired, and is economical of manufacture, convenient to install, and long lived and reliable in operation.

In accordance with this invention, the mounting pin of brake rigging cylinder levers that serves as the pivot point of the lever is made adjustable lengthwise of the lever, and the position of the mounting pin is changed by shifting the mounting pin under a bias applied by a car load weight sensing mechanism which shifts the mounting pin in one direction to increase the leverage the brake cylinder acts through, and in the opposite direction to decrease the leverage the brake cylinder acts through. In one form of the invention, the deflection of the car truck bolster support springs under changing load conditions is utilized to provide the change in cylinder lever leverage that is desired, while in another embodiment that is specifically adapted for hopper car use, the weight of the load itself is utilized to make the desired adjustment. In still another embodi-

ment specifically adapted for box car use, load sensing transducers in the floor of the car provide an electrical signal, on changes being effected in the weight of the load carried by the car, that is applied to an electromagnetic device which effects the mounting pin change desire.

Other objects, uses and advantages will become obvious or be apparent from a consideration of the following detailed description and the application drawings in which like reference numerals indicate like parts throughout the several views.

In the drawings:

FIG. 1 is a diagrammatic plan view illustrating a typical center rod application type brake adjuster arrangement in which this invention has been embodied, showing also a side elevational view of a diagrammatically illustrated railroad car truck equipped in accordance with this invention;

FIG. 2 is a fragmental elevational view showing the brake adjuster clevis arranged in accordance with this invention, with parts being shown in section;

FIG. 3 is an elevational view of one end of the truck shown in FIG. 1, taken from the right hand side of FIG. 1;

FIG. 3A is a sectional view of a load weight change sensing device that may be employed in accordance with this invention;

FIG. 4 diagrammatically illustrates a top rod brake adjuster application to which the invention may be applied;

FIG. 4A is similar to FIG. 4 and illustrates another variant form of the invention;

FIG. 5 diagrammatically illustrates a hopper car application of the invention, illustrating the location of the load sensing device therefor;

FIG. 6 is similar to FIG. 1, but showing the load sensing device of FIG. 5 applied thereto;

FIG. 7 is a diagrammatic longitudinal cross-sectional view through a box car illustrating another embodiment of the invention;

FIG. 8 is a transverse sectional view through the box car of FIG. 7;

FIG. 9 is a wiring diagram diagrammatically illustrating the electrical aspects of the embodiment of FIGS. 7 and 8;

FIG. 10 is a view similar to that of FIG. 1 but illustrates another embodiment of the invention; and

FIG. 11 illustrates the application of the device of FIG. 10 to the hopper car application of the invention shown in FIGS. 5 and 6; and

FIG. 12 is a view of a hopper car similar in nature to that of FIG. 5 showing the invention applied to the type of rigging wherein the brake cylinder and cylinder lever are mounted at the end of the car.

However, it is to be distinctly understood that the specific drawing illustrations provided are supplied primarily to comply with the requirements of the Patent Code, and that the invention may have other specific embodiments that are intended to be covered by the appended claims.

GENERAL DESCRIPTION

Referring first to the embodiment of FIGS. 1-3, reference numeral 10 generally indicates a brake adjuster of the type shown in Raugas U.S. Pat. No.

3,177,985 incorporated in the center rod structure 12 of brake rigging arrangement 14, which, aside from the improvements of this invention, may be of the type more fully illustrated and described in said Rauglas patent. Reference may be had to said Rauglas patent for a specific description of brake rigging 14, and it suffices for present purposes to point out that the brake rigging customarily includes an air actuated brake cylinder 16 that is secured to the car in any suitable manner and includes a thrust or piston rod 18 that is pivotally connected as at 19 to cylinder lever 20 which is in turn pivotally connected to the center rod structure 12 as at 24 and a connecting rod 26 as at 27 that extends to one of the car trucks.

The center rod structure 12 is also pivotally connected as at 61 to dead lever 60 which is fulcrumed in any suitable manner to the car structure as at 62 and which is pivotally connected as at 63 to connecting rod 64 that extends to the other car truck. Connecting rods 26 and 64 are connected to the truck brake apparatus of the respective trucks in any conventional manner, such as that shown in said Rauglas patent.

As is disclosed in said Rauglas patent, when braking of the car is to be effected, the brake cylinder 16 is actuated to move its thrust or piston rod 18 to the right of FIG. 1, which tends to throw the cylinder lever 20 counterclockwise about the pivotal connection 24 with the center rod structure 12, and tends to move the connecting rod 26 to the left to operate the truck brake apparatus that rod 26 is connected to. Similarly, dead lever 60 swings counterclockwise about its pivotal connection 62 to draw connecting rod 64 to the right of FIG. 1 to operate the truck brake apparatus that it is connected to. The brakes are in effect released when air is released from the cylinder 16 (in a conventional manner) due to the fact that the weight of the truck brake beams tends to swing them away from the respective truck wheels about the respective brake beam pivotal hanger mountings, which causes the connecting rods 26 and 64, cylinder lever 20, dead lever 60 and the thrust or piston rod 18 to move in the opposite directions and back to their running positions that are shown in FIG. 1.

During this functioning of the adjuster 10, the adjuster 10 operates under the control of operating or trigger lever 66 that is connected to the cylinder lever 20 at pivotal connection 27 and a bracket structure 68 in the manner disclosed in said Rauglas patent to control the slack let up and take up functions of adjuster 10. As disclosed in said Rauglas patent, the general function served by adjuster 10 is to consistently maintain the stroke of the brake cylinder at a predetermined length (7 inches in accordance with AAR regulations) and to automatically accommodate or effect the brake rigging slack take up and let out that is involved in providing such results.

In the forms illustrated, the cylinder lever 20, dead lever 60, and trigger lever 66 are assumed to be supported from the car center sill 69 in the usual manner.

As will be apparent from the leverage system involved in the brake rigging arrangement 14, the brake shoe forces transmitted to the truck wheels depend on the location of the pivotal connection 24 relative to the pivotal connections 19 and 27. For instance, moving the pivotal connection 24 in the direction of pivotal

connection 27 will increase the braking force applied through rods 26 and 64, while movement of the pivotal connection 24 in the opposite direction will reduce such braking force.

In accordance with this invention, the pivotal connection 24 is arranged to be adjusted as the weight of the load on the car is varied to maintain the braking force on the order of a given desired percentage of the weight supported by the truck wheels, but in any event, below force levels which will cause the brake shoes to lock against the brake wheels.

In the embodiments illustrated, this is accomplished by forming the cylinder lever with a slot 34 extending longitudinally thereof, and mounting the mounting pin 36 which forms the pivotal connection 24 between the cylinder lever and the adjuster clevis 38 in the slot 34 (see FIG. 2). Anchored to the adjuster clevis 28 is one end 40 of a cable 42 which extends through a suitable tubular guide 44 to a car load weight change sensing device 46.

In the form of FIGS. 1-3, the load change sensing device 46 is operably associated with one of the car trucks that is diagrammatically illustrated at 48 and includes the usual truck wheel 50 mounted on the respective axles 52 that are journaled in car side frames 54 which support a bolster 56 through suitable spring assemblies 58 interposed between the bolster and side frames at either side of the truck. Spring assemblies 58 in the form shown are made up of a plurality of compression springs 59.

The device 46 may be any one of a number of truck mounted devices that utilize vertical movement of the bolster as the result of load weight changes to provide the moving force desired for cable 42. The device 46 shown comprises a cylinder 70 having mounted therein a pair of oppositely acting prestressed compression springs 72 and 74 that bear against a spring seat structure 76 fixed to a guide rod 78 having a head 80 slidably received within a guide tube 82 that defines a dash pot cylinder 83 containing a suitable hydraulic liquid adapted to pass through restricted orifice 85 to provide a dash pot effect and sufficient in quantity to accomplish the purpose of the invention.

Guide rod 78 extends through the springs 72 and 74 and the upper end of cylinder 70 for connection to the cable 42 by suitable coupling 82 at the cable end 84. The cylinder 70 is fixed to the bolster by suitable clamp device 86 while the guide tube 82 is pivotally mounted on a base plate 87 suitably clamped or otherwise fixed to the side frame 54 to form mounting device 88. Guide tube 44 is suitably secured to the car body and cylinder lever 20, respectively by clamp devices 90 and 92 or the like.

The deflection of truck spring assemblies 58 reflects changes of load weights on the car, with a corresponding relative movement occurring between the truck bolster 56 and the side frames 54 on either side of the truck. Assuming that the load on the car is increased, which thus increases the weight to be carried by the car trucks, the truck bolster 56 will be deflected downwardly and move the cylinder 70 downwardly with respect to spring seat structure 76, which will tend to move the spring seat structure 76 through spring 72 downwardly a corresponding amount (as hydraulic liquid flows through orifice 85), and thus cable 42 will

be moved relative to tubular guide 44 to draw up the adjuster clevis 38 and thus the cylinder lever mounting pin 36 upwardly of FIG. 1 to increase the leverage that the cylinder lever provides on operation of the brake cylinder 16.

If the load on the car is lightened, the operation of the device 46 is reversed, with spring 74 urging the spring seat 76 upwardly to move cable 40 relative to tubular guide 44 to shift the adjuster clevis 38 and thus pin 36 downwardly of FIG. 1 to reduce the mechanical advantage that the brake cylinder operates through in acting on cylinder lever 20.

The application of the springs 72 and 74 between the spring seat structure 76 and the ends of cylinder 70 avoids unwanted adjustment of the mounting pin 36 due to truck spring pulsations as the result of track variations, swaying and the like. The dampening effect provided by the hydraulic liquid within the tubular guide 82 requires a prolonged displacement of the cylinder 70 relative to the guide rod 78 to effect a displacement of the guide rod 78 relative to guide tube 82 and the truck side frames 54 that will in turn effect a correction of the location of pivot pin 36 relative to cylinder lever 20.

In the showing of FIG. 4, the adjuster 10A is shown in a top rod application between connecting rod 26A and cylinder lever 20A which is assumed to be similar in arrangement to cylinder lever 20. Center rod structure 12A is a simple tension member pivotally connected to the cylinder lever 20A and the dead lever 60A as at 24A and 61A.

The dead lever 60A is pivotally connected to the other connecting rod 64A as at 63 and to the brake cylinder 16A at 62A. Adjuster 10A is controlled by operating or trigger rod lever 65 extending between the dead lever pivotal connection to connecting rod 64A and the adjuster 10A in the manner diagrammatically shown (the specifics pertaining to the operation of rod 65 may be as shown in my U.S. Pat. No. 3,520,387).

The top rod brake rigging arrangement 14B may have the braking force provided by same adjusted in the same manner as in the embodiment of FIG. 1 by adjusting the connection of center rod 12A to cylinder lever 20A at pivotal connection 24A in the manner already suggested in connection with the showing of FIGS. 1-3A, as indicated by corresponding reference numerals.

In the variation of the embodiment of FIG. 4 that is shown in FIG. 4A, it is the pivotal connection 27A that is adjusted rather than connection 24A.

In the embodiment of FIGS. 5 and 6, the brake rigging 14A, which is essentially the same as that described in connection with FIG. 1, is suitably applied to hopper car 100, with the cylinder lever, center rod structure, the dead lever, and the connecting rods of the respective cylinder and dead levers being arranged as indicated in FIG. 1, as indicated by corresponding reference numerals. In this embodiment of the invention, the cable 42A has its end 40A anchored to the adjuster clevis 38 in the manner indicated in FIG. 2, while the end 84A of the cable 42A is operably connected to load change sensing device 102, which comprises a movable operating member 104 having a pressure plate 102 affixed to one end thereof, with member 104 being slidably mounted in a suitable bushing 108 anchored to

the car frame structure in such a manner as to expose the pressure plate 106 to the weight of the lading contained within the hopper structure 110 defined by the car 100. Pressure plate 106 is supported by a suitable coil spring 112 bearing against bushing 108 and shielded by flexible boot 114. The operating member 104 is pivotally connected as at 116 to an arm 118 of bell crank 120 that is pivotally mounted as at 122 in the car underframe or the like (and exteriorly of the hopper), that has its arm 124 available for connection to the end 84A of cable 42A as at 126.

Thus, in the arrangement illustrated in FIGS. 5 and 6, when the car 100 is fully loaded, pressure plate 106 is deflected its maximum amount (note dashed line position) to swing bell crank 120 clockwise and exert a pulling action on cable 42A moving the adjuster clevis 38A and mounting pin 36 in the opposite direction with reduced leverage for the brake cylinder to work through in acting on the cylinder lever.

Tubular guide 44A is secured in place by suitable clamp device 90 and 92 respectively or the like.

In the embodiment of FIGS. 7-9, box car 130, which is shown as including the usual car body 132 mounted on wheeled trucks 134 and 136 each including wheels 138, which body 132 includes end walls 140 and 142, side walls 144 and 146, and flooring 148 mounted on the usual underframe structure that is omitted as it may be entirely conventional. Car 130 also includes a suitable roof or other cover which is not illustrated.

Composite floor 148, in accordance with this embodiment of the invention, includes a series of planks 150, 152, 154 and 156 extending longitudinally of the car and in spaced apart relation and each supported by a plurality of transducers 158 that may be of any suitable type that will, when connected in electrical circuiting such as the type suggested by FIG. 9, emit a signal of that type that, when the signals of the respective transducers are collected and transmitted to a suitable electromagnetic device 160 (including a plunger 162 suitably biased by compression spring 164 in one direction and adapted to be urged in the opposite direction by electromagnetic coil 166 in proportion to the current flowing through same), will move plunger 162 in proportion to the change in weight of the load supported by planks 150, 152, 154 and 156. Plunger 162 is connected to cable 42B at its end 40B by a suitable coupling device 168, with the other end of the cable (not shown) being operably connected to a brake rigging similar to that shown in FIGS. 1 and 6.

In accordance with the embodiment of FIGS. 7-9, when the car 130 is fully loaded, the weight of the lading resting on planks 150-156 presses down on transducers 158 to the maximum extent, thereby producing the maximum signal from each transducer. The transducers are connected in a suitable circuit 170 energized by a suitable battery 172.

Battery 172 supplies current to junction box 174 from which current passes to the respective transducers 158 and thence back to junction box 176 where connector 178 leads to coil 166 which has its other end connected to the battery by connector 180.

As the car 130 is unloaded, the transducers 158 operate to increase the resistance in the line thereby decreasing the current flow through coil 166, permitting spring 164 to act on cable 42B to move the

cylinder lever mounting pin toward the minimum leverage position for cylinder lever 20.

In the embodiments of FIGS. 10 and 11, the fulcrum changing device involved includes cushioning springs 190 and 192 interposed in the motion transmitting cable on either side of the motion inducing device employed to accommodate setting of the brakes through the car hand brake.

In the embodiment of FIG. 12, hopper car 100A, which is essentially the same as car 100, has brake rigging 14E of the type wherein the brake cylinder 16E is suitably secured within the triangular working space 290 beneath the end slope sheet 292 and the car center sill (not shown). Brake cylinder 16E is suitably mounted in operating position in a manner indicated with its thrust or piston rod 18E pivotally connected as at 19E to cylinder lever 20E that is of the vertically positioned type and has its end 294 pivotally connected as at 296 to connecting rod 298 that is in turn connected to foundation rigging of the type shown in FIG. 1, except that the pivotal connection 24 of the brake adjuster 10 is of the general type shown in said U.S. Patent No. 3,520,387, with connecting rod 298 being secured to the member shown as cylinder lever 20 of FIG. 1 at connection 19.

The other end 300 of cylinder lever 294 is formed with slot 34E to receive pin 302 carried in sliding block 304 actuated by load sensing device 102 through cable 42E extending through tubular guide 44E and having its end 40E suitably secured to the slide block 304. Clamp devices 90E and 92E secured to the car hold the guide 44E in mounted operating relation.

The load sensing device 102 of FIG. 12 operates in the manner already described to change the position of pin 302 relative to slot 34E to change the cylinder leverage in the manner already explained, the pin 304 being shown in the loaded car position, and when the car is emptied, the device 102 acting to shift pin to the other end of slot 34E.

It will thus be seen that in accordance with this invention, the position of the fulcrum about which brake applying forces are generated, for instance, the pivotal mounting for cylinder lever 20, is changed in accordance with the weight changes of the load on the car to effect corresponding changes in the leverage that the brake cylinder 16 operates through in applying tension forces to connector rods 26 and 64. It is only necessary to vary the location of the pivotal connection 24, as the reactance force on the center rod structure 12 is proportionately changed to effect the tension of connecting rod 64 in like manner.

Thus, railroad cars equipped with an empty load device of this invention will have braking forces applied to their wheels which are respectively appropriate for the loaded and unloaded conditions of the car.

SPECIFIC DESCRIPTION

The basic components of the brake rigging may be of any suitable type except that the cylinder lever requires the formation of slot 34 of its equivalent therein with the location of the slot depending on which fulcrum is to be adjusted (compare FIGS. 1 and 4A). Brake adjusters 10 and 10A may be of any suitable type and in the center rod application forms illustrated comprise an elongated housing member 200 having the clevis 38

suitably applied thereto at one end 202 thereof and operably receiving a rod member 204 through its other end 208 that is screw threaded for cooperation with a nut device (not shown) and spaced friction clutch seats of the type described in said Rauglas patent. Rod 204 is shown suitably connected to rod extension 210 formed with an eye 212 to receive a suitable pin that forms connection 61 with dead lever 60 in any suitable and conventional manner. In the top rod application of FIGS. 4 and 4A, rod member 204 is suitably connected to connecting rod 26A.

The adjusters 10 and 10A include a resiliently flexible thrust device 214 that is operated, in accordance with the invention of said Rauglas patent, under the control of the operating lever 65 or 66, to effect slack take up.

Clevis 38 may be of any suitable and conventional type defining spaced apart arms 220 and 222 (see FIG. 2) formed with the respective aligned holes 224 and 226 to receive mounting pin 36 that is provided with a suitable head 228 and shank 230, the latter receiving suitable cotter pin 232.

It is preferred that the mounting pin 36 have suitable antifriction relationships with respect to the cylinder lever slot 34, and for this purpose, roller 234 journaled on the pin shank 230 by suitable bearing rollers 236 riding in raceway 238 provides the antifriction results desired. Roller 234 is held in place against movement longitudinally of the shank 230 by suitable lock rings 240 and 242.

The cable 42 and its guide 44 and their equivalent that are illustrated may be of any suitable type; guide 44 may be in the form of a semi-flexible structure similar to that used for BX electrical conduiting, while cable 42 may be of the stranded or monofilament type having the physical characteristics necessary for the motion transmitting action that has been indicated, together with adequate lateral flexibility to accommodate ready conformity to the configuration of guide 44. Cable end 40 is anchored to the clevis 38 by suitable clamp device 243 which may consist of clamping element 244 held in place by suitable bolts or screws 246.

The clamp devices 90 and 92 may be of any suitable type and, of course, an adequate number of devices of this type or their equivalents may be employed to properly secure the guide 44 in place on the car underframe.

The truck 48 may be entirely standard in design, with the mounting devices 86 and 88 being of any suitable type to secure the cylinder member 80 and tubular guide 82 to the bolster and side frame respectively.

In the device 46, the springs 72 and 74 seat on inwardly extending fingers 250 (formed in the tubular member 70) when the spring seat structure 76 is in its neutral position. The spring seat structure is formed with notches 252 to accommodate the fingers 250 so that when the truck springs undergo sudden deflections, the spring seat structure 76 may move up and down without interference with the fingers 250. The fingers 250 and notches 252 are equal in number and symmetrically arranged about the axis of the device 46; guide rod 78 may be suitably guided to maintain proper alignment of notches 252 with fingers 252.

In the form of FIG. 4A slot 34A is formed at the pivotal connection 27A of cylinder lever 194, rather than at connection 24B to the standard center rod 12A. Pin 195 forming connection 27A may be the same as described in connection with pin 36.

In the embodiment of FIGS. 5 and 6, it is assumed that the hopper car 10 is of any suitable hopper car design, with the bushing 108, bell crank 120, and tubular guide 44A being mounted in place in any suitable manner.

In the embodiment of FIGS. 7-9, the transducers 158 may be of any suitable type that will provide the functions indicated as will be apparent to those skilled in the art. Electrical circuiting 170 that has been illustrated is strictly exemplary in nature and those skilled in the art will be able to provide operative arrangements in accordance with the principles herein disclosed which will provide the movement of plunger 162 that is needed to adjust the pivotal connection 24 of the brake rigging the amount required to keep brake shoe forces below levels when the car is empty that will cause locking of the wheels. Plunger 162 includes flange portion 260 between which and the end 262 of housing 264 (for plunger 162) spring 164 is interposed. Coil 166 is mounted in any suitable manner in housing 264 in operative electromagnetic motion inducing relation to plunger 162.

In the form of FIG. 10, the motion transmitting cable 42C extends across and from either side of clevis 28 through guides 44C and 44D (that are similar to guide 44 and are held in place by suitable clamps 90 and 92) to the location of load change sensing device 46 where the cable 42C has its respective ends 270 and 272 respectively connected to the respective tension springs 190 and 192 which are in turn connected to connecting arm 274 that is in turn connected to guide rod 78 of device 46. Arm 274 is suitably mounted for guided movement longitudinally of the axis of springs 190 and 192 which always act in tension in insuring that the motion of guide rod 78 will be transmitted to cable 42C (which is fixed to clevis 38 by clamp device 243C) but when the car brakes are set by employing the usual hand brake for this purpose, any motion of cable 42C that results from brake setting movement of lever 20 is taken up by springs 190 and 192, and connecting arm 274 is free to move with guide rod 78 where the car load weight is changed while the car remains braked (as frequently happens). On release of the hand brake, the fulcrum provided by the adjustable connection 27B shifts to the new position dictated by device 46. In this embodiment, the position of the clevis 38 is changed by cable 42C pulling on same in the direction dictated by the movement of arm 274.

In the embodiment of FIG. 11, the cable 42C and its associated parts are applied to a hopper car and attached to a load change sensing device 102 of the type shown in FIGS. 5 and 6, with the springs 190 and 192 suitably connected to arm 124 of bell crank 120, with like results. Cable 42C and its guides 44C and 44D are positioned and proportioned suitably for the use indicated.

In the embodiments of FIGS. 1-3 and 5-11, the cylinder lever and pivot 27 may be alternately arranged as shown in FIG. 4A (for either center rod or top rod application) and the actuating cable 42 and its

equivalents secured to the structure forming the pivot 27, with similar results.

In the embodiment of FIG. 12, the sliding block 304 is mounted between suitable guides 310 and 312 secured in any suitable manner in the upright position indicated, as by being fixed to brace 314. The ends of tubular guide 44E are anchored by suitable clamp devices 90E and 92E suitably affixed to the adjacent car structure, and intermediate its ends, guide 44E may be suitably anchored by similar clamp devices (not shown).

If so desired, the tension type cable actuation system suggested in FIGS. 10 and 11 may be employed in the embodiment of FIG. 12, with the second cable being suitably attached to the lower portion of sliding block 304, and the load change sensing device 102 being otherwise arranged substantially in the manner indicated in FIG. 11, as will be apparent in light of this disclosure.

The embodiment of FIG. 12 has the advantage that the brake forces applied to the car trucks will be the same for each truck since the location of the pivotal connections of the brake adjuster to the levers it cooperates in the center rod application that has been illustrated in FIG. 1 will not change.

It will thus be seen that I have provided a simple but effective arrangement, capable of embodiment in a number of different forms, to insure that the braking forces applied to the car wheels do not lock the wheels when the car is empty. The invention may obviously be readily applied to existing car structures without any substantial modification thereto to solve this long standing problem in the art, and does not depend on the air supply to the brake cylinder to be operative.

The foregoing description and the drawings are given merely to explain and illustrate the invention and the invention is not to be limited thereto, except insofar as the appended claims are so limited, since those skilled in the art who have the disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

I claim:

1. In railroad car brake rigging of the type employing a cylinder lever swingable about a mounting pin intermediate its ends and operably connected adjacent one end thereof to a brake cylinder for actuating same to apply wheel braking forces through brake shoes actuated by connecting means operably connected to the cylinder lever adjacent the other end thereof by pivoting the cylinder lever about said mounting pin,

the improvement wherein:

said mounting pin is adjustable relative to the cylinder lever longitudinally of the cylinder lever, and including means for adjusting said mounting pin relative to the cylinder lever longitudinally of the cylinder lever in accordance with the load actually carried by the car to keep the braking forces at a level below those causing locking of the car wheels,

whereby the braking forces at the car wheels are maintained below wheel locking levels for loaded, partially loaded, and empty conditions of the car, said adjusting means comprising:

means for sensing changes in the weight of the load carried by the car including a movable member

and means for converting load weight changes to movement of said movable member,
 a cable connected between said mounting pin and said movable member,
 and a tubular guide through which said cable extends to adjacent said mounting pin and said member,
 said movable member acting through said cable to move said mounting pin longitudinally of the cylinder lever in proportion to load weight changes sensed by said sensing means,
 the car being of the box car type,
 said converting means comprising:
 transducer means mounted in the floor of the car sensitive to load weight changes on the car floor,
 electromagnetic means including a plunger movable in response to energization of said electromagnetic means,
 and means for varying the energization of said electromagnetic means in proportion to the load changes sensed by said transducer means to move said plunger in proportion thereto,
 said plunger comprising said mounting member.

2. In railroad car brake rigging of the type employing a cylinder lever swingable about a mounting pin intermediate its ends and operably connected adjacent one end thereof to a brake cylinder for actuating same to apply wheel braking forces through brake shoes at one end of the car actuated by connecting means operably connected to the cylinder lever adjacent the other end thereof by pivoting the cylinder lever about said mounting pin, a dead lever fulcrumed adjacent one end thereof and applying wheel braking forces through brake shoes at the other end of the car through connecting means operably connected to the dead lever adjacent the other end thereof, and a center rod structure mounting said mounting pin at one end thereof and pivotally connected to the dead lever intermediate the ends of the latter for actuating the dead lever on pivotal movement of the cylinder lever, with the mounting pin pivotally connecting the center rod structure to the cylinder lever,
 the improvement wherein:
 said mounting pin is adjustable relative to the cylinder lever longitudinally of the cylinder lever,
 and including means for adjusting said mounting pin relative to the cylinder lever longitudinally of the cylinder lever in accordance with the load actually carried by the car to keep the braking forces at a level below those causing locking of the car wheels,
 whereby the braking forces at the car wheels are maintained below wheel locking levels for loaded, partially loaded, and empty conditions of the car,
 said adjusting means comprising:
 means for sensing changes in the weight of the load

carried by the car including a movable member and means for converting load weight changes to movement of said movable member,
 a cable operably connected between said mounting pin and said movable member,
 and a tubular guide through which said cable extends to adjacent said mounting pin and said member,
 said movable member acting through said cable to move said mounting pin longitudinally of the cylinder lever in proportion to load weight changes sensed by said sensing means,
 said cable and guide extending from either side of said mounting pin,
 and including springs in tension interposed between said cable and said movable member on either side of the latter.

3. In railroad car brake rigging of the type employing a cylinder lever swingable about a pivot pin and operably connected to a brake cylinder for actuating same to apply wheel braking forces through brake shoes actuated by connecting means operably connected through a pivot pin to the cylinder lever adjacent one end thereof by pivoting the cylinder lever about the first mentioned pin,
 the improvement wherein:
 one of said pivot pins is adjustable relative to the cylinder lever longitudinally of the cylinder lever,
 and including means for adjusting said one pivot pin relative to the cylinder lever longitudinally of the cylinder lever in accordance with the load actually carried by the car to keep the braking forces at a level below those causing locking of the car wheels,
 whereby the braking forces at the car wheels are maintained below wheel locking levels for loaded, partially loaded, and empty conditions of the car,
 said adjusting means comprising:
 means for sensing changes in the weight of the load carried by the car including a movable member and means for converting load weight changes to movement of said movable member,
 a cable operably connected between said one pivot pin and said movable member,
 and a tubular guide through which said cable extends to adjacent said one pivot pin and said member,
 said movable member acting through said cable to move said one pivot pin longitudinally of the cylinder lever in proportion to load weight changes sensed by said sensing means,
 said cable and guide extending from either side of said one pivot pin,
 and including springs in tension interposed between said cable and said movable member on either side of the latter.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,690,420 Dated September 12, 1972

Inventor(s) Eldred H. Natschke

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Columns 1 and 2 should read as shown on the attached sheet.

Signed and sealed this 5th day of February 1974.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

EMPTY LOAD DEVICE FOR RAILROAD CARS

This invention relates to an empty load device for railroad cars, and more particularly to a device which insures that the braking forces applied to the car wheels will be below the levels which cause locking of the wheels.

A long standing problem in the railroad field relates to the difficulty of insuring that car wheels have adequate braking force applied to same in both the loaded and unloaded conditions without causing wheel locking when the car is empty. Wheel locking occurs when the car is in route empty and the car and the car brakeshoes are applied to the wheels with the force either at or near that required to properly brake the car when loaded, which results in the brakes locking against the wheels that in turn results in the wheel sliding along the track rails with consequent wear and going out of round.

The problem has become particularly acute in connection with modern high cube cars which frequently will be of relatively light weight when empty, but which have a weight many times their empty weight when loaded. For instance, some aluminum hopper cars weigh only about 25 tons when empty but will weight on the order of 90 tons when fully loaded. And while the fully loaded vs. empty ration of ordinary box cars may be relatively low, the contrary is frequently true in railroad cars equipped to carry freight containers or piggyback equipment, depending on the size of the load, the type of lading carried and whehter or not the container involved is fully loaded.

A principal object of this invention is to provide a brake force adjusting device that is simple in nature and operates automatically, and independently of the air supply system of the car, to keep brake shoe forces acting on the car wheels when braking well below those that will result in locking of the wheels against rotation.

Another principal object of the invention is to provide an empty load device for railroad cars that operates on changes of the weight in the load the car carries to modify the braking force transmitted to the car wheels so as to avoid wheel locking.

Other objects of the invention are to provide an empty load device for railroad cars that is uniformly applicable to a wide variety of car types, that is adaptable to a number of different ways of sensing load changes to insure the braking force changes that are desired, and is economical of manufacture, convenient to install, and long lived and reliable in operation.

In accordance with this invention, the mounting pin of brake rigging cylinder levers that serves as the pivot point of the lever is made adjustable lengthwise of the lever, and the position of the mounting pin is changed by shifting the mounting pin under a bias applied by a car load weight sensing mechanism which shifts the mounting pin in one direction to increase the leverage the brake cylinder acts through, and in the opposite direction to decrease the leverage the brake cylinder acts through. In one form of the invention, the deflection of the car truck bolster support springs under changing load conditions is utilized to provide the change in cylinder lever leverage that is desired, while in another embodiment that is specifically adapted for hopper car use, the weight of the load itself is utilized to make the desired adjustment. In still another embodi-

ment specifically adapted for box car use, load sensing transducers in the floor of the car provide an electrical signal, on changes being effected in the weight of the load carried by the car, that is applied to an electromagnetic device which effects the mounting pin change desire.

Other objects, uses and advantages will become obvious or be apparent from a consideration of the following detailed description and the application drawings in which like reference numerals indicate like parts throughout the several views.

In the drawings:

FIG. 1 is a diagrammatic plan view illustrating a typical center rod application type brake adjuster arrangement in which this invention has been embodied, showing also a side elevational view of a diagrammatically illustrated railroad car truck equipped in accordance with this invention;

FIG. 2 is a fragmental elevational view showing the brake adjuster clevis arranged in accordance with this invention, with parts being shown in section;

FIG. 3 is an elevational view of one end of the truck shown in FIG. 1, taken from the right hand side of FIG. 1;

FIG. 3A is a sectional view of a load weight change sensing device that may be employed in accordance with this invention;

FIG. 4 diagrammatically illustrates a top rod brake adjuster application to which the invention may be applied;

FIG. 4A is similar to FIG. 4 and illustrates another variant form of the invention;

FIG. 5 diagrammatically illustrates a hopper car application of the invention, illustrating the location of the load sensing device therefor;

FIG. 6 is similar to FIG. 1, but showing the load sensing device of FIG. 5 applied thereto;

FIG. 7 is a diagrammatic longitudinal cross-sectional view through a box car illustrating another embodiment of the invention;

FIG. 8 is a transverse sectional view through the box car of FIG. 7;

FIG. 9 is a wiring diagram diagrammatically illustrating the electrical aspects of the embodiment of FIGS. 7 and 8;

FIG. 10 is a view similar to that of FIG. 1 but illustrates another embodiment of the invention; and

FIG. 11 illustrates the application of the device of FIG. 10 to the hopper car application of the invention shown in FIGS. 5 and 6; and

FIG. 12 is a view of a hopper car similar in nature to that of FIG. 5 showing the invention applied to the type of rigging wherein the brake cylinder and cylinder lever are mounted at the end of the car.

However, it is to be distinctly understood that the specific drawing illustrations provided are supplied primarily to comply with the requirements of the Patent Code, and that the invention may have other specific embodiments that are intended to be covered by the appended claims.

GENERAL DESCRIPTION

Referring first to the embodiment of FIGS. 1-3, reference numeral 10 generally indicates a brake adjuster of the type shown in Rauglas U.S. Pat. No.

3,177,985 incorporated in the center rod structure 12 of brake rigging arrangement 14, which, aside from the improvements of this invention, may be of the type more fully illustrated and described in said Rauglas patent. Reference may be had to said Rauglas patent for a specific description of brake rigging 14, and it suffices for present purposes to point out that the brake rigging customarily includes an air actuated brake cylinder 16 that is secured to the car in any suitable manner and includes a thrust or piston rod 18 that is pivotally connected as at 19 to cylinder lever 20 which is in turn pivotally connected to the center rod structure 12 as at 24 and a connecting rod 26 as at 27 that extends to one of the car trucks.

The center rod structure 12 is also pivotally connected as at 61 to dead lever 60 which is fulcrumed in any suitable manner to the car structure as at 62 and which is pivotally connected as at 63 to connecting rod 64 that extends to the other car truck. Connecting rods 26 and 64 are connected to the truck brake apparatus of the respective trucks in any conventional manner, such as that shown in said Rauglas patent.

As is disclosed in said Rauglas patent, when braking of the car is to be effected, the brake cylinder 16 is actuated to move its thrust or piston rod 18 to the right of FIG. 1, which tends to throw the cylinder lever 20 counterclockwise about the pivotal connection 24 with the center rod structure 12, and tends to move the connecting rod 26 to the left to operate the truck brake apparatus that rod 26 is connected to. Similarly, dead lever 60 swings counterclockwise about its pivotal connection 62 to draw connecting rod 64 to the right of FIG. 1 to operate the truck brake apparatus that it is connected to. The brakes are in effect released when air is released from the cylinder 16 (in a conventional manner) due to the fact that the weight of the truck brake beams tends to swing them away from the respective truck wheels about the respective brake beam pivotal hanger mountings, which causes the connecting rods 26 and 64, cylinder lever 20, dead lever 60 and the thrust or piston rod 18 to move in the opposite directions and back to their running positions that are shown in FIG. 1.

During this functioning of the adjuster 10, the adjuster 10 operates under the control of operating or trigger lever 66 that is connected to the cylinder lever 20 at pivotal connection 27 and a bracket structure 68 in the manner disclosed in said Rauglas patent to control the slack let up and take up functions of adjuster 10. As disclosed in said Rauglas patent, the general function served by adjuster 10 is to consistently maintain the stroke of the brake cylinder at a predetermined length (7 inches in accordance with AAR regulations) and to automatically accommodate or effect the brake rigging slack take up and let out that is involved in providing such results.

In the forms illustrated, the cylinder lever 20, dead lever 60, and trigger lever 66 are assumed to be supported from the car center sill 69 in the usual manner.

As will be apparent from the leverage system involved in the brake rigging arrangement 14, the brake shoe forces transmitted to the truck wheels depend on the location of the pivotal connection 24 relative to the pivotal connections 19 and 27. For instance, moving the pivotal connection 24 in the direction of pivotal

connection 27 will increase the braking force applied through rods 26 and 64, while movement of the pivotal connection 24 in the opposite direction will reduce such braking force.

In accordance with this invention, the pivotal connection 24 is arranged to be adjusted as the weight of the load on the car is varied to maintain the braking force on the order of a given desired percentage of the weight supported by the truck wheels, but in any event, below force levels which will cause the brake shoes to lock against the brake wheels.

In the embodiments illustrated, this is accomplished by forming the cylinder lever with a slot 34 extending longitudinally thereof, and mounting the mounting pin 36 which forms the pivotal connection 24 between the cylinder lever and the adjuster clevis 38 in the slot 34 (see FIG. 2). Anchored to the adjuster clevis 28 is one end 40 of a cable 42 which extends through a suitable tubular guide 44 to a car load weight change sensing device 46.

In the form of FIGS. 1-3, the load change sensing device 46 is operably associated with one of the car trucks that is diagrammatically illustrated at 48 and includes the usual truck wheel 50 mounted on the respective axles 52 that are journaled in car side frames 54 which support a bolster 56 through suitable spring assemblies 58 interposed between the bolster and side frames at either side of the truck. Spring assemblies 58 in the form shown are made up of a plurality of compression springs 59.

The device 46 may be any one of a number of truck mounted devices that utilize vertical movement of the bolster as the result of load weight changes to provide the moving force desired for cable 42. The device 46 shown comprises a cylinder 70 having mounted therein a pair of oppositely acting prestressed compression springs 72 and 74 that bear against a spring seat structure 76 fixed to a guide rod 78 having a head 80 slidably received within a guide tube 82 that defines a dash pot cylinder 83 containing a suitable hydraulic liquid adapted to pass through restricted orifice 85 to provide a dash pot effect and sufficient in quantity to accomplish the purpose of the invention.

Guide rod 78 extends through the springs 72 and 74 and the upper end of cylinder 70 for connection to the cable 42 by suitable coupling 82 at the cable end 84. The cylinder 70 is fixed to the bolster by suitable clamp device 86 while the guide tube 82 is pivotally mounted on a base plate 87 suitably clamped or otherwise fixed to the side frame 54 to form mounting device 88. Guide tube 44 is suitably secured to the car body and cylinder lever 20, respectively by clamp devices 90 and 92 or the like.

The deflection of truck spring assemblies 58 reflects changes of load weights on the car, with a corresponding relative movement occurring between the truck bolster 56 and the side frames 54 on either side of the truck. Assuming that the load on the car is increased, which thus increases the weight to be carried by the car trucks, the truck bolster 56 will be deflected downwardly and move the cylinder 70 downwardly with respect to spring seat structure 76, which will tend to move the spring seat structure 76 through spring 72 downwardly a corresponding amount (as hydraulic liquid flows through orifice 85), and thus cable 42 will