July 8, 1930. W. F. RICHARDS 1,770,043

SLACK ADJUSTER

Filed Oct. 14, 1925 2 Sheets-Sheet 1

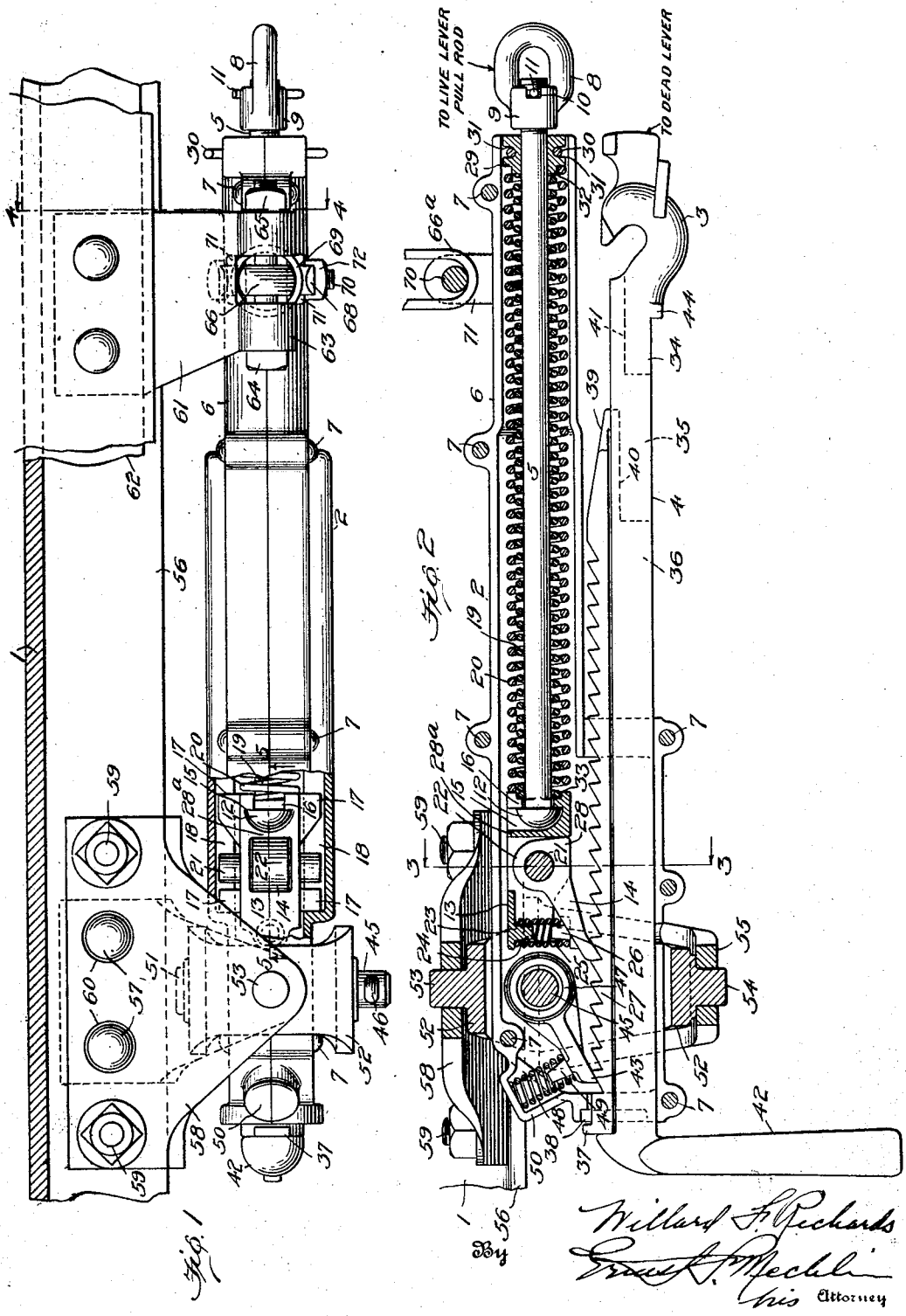


Fig. 1

Fig. 2

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Fig. 3

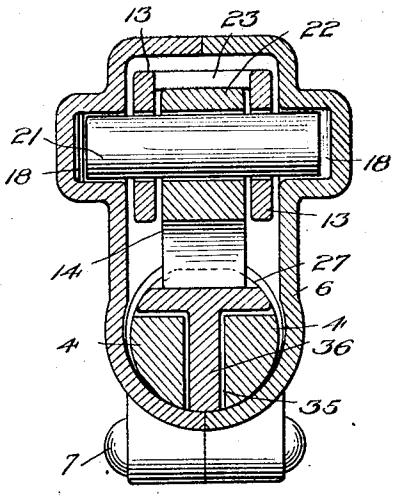


Fig. 4

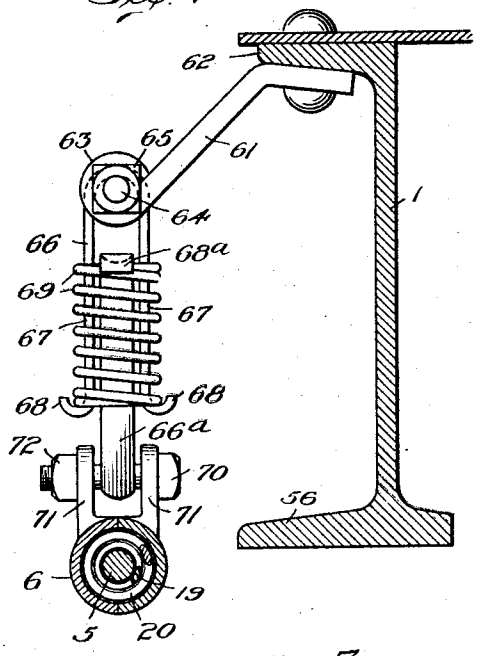


Fig. 5

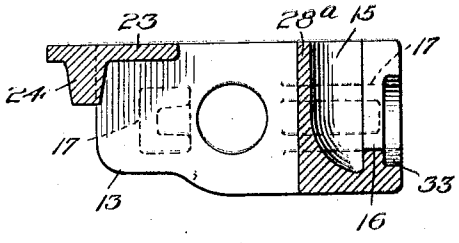


Fig. 6

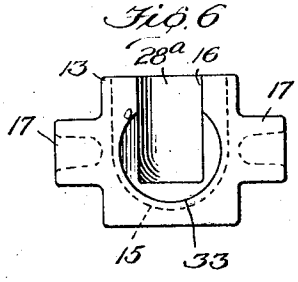


Fig. 7

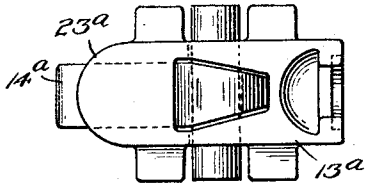
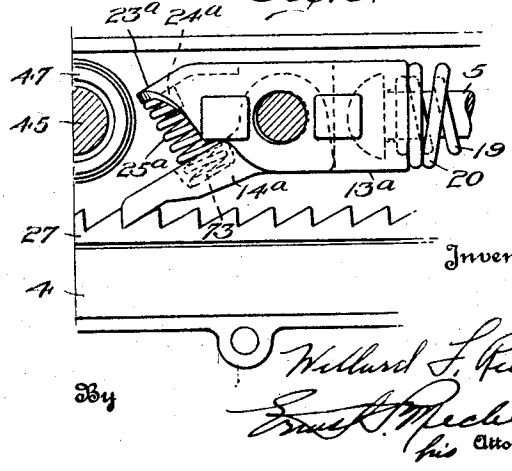


Fig. 8.



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Patented July 8, 1930 1,770,043

UNITED STATES PATENT OFFICE

WILLARD F. RICHARDS, OF DEPEW, NEW YORK, ASSIGNOR TO THE SYMINGTON COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MARYLAND

SLACK ADJUSTER

Application filed October 14, 1925. Serial No. 62,475.

This invention relates to automatic slack adjusters and particularly those of the type disclosed in Sauvage Patent No. 1,114,295 of October 20th, 1914, and may be considered as a modification of the slack adjuster described and claimed in the Kadel and Barrows application, Serial No. 39,348, filed June 24th, 1925.

The principal object of my invention, generally considered, is the provision of an improved slack adjuster for railway car brake rigging which is so arranged as to permit free angling thereof with respect to the car body, to permit ready connection and disconnection with respect to the car body and brake rigging and which involves various improved details of construction.

An object of my invention is the provision of a slack adjuster for railway brake rigging which is so connected with the car body that the necessary relative motion with respect to said car body is freely permitted, thereby avoiding strain on the mechanism and one end at least of said slack adjuster is spring supported on said car body.

Another object of my invention is the provision of an improved slack adjuster for railway cars in which the take-up rod thereof is returned to normal position after being released to suitably adjust the mechanism by a plurality of springs surrounding said rod, means being provided for properly centering said springs with respect thereto.

A further object of my invention is the provision of an improved slack adjuster for railway cars comprising a take-up rod formed with an eye threadedly connected with one end thereof and serving for connection with an associated live lever on the car, whereby an adjustment between said rod and live lever may be effected.

A still further object of my invention is the provision of an improved form of slack adjuster for railway cars in which the take-up pawl thereof is mounted on a suitably guided carriage connected to the take-up rod rather than being mounted directly on said take-up rod, whereby improvement in operation of the mechanism is effected.

Other objects and advantages of the invention relating to the particular arrangement and combination of the various parts will become more apparent as the description proceeds.

Referring to the drawings illustrating my invention, the scope whereof is defined by the appended claims:

Figure 1 is a plan view, partly in section, showing a slack adjuster embodying my invention connected to the body or underframe of a car shown only fragmentarily.

Figure 2 is an elevational view, shown partly in section, of the slack adjuster shown in Figure 1.

Figure 3 is a transverse sectional view on the line 3—3 of Figure 2, looking in the direction of the arrows.

Figure 4 is a transverse sectional view on the line 4—4 of Figure 1, looking in the direction of the arrows, and showing particularly an embodiment of my resilient supporting means used in the present instance at one end of a slack adjuster.

Figure 5 is a detail longitudinal sectional view of the take-up rod pawl carriage on the line 5—5 of Figure 1, looking in the direction of the arrows.

Figure 6 is an elevational view of the right hand end of the pawl carriage shown in Figure 5.

Figure 7 is a plan view of a modified form of take-up rod pawl and carriage.

Figure 8 is an elevational view of said modified form of pawl and carriage, a portion of the mechanism associated therewith being also illustrated.

Referring to the drawings in detail, similar parts being designated by like reference characters, there is indicated a part of the car underframe, such as one of the center sills 1 thereof and from said center sill is supported my slack adjuster, indicated generally by the reference character 2, in a manner to be more fully described hereinafter.

The car may be provided, as usual, with a pull rod connected to a live lever such as illustrated in the Sauvage patent beforementioned. A dead lever is also provided and, as will be understood, the fulcrums of said live and dead levers are adapted for con-

nection, in the usual manner, with brake beams carrying their respective brake shoes, but as such features are not part of the invention and are old in the art, as shown by said Sauvage patent, they are not illustrated. The corresponding ends of the live and dead levers are adapted for connection by a usual form of bottom rod, as will be understood, and when no slack adjuster is employed the dead lever fulcrum is customarily attached to the bolster of the car. In employing a slack adjuster, according to my invention, such a connection is dispensed with and said dead lever is instead connected to the hook 3 of the rack bar 4, in any desired manner, as by means of a chain which is shown in the Sauvage patent aforementioned, as will be understood. Likewise, the take-up rod 5 is operatively connected with respect to the corresponding end of the live lever or the pull rod connected therewith so that upon abnormal or excess movement upon said rod and live lever, the take-up rod is moved for effecting a take up of slack, as will be understood.

My improved form of slack adjuster 2 comprises a housing 6 formed as two complementary halves, preferably connected together by a plurality of rivets or bolts 7. In said housing, there is slidably mounted the take-up rod 5, the outer or rear portion of which is provided with an eye 8 for connection with a link or operating rod in turn operatively associated with the usual pull rod connected with a live lever of the car. Said eye is preferably provided with a hub or nut portion 9 threaded to the inner or rear end of the take-up rod 5 and preferably castellated, as indicated at 10, for the reception of a locking cotter or the like 11. On account of such construction, the eye 8 may be adjusted to a limited degree with respect to the take-up rod 5 and may be readily connected and disconnected with respect thereto.

The take-up rod 5, at its inner or front end with respect to the car, is formed with a preferably integral headed portion 12 adapted for connection with a pawl carriage 13 upon which is pivotally mounted a take-up pawl 14. Said headed portion 12 of the take-up rod is preferably removably connected with said carriage 13 as by being inserted in the pocket 15 in said carriage with the adjacent portion of the take-up rod 5 positioned in the slot 16 in said carriage 13, the shouldered portions formed between the slot 16 and chamber 15 engaging the headed portion 12 of the take-up rod 5 and preventing undesired disengagement therebetween. The carriage 13 is formed with transversely extending lug portions 17 guided in corresponding grooves 18 on the inner faces of the housing 6 so that said carriage 13 and its associated pawl 14 are guided straight in the housing 6 and are moved in one direction or to the right, as shown in Figure 2, upon actuation of the take-up rod and to the left by associated springs 19 and 20 upon release of said take-up rod 5.

The pawl 14 is preferably mounted in the carriage 13 by means of a pin 21 extending through the bearing or hub portion 22 of said pawl and supported by the side walls of the carriage 13, the ends of said pin 21 being continued to the grooves 18 in housing 6, serving as additional means for guiding the pawl 14 and by this means also preventing loss of said pivot pin 21. The carriage 13 is preferably formed with a forward extension or shelf 23 provided with a downwardly projecting lug 24 and upon which is positioned and centered a preferably helical pawl spring 25, the lower end of said spring being positioned around a similar lug 26 adjacent the outer or free end of said pawl. By means of this construction, the pawl 14 is at all times urged into engagement with the rack portion 27 of the rack bar 4.

In order to prevent undesired downward movement of the free or spring engaged portion of the pawl 14, the hub portion 22 of said pawl is preferably formed with a lug 28 extending downwardly and toward the transverse wall portion 28[a] of the carriage 13, thereby limiting downward movement of said pawl 14.

The rear end of the take-up rod 5 is slidably mounted in a bearing member 29, said member being formed to fit in the corresponding end of the housing 6 and preferably retained in place in said housing by means of a cotter 30, said cotter extending in the grooves 31 in said bearing 29 and through corresponding apertures in the adjacent housing portion. The inner side or left hand end of said bearing, as shown in Figure 2, is preferably formed with an annular extension 32 closely positioned with respect to the take-up rod 5 and formed of a diameter corresponding to the smallest diameter or inside dimension of the outer coil or helical spring 20 so as to form a bearing for one end of said spring and serve as centering means for said springs 19 and 20. Said springs 19 and 20, which serve for returning the take-up rod 5 to normal position upon release of the same, preferably extend between said bearing 29 and the adjacent end of the pawl carriage 13, the other end of said springs being preferably centered with respect to the engaging portion of the pawl carriage by the inner spring 19 fitting within the annular depression or groove 33 formed on said pawl carriage and of a diameter corresponding to the outer diameter of the inner spring 19.

As an additional means for centering the springs one with the other, said springs 19 and 20 are preferably wound in the opposite manner. That is, the inner helical spring 19 may be wound right handed and the outer

helical spring 20 may be wound left handed so that there will be no danger of the coils of one slipping between the coils of the other when in service.

The rack or ratchet bar 4, in the present embodiment, is formed generally cylindrical as at 34 and bifurcated or slotted along an intermediate portion thereof at 35 and slidably embraces a depending portion 36 from the ratchet or rack portion 27 thereof. The lower edge or surface of the depending flange 36 from the ratchet 27 as well as the lower surface of the cylindrical portion 34 of the rack bar 4 bears on the lower wall of the housing 6, as illustrated particularly in Figure 3, a certain amount of clearance being preferably provided between the adjacent substantially horizontal surfaces on the rack 27 and the cylindrical portion 34 of the rack bar, as illustrated in said figure. The front or outer portion of the rack 27 is provided with a lip portion 37 adapted for engagement in a corresponding pocket 38 in the housing 6 to limit rearward movement thereof. The rear portion of the rack is preferably tapered or beveled or provided with an extension, as indicated at 39, to facilitate assembly thereof.

As will be appreciated from a consideration of Figure 3, particularly, the rack portion 27 is generally T-shaped in cross section with the depending flange 36 engaged in the bifurcated portion 35 of the rack bar 4. The flange 36, although partially cut away at its inner or rear end, is preferably continued at reduced depth, as indicated at 40, underlying the extension 39 for increasing the strength thereof and the cylindrical portion 34 of said rack bar 4 is correspondingly grooved at 41 for the reception thereof. One end of said rack bar is formed with the connecting means or hook 3, as illustrated, whereby the same is operatively connected with the dead lever, as previously described. The other end of the rack bar 4 is provided with an operating handle 42, said handle preferably normally depending and adapted for horizontal or rotary movement.

On account of the difference in length between the bifurcated portion 35 of the rack bar 4 and the rack or depending flange portion 36 thereof, the operating handle 42 may be moved a substantial distance longitudinally without affecting the rack 27. The object of such construction is to prevent injurious effect resulting from unauthorized persons tampering with the operating lever 42. However, upon pulling said lever to close up the distance between the right hand ends of the bifurcated portion 35 and the flange portion 36, said rack 27 may be manually moved the requisite distance to the left, if desired.

If at any time, it is desired to entirely release the rack from the take-up pawl 14 and the locking dog 43, said handle 42 may be rotated through approximately 90° in an outward direction about the rack bar 4 as an axis, when said rack 27 is thrown out of engagement with the pawl 14 and the dog 43, the rack bar 4 will then be entirely released with respect thereto. The hook 3 may be provided with an abutment or stop portion 44 adapted to engage the adjacent portion of the lower wall of the housing 6 to limit the movement of said rack bar 4 to the left.

The locking dog 43 is preferably pivotally connected with respect to the housing 6, as illustrated, either by means of a pivot pin 45 extending therethrough and locked in place by a cotter 46 or by means of transversely extending trunnions 47 therefrom engaging in correspondingly formed pockets in the walls of the housing 6. In the latter instance sufficient clearance may be provided between the pin 45 and the hub portion of the dog 43 to prevent frictional engagement therebetween so that said pivot pin 45, which serves to pivotally support the housing 6, does not influence the action of the dog 43 on account of the weight imposed thereon from the housing. The operative or free end of the dog or pawl 43 is preferably pressed into engagement by means of a helical spring 48, said spring preferably surrounding, at its lower end, an extension or lug 49 from the pawl and being housed at its upper end in a pocket 50 in the housing 6.

The pivot pin 45, preferably headed at one end, as at 51, and provided with locking means 46 at the other end, serves to support the housing 6 and contained members of the slack adjuster by extending through apertures in said housing and registering apertures in a trunnion ring or frame 52, said ring entirely encircling one end of the housing 6 and being provided at its upper and lower ends, respectively, with substantially vertical or upright trunnion portions 53 and 54. The lower trunnion 54 is adapted for being supported by a bracket or anchorage 55 preferably extending from and connected to the lower surface of the outstanding flange 56 of the center sill 1 by a plurality of rivets 57. In the preferred embodiment, there are two rivets 57 spaced relatively close, as indicated in Figure 1. The upper trunnion 53 is pivotally supported by means of the bracket or anchorage 58 preferably extending from and bolted to the upper surface of flange 56. In the present embodiment, two bolts 59 are employed spaced relatively far apart, as indicated in Figure 1, and outwardly of the rivets 57, that portion of the bracket 58, adjacent the heads of rivets 57, being cut away or provided with clearance holes 60, as illustrated. By virtue of this construction, the lower bracket 55 is securely attached to the center sill and not readily removed therefrom, whereas the upper

bracket 58 is adapted for ready disconnection by merely removing the bolts 59 so that the slack adjuster may be detached from the car, when desired. On account of the bracket 58 being cut away at 60, adjacent the heads of the rivets 57, there is no interference between said bracket and rivets.

On account of this form of support between the slack adjuster and housing and the car underframe, a full universal connection is provided as horizontal angling is permitted between the frame or ring 52 and the brackets 55 and 58, whereas vertical angling is permitted between the housing 6 and the frame.

The other end of the housing 6 is preferably supported for permitting relative vertical motion between said housing and underframe, said support, in the present embodiment, taking the form of a plate 61 riveted or otherwise suitably connected to the flange 62 of the center sill 1 and extending downwardly and outwardly with a bifurcated and apertured outer portion 63 through which extends a connecting bolt or the like 64 headed at one end and provided with a nut 65 at the other end.

Supported on said bolt 64, as illustrated particularly in Figure 4, is an inverted U-shaped member 66 preferably embraced between the bifurcated portions 63 at the end of the bracket 61 with the closed or curved end thereof embracing the intermediate portion of the bolt 64. The downwardly extending arms 67 of said U-shaped member 66 are preferably bent outwardly or transversely, as indicated at 68, forming ledges or supporting means for the preferably helical spring 69 surrounding the lower portion of the U-shaped member 66. A corresponding or identical U-shaped member 66ª preferably extends between the depending arms 67 of the U-shaped member 66 and is surrounded by the spring 69, the outwardly extending portions 68ª thereof engaging the upper end of the spring 69 and the lower or closed portion thereof receiving a supporting bolt or the like 70 extending through corresponding ears or lugs 71, preferably integral with the housing 6. The bolt 70 is preferably headed, in the usual manner, and held in place by means of a nut 72 threaded to the opposite end thereof.

It will be apparent that on account of this construction the slack adjuster housing is resiliently supported from the bracket 61 and the center sill of the car and it will be obvious that the weight of said housing and contained members tends to pull the U-shaped member 66ª from the inverted U-shaped member 66 and thereby compress the associated spring 69 therebetween. Not only is this vertical movement allowed for at this end of the slack adjuster housing 6, but it will be apparent that angling motion is also provided for by virtue of the pivotal connections at the bolts 64 and 70.

Referring now to Figures 7 and 8, a modified form of take-up rod pawl 14ª and carriage 13ª therefor is illustrated. The only material difference between this construction and that of the previous modification before described and illustrated, is that the pawl actuating spring 25ª, instead of acting vertically or between a substantially horizontal shelf portion 23 and the pawl 14 therebeneath, acts at an angle to the vertical, or substantially perpendicular or normal with respect to the engaged pawl portion. Instead of engaging lug portions at the opposite ends thereof, said spring engages a lug portion 24ª from the sloping shelf portion 23ª on the pawl carriage 13ª, the other end of said spring 25ª being received in a pocket 73 in said pawl 14ª. In other respects the construction of the pawl carriage and pawl may be identical with that previously described.

The operation of the aforedescribed slack adjuster is as follows:

When the brake shoes are new so that a normal amount of piston travel only is necessary to set the brakes, the pull rod moves during the normal operation of said brakes a distance merely sufficient to cause engagement with the actuating or connecting rod to take-up rod 5 without motion of said take-up rod. When the brake shoes become worn to such an extent that it is necessary to move the pull rod an abnormal amount to apply the brakes sufficiently, movement of the take-up rod is effected, in the usual manner, and the same is drawn to the right, considering Figures 1 and 2, a distance corresponding to this excess or abnormal motion. Such motion, if greater than the length of one of the teeth of the rack 27, will cause the pawl 14 or 14ª, if the alternative construction is employed, to slide over one or more of said teeth, the engagement of locking dog 43 preventing said rack from being drawn to the right with the pawl 14. Upon release of the brakes, the take-up rod 5 is likewise released and the springs 19 and 20 force said take-up rod back to its normal position and on account of the engagement between the pawl 14 and rack 27 a movement of said rack to the left is effected together with the associated rack bar 4 corresponding to the tooth or number of teeth over which said pawl 14 has slipped when the brakes were applied. This movement of the rack bar to the left draws the corresponding end of the dead lever to the left and through the connection between the dead and live levers effects a corresponding movement at the end of the live lever connected to the pull rod so that until further wear of the brake shoes has taken place no further movement of the take-up rod is effected. As will be obvious, when the rack 27 has been moved to the left by means of

the take-up rod and pawl it will be locked in place by means of the locking dog 43.

From the foregoing disclosure, it will be apparent that I have devised an improved form of automatic slack adjuster in which the necessary relative motion thereof, with respect to the car, is permitted and in which the take-up pawl is so carried and guided that it at all times acts in the proper manner and that the various other parts are advantageously arranged and constructed so that the brake rigging is at all times maintained in the proper adjustment.

Having thus described the invention, I claim:

1. In combination, a car body, a slack adjuster mounted thereon and including two relatively movable members adapted for connection, respectively, with a live lever and a dead lever on the car, a housing for said relatively movable members, and a support for said housing comprising a bracket mounted on the car body and a depending resilient connector extending from the outer portion of the bracket to the housing.

2. In combination, a car body, an automatic slack adjuster mounted thereon and including two relatively movable members adapted for being operatively associated, respectively, with a live lever and a dead lever on the car, a housing for said relatively movable members, and supporting means for said housing comprising a universal connection with the car body at one end thereof, and a spring supporting means at the other end.

3. In combination, a car body, a slack adjuster mounted thereon and comprising a rack bar adapted for connection with a dead lever on the car, a take-up rod adapted for operative connection with a live lever on the car and for longitudinal movement in one direction upon excess movement of said live lever, a dog in operative engagement with said rack bar to prevent movement thereof in the same direction and permit free movement thereof in the opposite direction, a pawl carriage mounted on one end of the take-up rod, a pawl pivotally mounted on said carriage, a spring positioned between said pawl and carriage and pressing said pawl into engagement with the rack bar, means for turning said rack bar to disengage said dog and pawl, and a plurality of coaxial springs surrounding said take-up rod, and pressing against the carriage mounted thereon, to slide said rod in the opposite direction.

4. In combination, a car body, a slack adjuster mounted thereon and comprising a rack bar adapted for connection with a dead lever on the car, a take-up rod adapted for operative connection with a live lever on the car and for longitudinal movement in one direction upon excess movement of said live lever, a dog in operative engagement with said rack bar to prevent movement thereof in the same direction and permit free movement thereof in the opposite direction, a housing for said slack adjuster, said dog being pivoted with respect to said housing and spring-pressed against said rack bar, a pawl carriage connected to an end of the take-up rod and guided in said housing, a pawl pivotally mounted on said carriage, a spring mounted between said carriage and pawl and serving to urge said pawl into engagement with the rack bar, a handle on said rack bar for moving it to release said dog and pawl, and a plurality of springs mounted on said take-up rod between said carriage and housing and pressing said rod in the opposite direction.

5. In combination, a car body, a slack adjuster mounted thereon and comprising a rack bar adapted for connection with a dead lever on the car, a take-up rod adapted for operative connection with a live lever on the car and for longitudinal movement in one direction upon excess movement of said live lever, a dog in operative engagement with said rack bar to prevent movement thereof in the same direction and permit free movement thereof in the opposite direction, a housing for said slack adjuster, said dog being pivoted with respect to said housing, a spring between said dog and housing to press said dog against said rack bar, a bearing in said housing slidably supporting said take-up rod, a pawl carriage connected to an end of the take-up rod and provided with guiding lugs engaging in corresponding grooves in the housing, a pawl pivotally mounted on said carriage, a spring with the opposite ends thereof supported, respectively, on the carriage and pawl for causing said pawl to engage the rack bar, and spring means mounted on said take-up rod and acting between said carriage and take-up rod bearing to force the rod in the opposite direction.

6. In combination, a car body, a slack adjuster mounted thereon and comprising a rack bar adapted for connection with a dead lever on the car, a take-up rod adapted for operative connection with a live lever on the car and for longitudinal movement in one direction upon excess movement of said live lever, a dog in operative engagement with said rack bar to prevent movement thereof in the same direction and permit free movement thereof in the opposite direction, a housing for said slack adjuster, said dog being pivoted with respect to said housing, a spring between said dog and housing to press said dog against said rack bar, a bearing in said housing slidably supporting said take-up rod, said bearing being provided with an annular longitudinal extension, a pawl carriage connected to an end of the take-up rod and provided with guiding lugs engaging in corresponding grooves in the housing and formed with a concentric annular groove around said take-

up rod, a pawl pivotally mounted on said carriage, a spring at the opposite ends thereof supported, respectively, on the carriage and pawl for causing said pawl to engage the rack bar, a spring closely mounted on said take-up rod and acting between the annular groove on said carriage and the annular extension on the take-up rod bearing, and an outer spring surrounding said first spring and acting between said carriage and take-up rod bearing, said springs cooperating to move the rod in the opposite direction.

7. In combination, a car body, a slack adjuster mounted thereon and comprising a rack bar adapted for connection with a dead lever on the car, a take-up rod adapted for operative connection with a live lever on the car and for longitudinal movement in one direction upon excess movement of said live lever, a dog for operative engagement with said rack bar to prevent movement thereof in the same direction and permit free movement thereof in the opposite direction, a pawl carriage mounted on the take-up rod, a pawl pivotally mounted on said carriage and provided with a stop lug adapted for engagement with an adjacent wall of the carriage to limit downward movement of said pawl, a spring positioned between said pawl and carriage and pressing said pawl into engagement with the rack bar, and spring means to slide the take-up rod in the opposite direction.

8. In combination, a car body, a slack adjuster mounted thereon and comprising a rack bar adapted for connection with a dead lever on the car, a take-up rod adapted for operative connection with a live lever on the car and for longitudinal movement in one direction upon excess movement of said live lever, the connecting means for said take-up rod comprising a castellated nut portion threadedly engaging one end of said take-up rod and provided with an eye portion for connection with the live lever, cotter means inserted through the cooperating portion of the take-up rod and castellations of the nut to hold said members in adjusted position, a dog in operative engagement with said rack bar to prevent movement thereof in the same direction and permit free movement thereof in the opposite direction, a pawl associated with said take-up rod and spring-pressed into engagement with the rack bar, and spring means to slide the take-up rod in the opposite direction.

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