June 5, 1934. H. E. ANDERSON 1,961,919

AUTOMATIC SLACK ADJUSTER

Filed Sept. 12, 1932 2 Sheets-Sheet 1

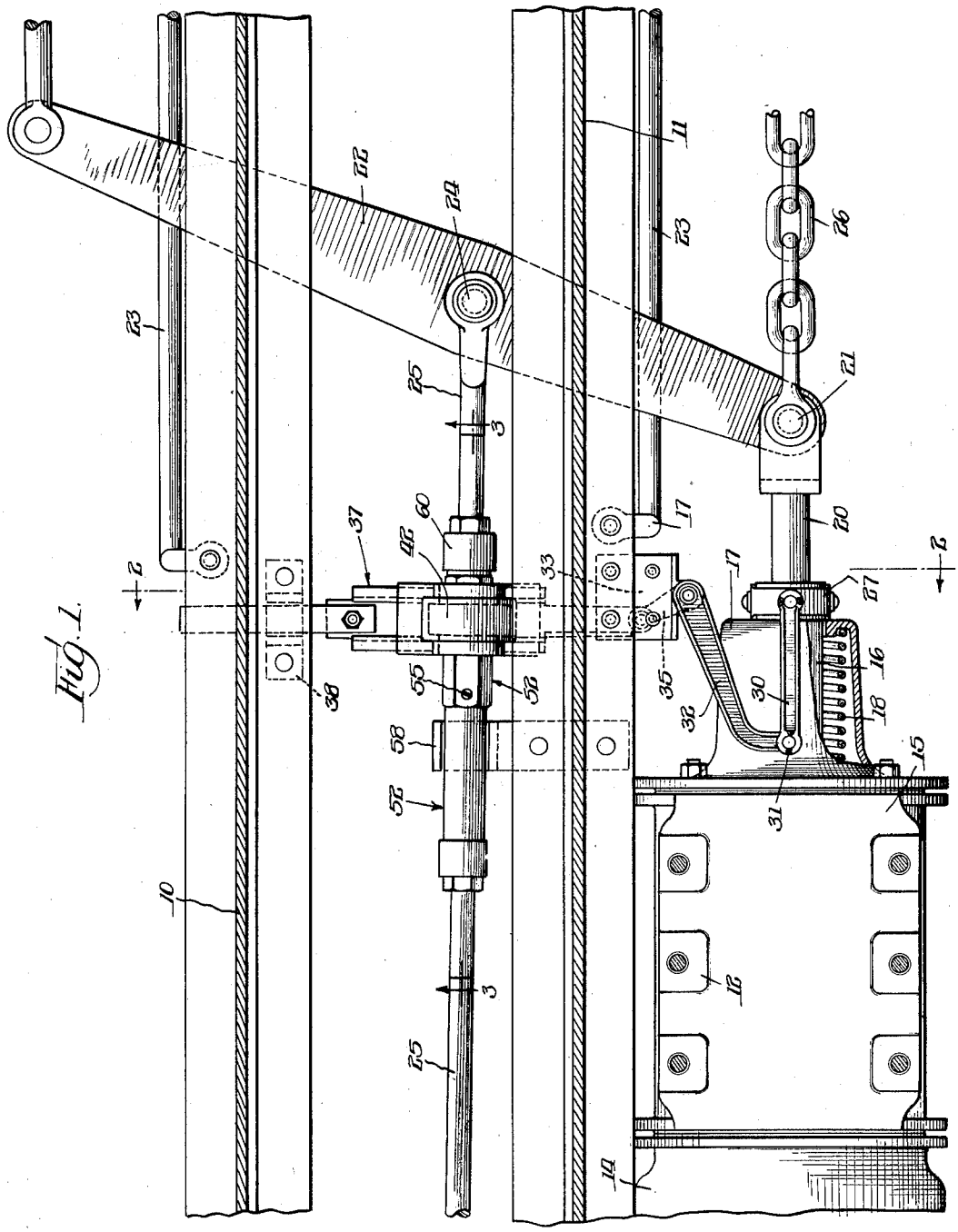

Fig. 1.

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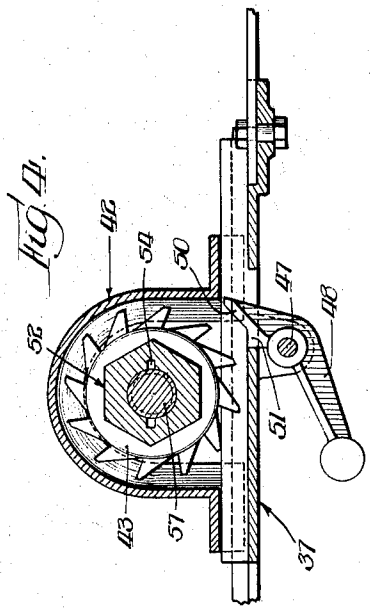

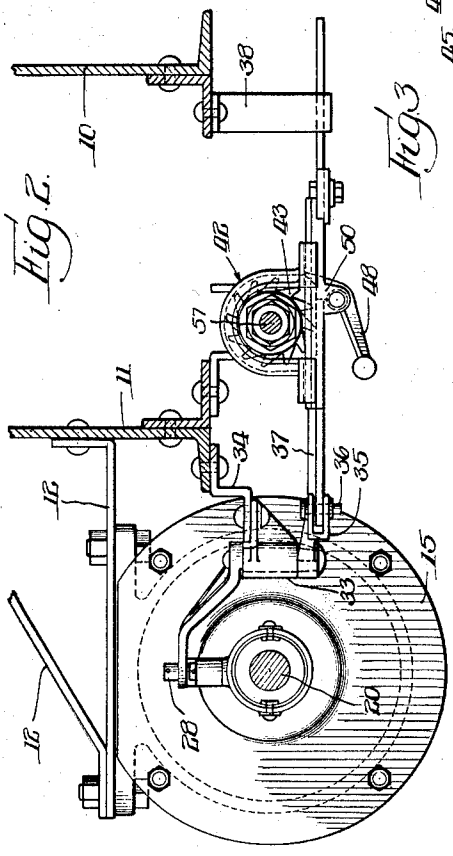

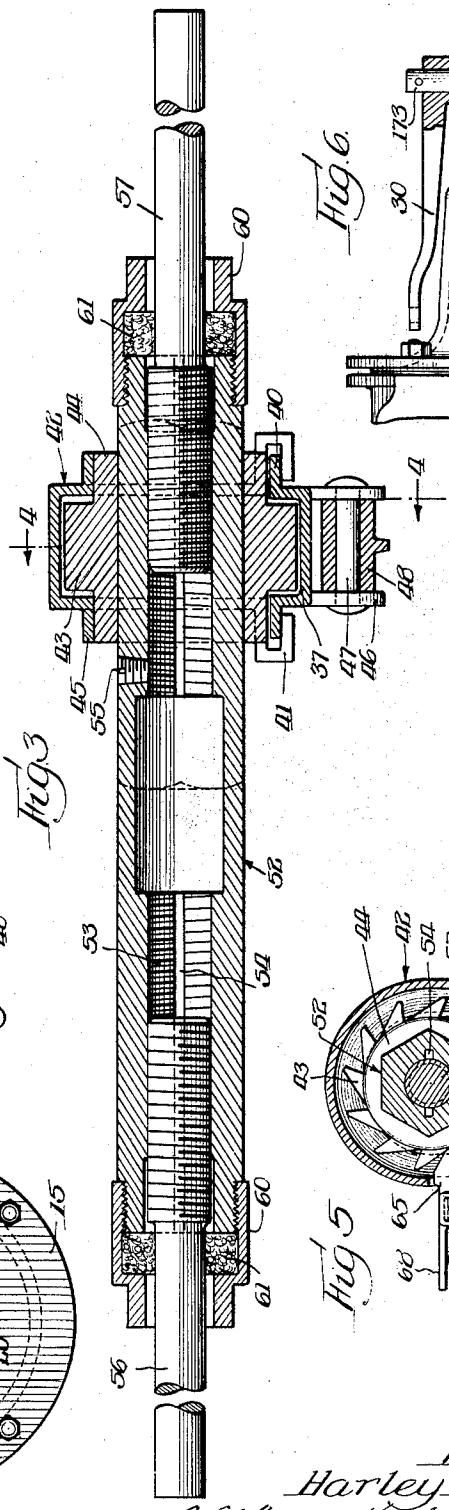

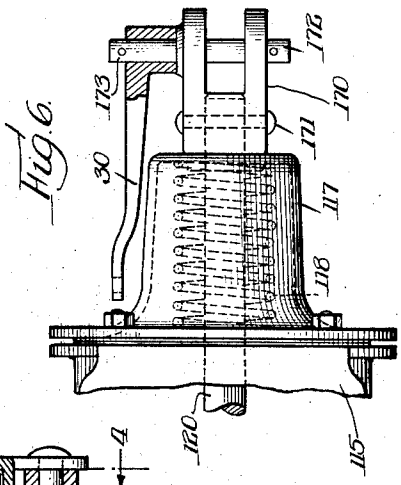

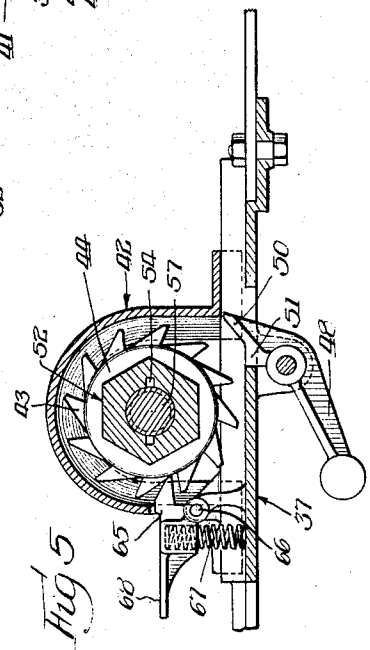

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Patented June 5, 1934

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UNITED STATES PATENT OFFICE

1,961,919

AUTOMATIC SLACK ADJUSTER

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18 Claims. (Cl. 188—202)

The invention relates to improvements in air brake systems and has reference more particularly to automatic slack adjusting means for regulating the brake rigging to give constant brake shoe clearance and maximum efficiency.

The A. R. A. regulations are that the piston travel of the brake cylinder must be maintained at not less than seven inches or more than nine inches with eight inches being the desired travel for the most efficient operation of the air brake equipment. At present the adjustment is generally made by manually changing the fulcrum point of the dead truck lever, the fulcrum strap of which is provided with a number of pin openings so that the piston travel can be lengthened or shortened, depending on the particular opening employed. Such manual adjustment is undesirable as it is almost impossible to maintain the correct piston travel and often slack in the brake rigging is taken up by adjusting one lever only of a truck, which throws all the brake levers out of line, at times causing the foundation rigging to foul.

The present invention provides for automatically controlling the piston travel by the provision in the pull rod of the brake rigging of a turn-buckle operatively connected for actuation by the piston of the brake cylinder. A desirable feature of the device is that while it acts automatically it is free from springs, depending on the release spring within the air cylinder to cause the adjuster to function as the piston returns to released position in the cylinder. Also the present installation saves the expense of the usual fulcrum strap for the dead levers as the same may be permanently fastened to the truck bolster.

One of the objects of the present invention is to provide mechanism of the above general character of simple and practical construction and which can be applied to the foundation rigging without material alteration in the existing structure.

A further object is to provide a slack adjuster for controlling the travel of the piston of the air brake cylinder automatically within the limits required by the A. R. A. as the brake shoes wear, which will be substantially fool-proof, which will be so constructed as to prevent fouling, and wherein easy and quick manual regulation is possible for positioning the various parts for the insertion of new shoes.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the invention and wherein like reference characters are used to designate like parts—

Figure 1 is a plan view of the under-frame of a railway car showing that portion of the foundation rigging associated with the air brake cylinder equipped with the automatic slack adjuster of the present invention;

Figure 2 is a sectional view taken along line 2—2 of Figure 1 showing parts of the device in elevation;

Figure 3 is a detail sectional view longitudinally of the turn-buckle taken on line 3—3 of Figure 1.

Figure 4 is a sectional view taken on line 4—4 of Figure 3 showing the association of the ratchet wheel with its housing and pivoted gravity dog;

Figure 5 is a view similar to Figure 4 showing additional structure for preventing unintentional turning of the ratchet wheel; and

Figure 6 is a fragmentary elevational view of a passenger brake cylinder showing the method of operatively connecting the slack adjuster with the solid piston rod of the same.

The foundation rigging shown in Figure 1 is associated with a freight car consisting of spaced center sills 10 and 11, the latter supporting by means of brackets 12 an air reservoir 14 and freight brake cylinder 15. The brake cylinder is provided with the usual piston not shown and connected hollow piston sleeve 16 which projects outwardly of the non-pressure head 17, the piston and hollow piston sleeve being maintained in retracted position by the release spring 18 confined between the piston and the non-pressure head 17. The piston of the air brake cylinder actuates the push rod 20 supported by the hollow piston sleeve and pivotally connected at its outer end as at 21 to a cylinder lever 22 supported for movement from the center sills by supports 23. The cylinder lever connects at its other end with means joining with the live levers of the brake rigging on the forward truck and intermediate its ends at 24 with a pull rod 25. Through suitable connections well known to those skilled in the art, and for that reason not disclosed, the pull rod connects with the live truck levers on the rearward truck so that actuations of the piston of the air brake cylinder are simultaneously imparted to both trucks for applying the brakes to the car wheels. Hand brake actuating means is indicated generally at 26, the chain having connection with the cylinder lever 22 at 21 to cause a relative movement of the push

rod and connected end of the cylinder lever toward the right in applying the brakes by hand without in any way disturbing the position of the piston or hollow piston sleeve.

After a time successive application of the brakes of the car wheels soon causes the brake shoes to wear with the result that the clearance between the brake shoe and the car wheels is increased, resulting in an increase in piston travel to apply the brakes. To maintain the ideal piston travel requires frequent adjustment of the brakes and accordingly the invention provides an automatic adjuster whereby the pull rod connecting the cylinder and floating levers can be shortened to take up the slack in the brake rigging on the trucks and when new shoes are installed to replace the old ones the pull rod can be manually lengthened to provide the necessary slack for accommodating the new shoes.

Referring more particularly to Figures 1 and 2 the hollow piston sleeve is disclosed as having riveted to its projecting end a collar 27 provided with upstanding pin 28 for pivotally securing to the collar and the sleeve an arm 30. Pivotally connecting with the arm 30 at 31 is a lever 32 supported for rotation in the hinge bracket 33 suitably secured by means of rivets to support 34, in turn riveted to the base of the center sill 11. The bifurcated arm 35 has non-rotative securement to lever 32 and at its outer end connects by means of pin 36 with a transverse member in the form of a strap 37 supported at its opposite end from center sill 10 by the depending bracket 38.

Centrally of the strap 37 are provided side walls flanged outwardly at 40 for receiving the shaped ends 41 of the cover or housing 42. The cover encloses a ratchet wheel 43 mounted on a turnbuckle to be presently described, and is provided with hubs 44 which contact with semi-circular portions 45 on the cover, and since the cover is held to the strap 37 it will be seen that the structure provides for rotation of the ratchet wheel within the cover while maintaining the ratchet wheel and strap in desired spaced relation. Also formed centrally of the strap are a pair of depending lugs 46 apertured for receiving the pivot pin 47 serving to pivotally secure to the strap the gravity dog 48 having a latch 50 projecting through an opening provided in the strap and adapted to engage with the teeth on the ratchet wheel 43. The latch of the gravity dog is formed with a shoulder 51 which engages one end of the opening in the strap to position the latch upright.

The adjuster proper comprises a turn-buckle in the form of an elongated tube 52 threaded internally as at 53, the threads being grooved at 54 so that the same can be continuously supplied with oil admitted to the interior of the turn-buckle through the opening normally closed by the plug 55. In applying the adjuster to the pull rod 25 the same has a portion removed and the ends are threaded so that they can be connected to the adjuster by being threaded to the ends of the turn-buckle. In those cases where it is necessary to equip rigging already in operation on a railway car the turn-buckle is provided with extensions 56 and 57 threaded at their inner ends for association with the turn-buckles and which are suitably welded or otherwise secured to the separated portions of the pull rod. In either case the turn-buckle has threaded engagement with the separated sections of the pull rod and it is to be noted that the threads of one end of the turn-buckle are right hand, while those on the other end are left hand, so that rotation of the turn-buckle serves to shorten or lengthen the pull rod. A portion of the exterior surface of the tube 52 is formed of hexagonal shape for association with the ratchet wheel 43 which has limited longitudinal movement on the tube, while the remaining portion thereof is circular for engagement with the supporting strap 58 depending from the center sill 11.

It will be understood that if for any reason the adjuster fouled it would cause the piston of the air brake cylinder to fail to release, with the result that the brake shoes would drag or bear against the wheels causing brake burn on the tread of the wheels and flat spots. In order that the adjuster may at all times be free to operate the invention provides that the threaded ends of the pull rod be continuously immersed in oil. For this purpose the bore of the turn-buckle is grooved at 54 and end caps 60 are provided for retaining a felt washer 61 which serves to close the ends of the turn-buckle, holding the oil within the same. The groove forms a by-pass for the oil, allowing passage of the same from the center of the turn-buckle to the ends as the threaded ends of the pull rod come together and to return to the center chamber as the threaded ends are moved outwardly.

The device as above described is actuated by movement of the hollow piston sleeve 16 toward the right, Figure 1, upon the application of the brakes to the car wheels. As the collar 27 is fixedly secured to the sleeve the same is carried outwardly rotating lever 32 and imparting movement to the strap 37 in a direction toward the left. As the gravity dog 48 is carried by the strap the latch 50 will be located somewhere under the ratchet wheel 43, the particular location depending on the extent of travel of the piston sleeve. The present invention contemplates the proper proportioning of the parts so that the latch 50 will be located under the ratchet wheel and within the toothed space formed by the two lower-most teeth of the ratchet when the piston travel is eight inches. When this condition occurs and the brakes are released it will be seen that the piston is immediately returned to initial position by the release springs 13 thus causing actuation of the strap 37 in a direction toward the right, Figure 2, and as the strap carries dog 48 the latch 50 will contact with a tooth on the ratchet wheel 43 to cause rotation of the wheel. As the extent of movement of the latch 50 is very small the rotation imparted to the ratchet wheel is sufficient to rotate the same only one tooth, which rotation likewise takes place with respect to the turnbuckle to cause shortening of the pull rod 25, thereby taking up the slack in the brake rigging.

With the piston travel greater than eight inches a greater degree of rotation will be imparted to lever 32 to cause further movement of the strap 37 toward the left, which movement may be sufficient to locate the latch 50 to the left of the ratchet wheel whereupon rotation will be imparted to the ratchet wheel upon release of the brakes to the extent of two teeth which will result in a more pronounced shortening of the pull rod 25. On the other hand, should the piston travel approximate seven inches it will be seen that the latch 50 will not be moved sufficiently to engage with a tooth on the ratchet wheel and accordingly no rotation of the ratchet wheel nor actuation of the turn-buckle to shorten

the pull rod will take place. The present device thus responds to the extent of piston travel and when the same is beyond the ideal the turn-buckle is actuated to cause shortening of the pull rod and the taking up of slack in the brake system. When the brake shoe clearance and piston travel are such that no excess slack exists the turn-buckle is not actuated and adjustment of the brake rigging is not effected until considerable brake shoe wear occurs.

After a set of brake shoes have worn and a new set are to be applied the operator in order to make available sufficient slack in the system simply rotates the turn-buckle by hand, lengthening the middle connecting rod to its original length. The turn-buckle is much easier to reach and safer than bending over the axle at each truck to get at the dead levers and also there are no cotter pins or brake lever pins to remove. As the turn-buckle is part of the pull rod the same has free longitudinal movement with respect to the ratchet wheel to permit the brake rigging to adjust itself as the trucks round a curve or pass over a switch. It is also to be noted that the pawl and ratchet which operate upon reciprocation of the strap member to rotate the turn-buckle to shorten the pull rod are normally disconnected. That is, the parts are located in spaced relation when the brakes are in released position. This normal disconnection of the parts is desirable as it permits manual adjustment of the rigging to lengthen the pull rod without requiring the disconnection or release of any part.

The additional structure shown in Figure 5 is added in order to prevent unintentional rotation of the ratchet wheel due to vibration of the foundation rigging, and consists in the provision of a latch 65 pivoted at 66 to members projecting from the strap 37 and resiliently urged by coil spring 67 in a clockwise direction against a stop provided so as to maintain the latch substantially horizontal. As the latch is carried by the strap movement of the latter serves to remove the latch from association with the ratchet wheel so that the same does not interfere with the rotation of the wheel by latch 50. When, however, it is desired to manually rotate the wheel the latch 65 may be removed by grasping the finger piece 68 and rotating the latch against the coil spring 67.

In the application of the present invention to a freight brake cylinder it will be noted that the hollow piston sleeve has fixedly secured to its outer end a collar 27. This collar functions as a safety feature since the same is located on the sleeve to the outside of the non-pressure head and retains the release spring within the head when the same is removed for cleaning the brake cylinder. The practice heretofore required the operator to insert a pin in holes provided in the end of the hollow piston sleeve before attempting removal of the non-pressure head. This pin or other means used would often fail, releasing the non-pressure head and release spring and causing injury to the operator. As the collar 27 is securely riveted to the hollow piston sleeve such dangers are eliminated by the installation of the present device.

In passenger cars a structural difference exists between the brake cylinder equipment on the same and that employed on freight cars in that the hollow piston sleeve is omitted and the piston rod connects the cylinder lever directly with the piston. In Figure 6 the passenger brake cylinder 115 having the non-pressure head 117 is shown with a solid piston rod 120 extending from the piston connected thereto through the head and beyond for securement to the jaw 170 by the bolt 171. By means of the brake pin 172 the cylinder lever 22 can be pivotally connected to the jaw and thus the piston rod, and accordingly any movement of the piston is transmitted to the cylinder lever which is returned after a brake application by the release spring 118. For attaching the arm 30 to the jaw the brake pin 172 has an extension 173 and the construction operates in the same manner as that of the freight cylinder since arm 30 is caused to rotate lever 32 upon each application of the brakes with the parts being returned by the release spring as described. Since the piston rod 120 and hollow piston sleeve 16 both have varying extent of movement, depending on the piston travel, the adjuster functions in like manner whether associated with freight or passenger brake equipment.

It is to be understood that I do not wish to be limited by the exact embodiment of the device shown, which is merely by way of illustration and not limitation, as various and other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In a regulator for foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod, an adjuster including a turn-buckle positioned intermediate the ends of said rod, a ratchet wheel non-rotatably but slidably mounted on said turn-buckle, reciprocating means actuated by said brake cylinder, a latch carried by said means and adapted to engage the wheel to cause rotation thereof, said latch and wheel being positioned in spaced relation when the brakes are released so that rotation of the wheel occurs only upon a predetermined extent of piston travel upon brake application.

2. In a regulator for foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod, said cylinder including a piston sleeve and release spring, an adjuster in the form of a turn-buckle positioned intermediate the ends of said rod, and reciprocating means actuated in one direction by the brake cylinder upon a brake application and in the other direction by the release spring for rotating said turn-buckle.

3. In a regulator for foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod, said cylinder including a piston sleeve and release spring, an adjuster in the form of a turn-buckle poistioned intermediate the ends of said rod, and reciprocating means disposed normally to the turn-buckle and operatively connecting with the piston sleeve, said means being actuated in one direction by the brake cylinder upon a brake application and in the other direction by the release spring for rotating said turn-buckle.

4. In a regulator for foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod, said cylinder including a piston sleeve and release spring, an adjuster in the form of a turn-buckle positioned intermediate the ends of said rod, a reciprocating member disposed normally to the turn-buckle and operatively connecting with the piston sleeve, said member being actuated in one direction by the brake cylinder upon a brake application and in the other direction by the release spring, and means between the member and turn-buckle operating to rotate the latter

when the extent of reciprocation exceeds a predetermined amount.

5. In a regulator for foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod, said cylinder including a piston sleeve and release spring, an adjuster in the form of a turnbuckle positioned intermediate the ends of said rod, a reciprocating member disposed normally to the turn-buckle and connecting with the piston sleeve, said member being actuated in one direction by the brake cylinder upon a brake application and in the other direction by the release spring, a ratchet wheel non-rotatably mounted on the turn-buckle, and a latch carried by the member, said latch operating to rotate the wheel when the extent of reciprocation exceeds a predetermined amount.

6. Automatic slack adjusting means for foundation brake rigging having a pull rod including a turn-buckle forming part of said rod, a ratchet wheel on said turn-buckle, and reciprocating means actuated by the brake cylinder upon an application of the brakes for engaging and rotating said wheel, and other means carried by the reciprocating means for preventing inadvertent rotation of the wheel.

7. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod, said cylinder having a piston sleeve, an adjuster including a turnbuckle positioned intermediate the ends of said pull rod, a ratchet wheel non-rotatably but slidably mounted on said turn-buckle, a reciprocating strap member supported for movement from the underframe of the car and carrying a latch member for engaging with the ratchet wheel, and connections having pivotal association with the car underframe for operatively connecting the strap member and piston sleeve of the cylinder.

8. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod and having a piston sleeve and a release spring, an adjuster including a turn-buckle positioned intermediate the ends of said rod, a ratchet wheel non-rotatably but slidably mounted on said turn-buckle, a reciprocating strap member supported for movement from the underframe of the car and carrying a latch member for engaging with the ratchet wheel, and means including a bell crank having pivotal association with the car underframe for operatively connecting the strap member and piston sleeve, whereby said strap member is reciprocated in one direction by a brake application and in the reverse direction by the release spring, said bell crank being constructed and arranged to materially decrease the distance the strap moves relative to that of the piston sleeve and to increase the force exerted by the strap in like proportion.

9. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod and having a piston sleeve, an adjuster in the form of a turnbuckle positioned intermediate the ends of said rod, means supporting said turnbuckle from the car frame permitting longitudinal movement thereof but preventing lateral movement of the turnbuckle, a ratchet wheel nonrotatably but slidably mounted on said turnbuckle, a strap member supported for reciprocating movement from the car underframe and having a latch member for engaging with the ratchet wheel, and means actuated by the piston sleeve of said brake cylinder for imparting reciprocating movements to said strap member.

10. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod and having a piston sleeve, an adjuster in the form of a turnbuckle positioned intermediate the ends of said rod, means supporting said turnbuckle from the car frame permitting longitudinal movement thereof but preventing lateral movement of the turnbuckle, a ratchet wheel nonrotatably but slidably mounted on said turnbuckle, a strap member supported for reciprocating movement from the car underframe and having a latch member for engaging with the ratchet wheel, and means actuated by the piston sleeve of said brake cylinder for imparting reciprocating movements to said strap member, said latch member being spaced from the ratchet wheel when the brakes are released but engaging the wheel to cause rotation thereof upon a predetermined extent of movement of the sleeve during brake application.

11. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod and having a piston sleeve, an adjuster in the form of a turnbuckle positioned intermediate the ends of said rod, means supporting said turnbuckle from the car frame permitting longitudinal movement thereof but preventing lateral movement of the turnbuckle, a ratchet wheel nonrotatably but slidably mounted on said turnbuckle, a strap member supported for reciprocating movement in the car underframe and having latch means for engaging the ratchet wheel upon reciprocating movement thereof, and means actuated by the piston sleeve of said brake cylinder for imparting reciprocating movements to said strap member, said means including a bell crank mounted for pivotal movement on the car underframe.

12. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod and having a piston sleeve, an adjuster in the form of a turnbuckle positioned intermediate the ends of said rod, a ratchet wheel nonrotatably but slidably mounted on said turnbuckle, a housing for said ratchet wheel, a reciprocating strap member supported for movement from the car underframe and having a latch member for engaging with the ratchet wheel during said reciprocating movement, means forming part of said housing for maintaining the strap member and ratchet wheel in proper relation, and connections operatively connecting the strap member and piston sleeve of the brake cylinder, whereby reciprocating movements are imparted to the strap member upon movement of the piston sleeve during application of the brakes.

13. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod and having a piston sleeve, an adjuster in the form of a turnbuckle positioned intermediate the ends of said rod, a ratchet wheel nonrotatably but slidably mounted on said turnbuckle, a reciprocating strap member supported for movement from the car underframe, connections operatively connecting the strap member and the piston sleeve of the cylinder, a latch pivotally carried by the strap member to one side of the ratchet wheel for engaging the ratchet wheel to rotate the same upon a predetermined extent of movement of the strap member in a certain direction, and locking means carried by the strap member and located to the

other side of the ratchet wheel, said locking means normally engaging the ratchet wheel but being withdrawn therefrom by movement of the strap member in said certain direction.

14. In a regulator for foundation brake rigging, an air brake cylinder for actuating said rod, an adjuster in the form of a turnbuckle positioned intermediate the ends of said rod, said turnbuckle comprising an elongated tube threaded internally for receiving the threaded ends of said pull rod, a ratchet wheel mounted on said turnbuckle, a housing for the ratchet wheel, reciprocating means actuated by the brake cylinder for rotating said wheel causing rotation of the turnbuckle to take up slack in the rigging, said reciprocating means being engaged by the housing and having movement substantially at right angles to the turnbuckle, and means supporting the turnbuckle from the car underframe permitting longitudinal movement thereof but preventing lateral movement.

15. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder having piston actuated means for actuating said rod to apply the brakes, an adjuster in the form of a turnbuckle positioned intermediate the ends of said rod, a ratchet wheel nonrotatably but slidably mounted on said turnbuckle, a reciprocating strap member supported for movement from the car underframe, connections operatively connecting the strap member and the piston actuated means of said cylinder, said strap member being located under the ratchet wheel and carrying a pivotally mounted latch, and counter-balancing means for maintaining the latch in vertical position, whereby predetermined extent of movement of the strap member in a certain direction will result in the latch operatively engaging with the ratchet wheel to cause rotation thereof when the strap has movement in the opposite direction.

16. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod, said cylinder having a piston rod, an adjuster including a turnbuckle positioned intermediate the ends of said pull rod, a ratchet wheel nonrotatably but slidably mounted on said turnbuckle, a reciprocating strap member supported for movement from the underframe of the car and carrying a latch member for engaging with the ratchet wheel, and connections having pivotal association with the car underframe for operatively connecting the strap member and piston rod of the cylinder.

17. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod and having a piston rod and a release spring, an adjuster including a turnbuckle positioned intermediate the ends of said pull rod, a ratchet wheel nonrotatably but slidably mounted on said turnbuckle, a reciprocating strap member supported for movement from the underframe of the car and carrying a latch member for engaging with the ratchet wheel, and means including a bell crank having a pivotal association with the car underframe for operatively connecting the strap member and piston rod, whereby said strap member is reciprocated in one direction by a brake application and in the reverse direction by the release spring, said bell crank being constructed and arranged to materially decrease the distance the strap moves relative to that of the piston rod and to increase the force exerted by the strap in like proportion.

18. In a railway car, in combination with foundation brake rigging, a pull rod, an air brake cylinder for actuating said rod and having a piston rod, and adjuster in the form of a turnbuckle positioned intermediate the ends of said pull rod, means supporting said turnbuckle from the car frame permitting longitudinal movement thereof but preventing lateral movement of the turnbuckle, a ratchet wheel nonrotatably but slidably mounted on said turnbuckle, a strap member supported for reciprocating movement in the car underframe and having latch means for engaging the ratchet wheel upon reciprocating movement thereof, and means actuated by the piston rod of said brake cylinder for imparting reciprocating movements to said strap member, said means including a bell crank mounted for pivotal movement on the car underframe.

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