

Aug. 5, 1930.

H. E. ANDERSON

1,772,433

SLACK ADJUSTER FOR RAILWAY CAR BRAKE EQUIPMENT

Filed March 21, 1930

5 Sheets-Sheet 1

FIG. 1

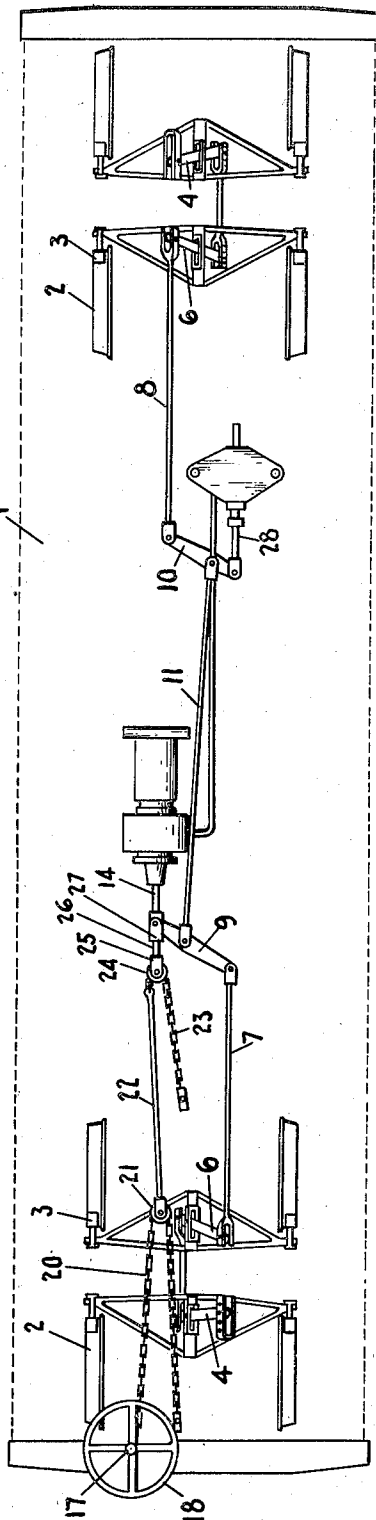


FIG. 2

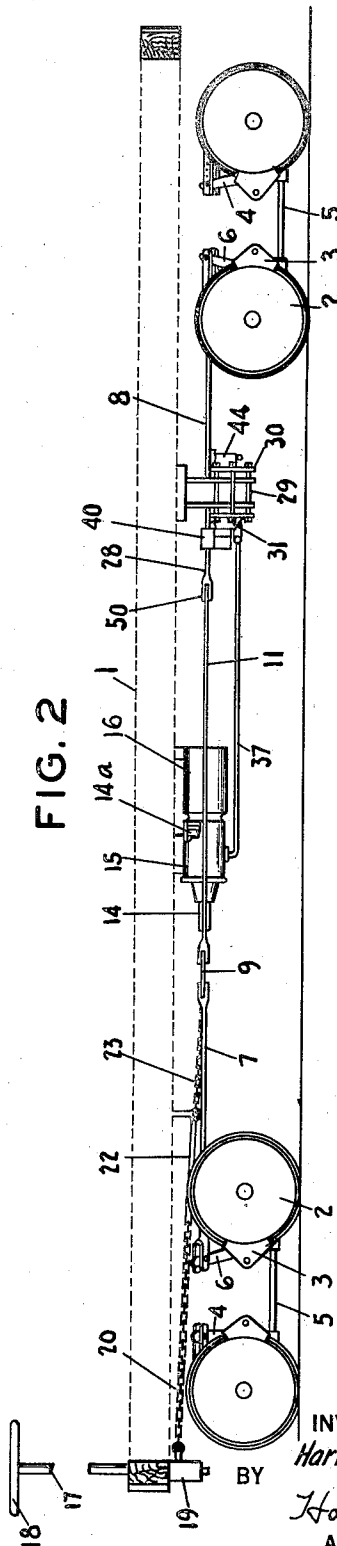
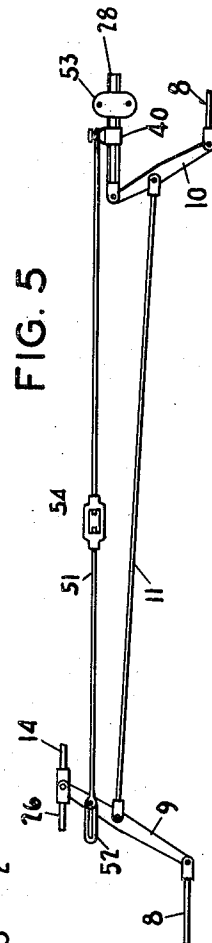


FIG. 5



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FIG. 3

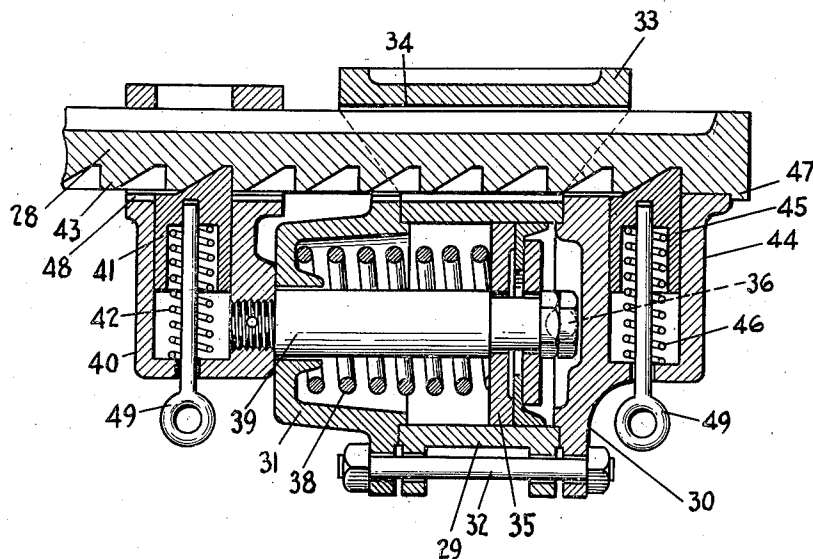
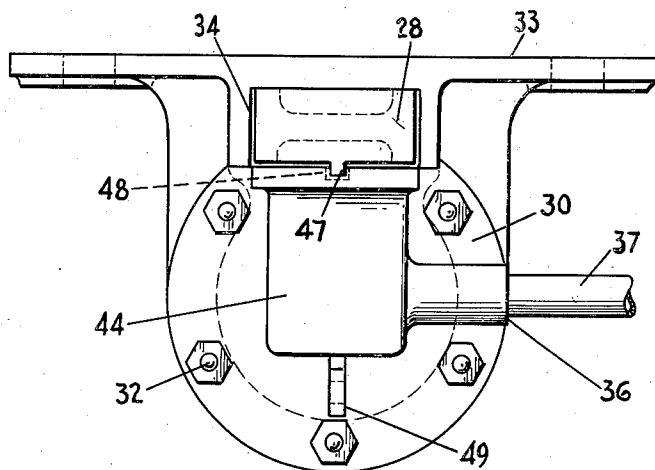


FIG. 4



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FIG. 6

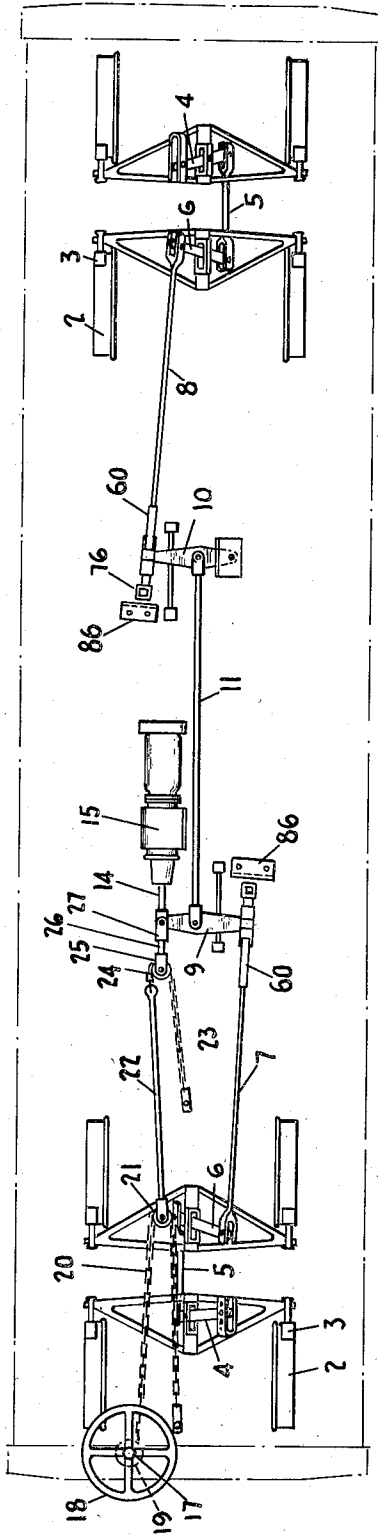
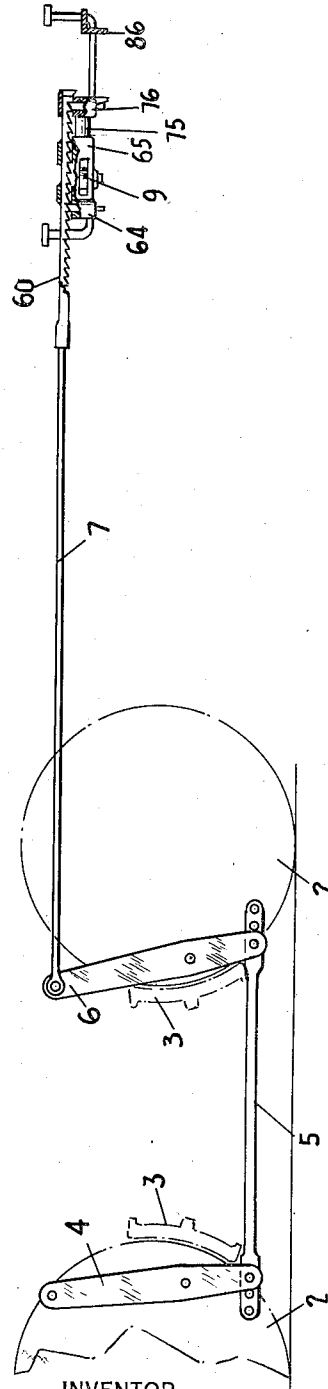


FIG. 7



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FIG. 8

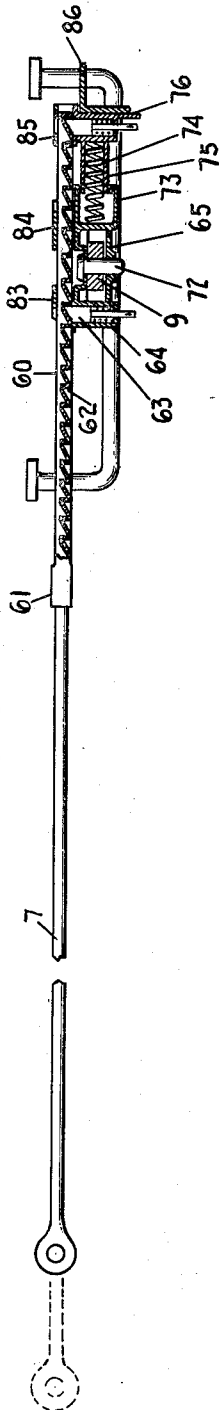


FIG. 9

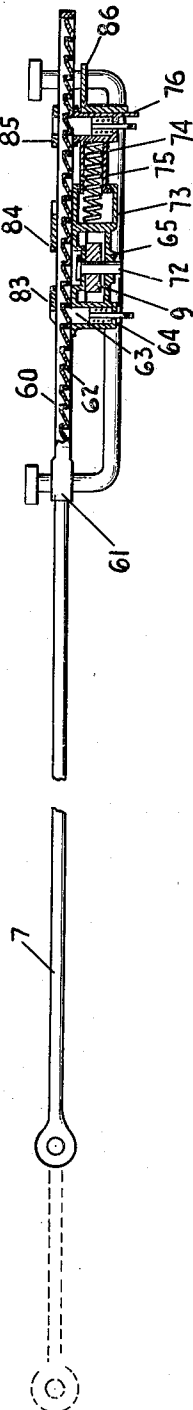
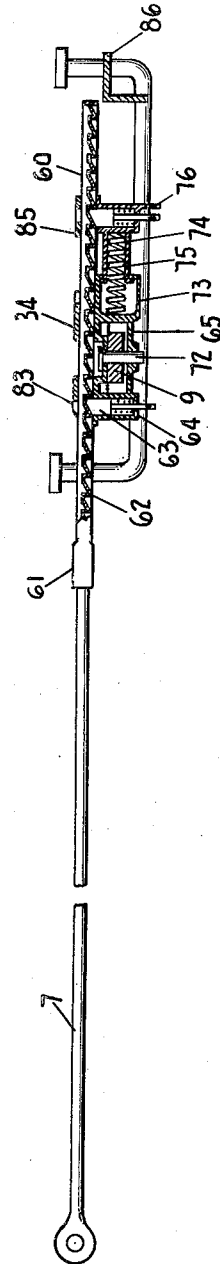


FIG. 10



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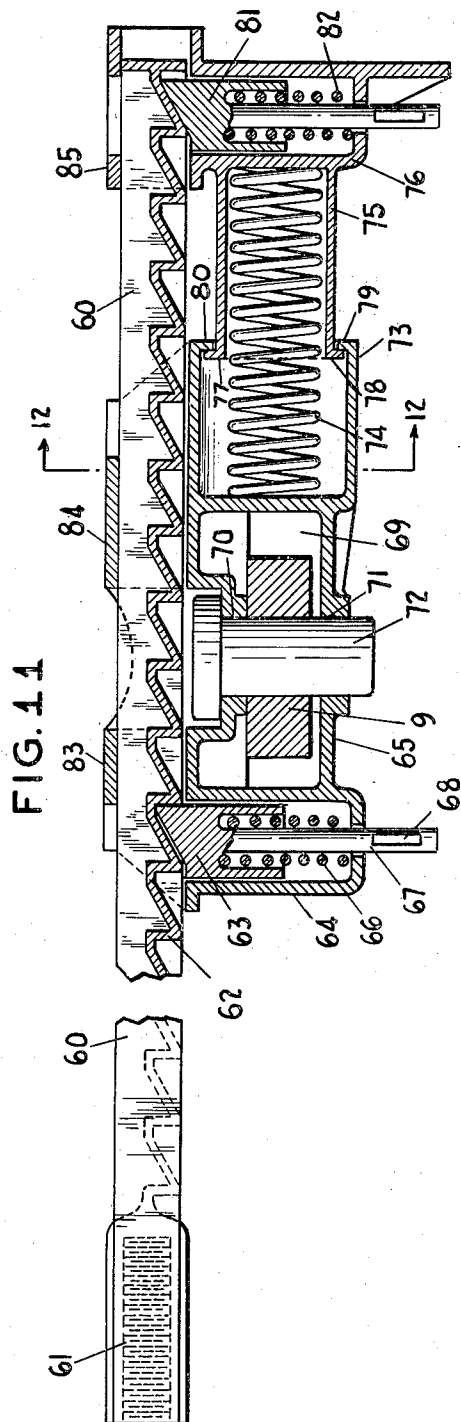
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UNITED STATES PATENT OFFICE

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SLACK ADJUSTER FOR RAILWAY-CAR-BRAKE EQUIPMENT

Application filed March 21, 1930. Serial No. 437,653.

My invention relates more particularly to brakes which are operated by compressed air or vacuum, and this application is a continuation, in part, of my application filed December 24, 1928, Serial No. 328,199.

One of the objects of my invention is, to produce hand brake mechanism utilizing standard equipment now readily available, whereby it is possible to comply with the American Railway Association requirement as to the force exerted at the air brake push rod by the hand brake equipment, under which the pull exerted by the brake staff shall equal the power of the air brake.

Another object of the invention is, to produce brake mechanism of such nature that the pull exerted by the brake staff shall be applied in substantially a straight line from the lower end of the staff to the end of the air brake push rod. With all standard equipment with which I am familiar, and which complies with the power requirement, it is impossible to maintain the pull in substantially a straight line, as all of such equipment utilizes auxiliary levers pivoted to the car, and extending outwardly from the center line to such a point as to foul or interfere with the truck wheels when rounding a curve.

Another object of the invention is, to provide means whereby the piston travel is maintained within predetermined limits in cooperation with power-increasing hand brake mechanism, whereby full manual power may be quickly applied to the brake shoes by maintaining a short chain wrap-up. With present equipment, when brake shoes are worn, the brake staff must be rotated beyond its limit of normal chain wrap-up, causing the chain to wrap on itself and resulting in a loss of power, and also, as the staff must be rotated a greater number of times, resulting in a longer period of time before the brake shoes are fully applied to the wheels.

A further object of the invention is, the provision of means whereby the air brake piston travel is automatically maintained between predetermined limits, regardless of the degree of wear on the brake shoes, thus

making it possible for a braking application to be uniformly made throughout the length of a train.

A further object of my invention is, to provide a device wherein the failure of a brake rod, brake pin, truck lever, or even the loss of a brake beam, will not cause complete failure of the air brakes on the particular car where such loss occurs.

Still another object of the invention is, to provide a device which, although strong, durable, efficient and inexpensive, can be very light in construction, because of locating it on the top rod of the brake structure.

A further object of my invention is, to provide a device which will shorten up the top rod, rather than move the brake cylinder levers.

Another object of the invention is, to provide a construction which will at all times maintain the brake cylinder levers at a right-angled position with relation to the center line of the brake cylinder, thereby avoiding the danger of the brake rigging fouling on the car wheels or the car frame.

A concrete embodiment of my invention is illustrated in the accompanying drawings, which are to be considered as a part of this specification, in which—

Fig. 1 is a phantom top plan view through the floor of a freight car, to indicate the brake rigging and parts of the invention;

Fig. 2 is a side view of the car as shown in Fig. 1;

Fig. 3 is an enlarged central vertical sectional view through the take-up apparatus;

Fig. 4 is an end view of the same;

Fig. 5 is a diagrammatic view of a slightly modified form of take-up;

Fig. 6 is a phantom top plan view through the floor of a freight car, showing a modified form of my device;

Fig. 7 is a side view of the modified form shown in Fig. 6, partly in section, showing the position of the device when the brakes are in released position;

Fig. 8 is a similar view, showing the position of the device when the brakes are set, and with no wear on the brake shoes;

Fig. 9 is a similar view of the device, show-

ing its position with the brakes set, where the brake shoes at the wheels have partly worn off and the device has taken up on the rack;

Fig. 10 is a view similar to Fig. 8, but showing the device being compensated for the wear on the brake shoes;

Fig. 11 is an enlarged sectional view of my device;

Fig. 12 is a cross-section, taken on lines 12—12 in Fig. 11, as indicated by the arrows; and

Fig. 13 is an end view of my device.

Similar reference numerals refer to similar parts throughout the entire description.

In the drawings I show the plan view of a freight car, with floor 1, wheels 2, brake shoes 3, dead levers 4 of each truck, lower rods 5 connecting the dead levers 4 with floating truck levers 6, top rods 7 and 8 connected to floating cylinder lever 9 and dead lever 10, cylinder lever rod 11, and brake push rod 14. The brake push rod 14 is not connected to air brake piston 14^a slidingly mounted within air cylinder 15, the latter and its air reservoir 16 being securely supported below the floor 1 in any suitable manner. All the parts just enumerated are standard equipment on railway cars as now constructed.

In order to provide means whereby the hand brake power will equal the air brake power, a brake staff 17 is mounted at one end of the car, and equipped at its upper end with an operating wheel 18, or the like, the bottom end of said staff 17 being journaled in a stirrup 19 fastened to the end sill of the car. Secured at one end to the brake staff 17, and at its other end to a fixed part of the car, is a brake chain 20, which encircles a sheave 21 journaled on one end of a hand brake rod 22. The other end of said rod 22 is secured to one end of a chain 23 which encircles a sheave 24, and is attached at its other end to a fixed point on a car. The sheave 24 is journaled in a yoke 25, carried at one end of a short hand brake rod 26, which is equipped at its other end with a clevis 27 secured to a connecting pin fastening the ends of the floating lever 9 and the cylinder push rod 14.

With the construction just described, it will be apparent that the force applied to the brake wheel 18 is quadrupled at the cylinder push rod 14, provided the chain 20 does not wrap on itself during a brake-setting operation. It will also be evident in this connection, that is when the parts are designed for a 5½-inch piston travel for full braking application, substantially 22 inches of chain 20 must be taken up by the staff 17. However, it will be evident that as the brake shoes 3 wear, the piston must travel a greater distance before it is applied, and that consequently the brake chain wrap-up is also increased. Moreover, the maximum piston travel on standard equipment is 12 inches, and the brake rig-

ging is so proportioned that when the piston has reached its maximum travel the brake shoes 3 are entirely worn away. To accommodate this maximum piston travel, the brake staff 17 and connected parts are so proportioned that the staff 17 may accommodate sufficient chain 20 for a full 12-inch pull at the end of the floating lever 9. In other words, with the brake shoes 3 completely worn away, the chain wrap-up is 40 inches instead of the normal or optimum 22 inches. With the construction and apparatus above described, the power of the hand brake is equal to the power of the air brake, but with completely worn brake shoes 3 the air brake piston must travel over twice as far, and the hand brake staff 17 must be rotated over twice as many times, as is necessary when the brake shoes 3 are new.

In order, therefore, to provide mechanism cooperating with the brake rigging, whereby the wear on the brake shoes 3 may be automatically compensated and an optimum piston travel and manual chain wrap-up be maintained, the end of the dead lever 10, instead of being fulcrumed on the car frame as in standard practice, is fulcrumed to the end of a longitudinally movable fulcrum arm or rack bar 28.

Secured to the under side of the car floor 1, or to any other fixed point of support, is an air cylinder 29, closed at one end by a pressure head 30, and at its other end by a non-pressure head 31, said heads and cylinder being formed with circumferential aligned flanges held in clamped relation by clamping bolts 32. The cylinder 29 is formed integrally with a supporting flange or base 33, which is bolted to the under side of the car floor 1, as shown in Fig. 2, said base 33 being formed with a passageway 34 in which the rack bar 28 is slidingly mounted.

Fitted within the cylinder 29 is a piston 35, said cylinder 29 having an air port 36 in front of the piston, connected by a pipe 37 to the air cylinder 15 of the car brake. The piston 35 is normally held in position by an expansion spring 38, fitted between the back of the piston 35 and the non-pressure head 31. Rigidly fastened to the piston 35, and projecting through the non-pressure head 31, is a piston rod 39, provided on its end with a housing 40, having vertical and horizontal intersecting passageways for the respective reception of a dog 41, advanced by a spring 42, and the rack bar 28. The end of the dog 41 is designed so that it shall engage teeth 43 formed on the underside of said rack bar 28.

The pressure head 30, at the opposite end of the cylinder 29, is formed integrally with a housing 44, substantially conforming to the housing 40, except that it terminates flush with the under side of the rack bar 28 and therefore does not engage or encircle said

bar. Mounted in said housing 44 is a dog 45, adapted to be advanced by a spring 46, for engagement with the teeth 43 of the rack bar 28.

By reference to Figs. 3 and 4, it will be noted that the rear end of the rack bar 28 is formed with a downwardly-projecting stop lug 47, for engagement with the end of the housing 44 as illustrated, to prevent the rack bar 28 from being advanced too far inwardly under conditions that will hereinafter appear. In order to permit the device to be assembled or dismounted, the housing 40, the non-pressure head 31, and the exterior of the cylinder 29, are all formed with an aligned groove 48, through which the stop lug 47 may pass.

In order that the device may be conveniently assembled and dismounted, the dogs 41 and 45 are each provided with a stem 49 projecting through the bottom of their respective housings, whereby an operator may retract the dogs 41 and 45 to free the rack bar 28 for manual operation of the brake rigging, so that slack may be gained when it is desired to replace the brake shoes 3.

The rack bar 28 and cylinder 29 may be designed to take up slack by inches, or in fractions thereof, but for freight car use the removal of slack in inch steps has been found to be a sufficiently fine adjustment, the length of the rack bar 28 being such as to accommodate the maximum piston travel beyond a predetermined or optimum travel. For example, in the construction as illustrated, the maximum piston travel is 12 inches, and the desired or optimum travel, is $5\frac{1}{2}$ inches. As the rack bar 28 is adjusted in steps of one inch, the pipe 37, leading to the cylinder 29, is tapped into the cylinder 15 at a point $6\frac{1}{2}$ inches from the pressure head 30 of said last-named cylinder; thus the travel of the air brake piston is maintained between $5\frac{1}{2}$ inches and $6\frac{1}{2}$ inches.

With the construction described, it will be apparent that as long as the brake shoes 3 are substantially new, and the air brake piston does not travel $6\frac{1}{2}$ inches, the port leading to the air pipe 37 is not uncovered, and the adjusting air cylinder 29 does not function. However, when wear occurs in the brake shoes 3, and the air brake piston travels $6\frac{1}{2}$ inches, a part of the air in said cylinder passes through the pipe 37 and enters the cylinder 29. Entry of air into said cylinder 29 projects the piston 35, and moves the housing 40 to the left on the rack bar 28 a sufficient distance for its dog 41 to engage the next tooth 43 of said rack bar 28, the yoke 50 on the end of said rack bar 28, to which the dead lever 10 is pivoted, remaining stationary during the outward travel of the dog 41, as the rack bar 28 is held by the rearmost dog 45.

Upon release of the air from the air brake cylinder 14, the brake piston 35 will, on its

reverse movement, uncover the pipe 37 and permit the air in the cylinder 29 to exhaust. The spring 38 now expands and, as it reversely moves the piston 35, effects movement of the rack bar 28 to the right (as illustrated in Fig. 3), as the dog 41 has entered another tooth 43, the dog 45 being depressed upon movement of the rack bar 28 until another tooth 43 is in alignment. The fulcrum point at the end of the dead lever 10 is moved a distance equivalent to the length of a tooth 43, thus shortening the travel of the brake rigging necessary to place the brake shoes 3 in full brake-applying position.

With the parts constructed as above described, the rack bar 28 will be retracted one step (one inch), and the piston travel consequently returned to its original travel $5\frac{1}{2}$ inches, every time the wear on the brake shoes 3 is such as to permit the piston travel to attain $6\frac{1}{2}$ inches, the point of connection of the pipe 37. It will thus be apparent that the hand brake chain wrap-up is automatically maintained well within the limit of the staff 17, namely, between 22 inches and 26 inches, as herein set forth. It will also be understood that the maximum piston travel is governed by the point at which cylinder 15 is tapped, and that the rack bar 28 may be designed to take up in large or small steps, depending on whether a coarse or a fine adjustment is desired.

Fig. 5 illustrates a modified form of take-up, in which the air brake cylinder 29 is not used. The housing 40 carrying the dog 41 is connected, by a rod 51 having a slotted connection 52, to the floating lever 9. It will be evident that each time the floating lever 9 moves beyond the distance accommodated by the slotted connection 52, the rod 51 will be pulled, and the housing 40 and dog 41 will be advanced on the rack bar 28, and upon release of the air in the cylinder 15, the expansion spring (not shown) within the bracket 53, corresponding to the expansion spring 36 in the cylinder 29, will retract the rack bar 28. With this construction, a very fine adjustment of the piston travel may be attained, by utilizing a turn-buckle 54 in the rod 51, the piston travel being thus maintained within any desired limits.

In Figs. 6 to 13, I have shown a modified form of construction, in which I have completely divorced the mechanism from the connection to the air brake cylinder 15. This is very desirable, since a connection to the brake cylinder 15 by a pipe 37, as in the hereinbefore described construction, adds just that much more possibility of the air in the brake cylinder 15 leaking off, which result the railroad companies are constantly striving to avoid.

In the hereinafter contained description I shall confine myself to the function and operation of a single top rod, as the construc-

tion is identical for both. The top rod 7 is connected to a rack 60. As illustrated, this rack 60 is provided with an enlarged portion 61, which is threaded so the top rod 7 can be screwed into it. This rack 60 is also provided with a number of teeth 62, which engage a dog 63, carried at one end of a housing 65. A coil spring 66 is provided, to hold the dog 63 projected and in engagement with the registering teeth 62 on the rack 60. The dog 63 is provided with a downwardly depending neck or stem 67, which projects beyond the housing 65, and is provided with a keyway 68, to provide for the convenient release of the dog 63 from engagement with the rack 60 when desired. In the central part of the housing 65 I provide a chamber 69, the walls of which are provided with apertures 70 and 71 for the reception of a pin 72, for engagement with the brake cylinder lever 9.

The other end 73 of the housing 65 is cylindrical in form, and has mounted therein a compression spring 74, which extends into a cylinder 75, formed in a supplemental housing 76. This cylinder 75 is provided with segmental flanges 77 and 78, which engage inwardly extending segmental flanges 79 and 80, formed on the end of the cylindrical portion 73 of the housing 65. In the other end of the supplemental housing 76 is mounted a dog 81, which is similar in all respects to the dog 63, it being provided with a coil spring 82 for holding the dog 81 projected, so as to engage the teeth 62 on the rack 60.

The housing 65 is provided with upwardly extending rectangular guides 83 and 84, in which the rack 60 slides. The supplemental housing 76 is also provided with a corresponding extension 85, which provides a suitable guide for the rack 60.

In assembling the device, the supplemental housing 76 is turned until the segmental flanges 77 and 78 are out of register with the inwardly extending segmental flanges 79 and 80, when it can be pushed into the cylindrical portion 75 of the housing 65, when, by turning it 90° the flanges will abut, and the cylindrical sleeve 75 on the supplemental housing 76 will be held in the position clearly seen in Fig. 11.

I prevent failure of the brakes, by the loss of a brake rod, brake pin, truck lever, or even the loss of a brake beam, by providing a permanent stop bracket 86, which is located just ahead of the supplemental housing 76, and which will stop the lever 9 from traveling so there will still be a brake on the truck at the end of the car opposite the end where the failure occurred.

The operation of this modified form of device is as follows: The permanent stop bracket 86 is located on the car frame, so that the device barely touches it. When the brakes are in released position, the device occupies the position shown in Fig. 7. When the

brakes are set, the top rod 7 is moved back, carrying with it the modified form of device, until it occupies the position shown in Fig. 8. When the brake shoes 3 wear, obviously the tendency is to move the device farther, but as the supplemental housing 76 is brought into contact with the permanent stop bracket 86, it could move no farther. Further movement, therefore, compresses the spring 74 until the end of the cylinder 75 abuts one end of the cylindrical portion 73 of the housing 65. Since the supplemental housing 76 can move no farther, the result will be that the dog 81 will be retracted until the amount of wear on brake shoes 3 is taken up. Upon release of the brake, the compression spring 74 will project the housing 65 away from the supplemental housing 76, thereby depressing the dog 63 until it occupies the correspondingly advanced tooth 62 in the rack 60.

From this it will be seen that all this form of device does is to shorten the top rod 7, in order to compensate for wear of the brake shoes 3; and since I do not move the cylinder lever 9 to compensate this wear, it follows that I am able to maintain at all times a right-angled position of the two cylinder levers with relation to the center line of the air brake cylinder. At the same time, and by reason of this fact, I am able to maintain the same number of inches of piston travel, whether the brake shoes 3 are brand new, or whether they are practically worn out.

Having described my invention, what I regard as new, and desire to obtain by Letters Patent of the United States, is:

1. In a device of the character described, the combination, with a brake rigging having cylinder levers and top rods, of a rack connected to the end of each top rod adjacent its engagement with the cylinder lever, a housing, guides in said housing for said rack, a dog mounted in said housing, which normally engages the teeth on said rack, a spring to hold said dog in engagement with said teeth, a pin mounted in said housing which passes through an opening formed in one end of a cylinder lever, a supplemental housing, comprising a cylindrical portion slidably mounted in one end of said first named housing, a spring which holds said supplemental housing normally in projected position, a dog mounted in said supplemental housing, which normally engages the said rack, a spring to hold said dog in engagement with the teeth on said rack, and a permanent stop against which said supplemental housing abuts when the brakes are set.

2. In a device of the character described, the combination, with a brake rigging having cylinder levers and top rods, of a rack connected to the end of each top rod adjacent its engagement with the cylinder lever, a housing, guides in said housing for said rack,

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means to secure said housing to a cylinder lever, a supplemental housing, comprising a cylindrical portion slidably mounted in one end of said first named housing, a spring which holds said supplemental housing normally in projected position, means carried by said housings which hold said rack against longitudinal movement in one direction but yield when pressure is exerted on the rack in the opposite direction, and a permanent stop against which said supplemental housing abuts when the brakes are set.

3. In a device of the character described, the combination, with a brake rigging having cylinder levers, brake shoes, top and lower rods and means to actuate same, of housings, a pin mounted in each housing intermediate the ends thereof, said pin pivotally engaging one end of a cylinder lever whereby the movement of the lever moves the housing, and automatically operated means which shortens said top rods as the brake shoes wear.

4. In a device of the character described, the combination, with a brake rigging having cylinder levers, brake shoes, top and lower rods and means to actuate same, of automatically operated means which shorten said top rods as the brake shoes wear, and a housing for said means one end of each of said cylinder levers being pivotally supported intermediate the ends of each housing.

5. In a device of the character described, the combination with a brake rigging having cylinder levers, brake shoes, top and lower rods and means to actuate the same, of housings, a pin mounted in each housing intermediate the ends thereof, said pin pivotally engaging one end of a cylinder lever which is supported intermediate the ends of the housing whereby the movement of the lever moves the housing, automatically operated means which shortens said top rod as the brake shoes wear, and a permanent stop to prevent the movement of said housing beyond a predetermined point.

6. In a device of the character described, the combination, with a brake rigging having cylinder levers and top rods, of a rack connected to the end of each top rod adjacent its engagement with the cylinder lever, a housing, guides in said housing for said rack, a dog mounted in said housing, which normally engages the teeth on said rack, means to hold said dog in engagement with said teeth, a pin mounted in said housing which passes through an opening formed in one end of a cylinder lever, a supplemental housing, comprising a cylindrical portion slidably mounted in one end of said first named housing, means which hold said supplemental housing normally in projected position, a dog mounted in said supplemental housing, which normally engages the said rack, means to hold said dog in engagement with the teeth on said rack, and a permanent

stop against which said supplemental housing abuts when the brakes are set.

7. In a device of the character described, the combination, with a brake rigging having cylinder leaves and top rods, of a rack connected to the end of each top rod adjacent its engagement with the cylinder lever, a housing, guides for said rack, means carried by said housing which normally engage the teeth of said rack, means to hold said first named means normally in engagement with said teeth, a pin mounted in said housing which passes through an opening formed in a cylinder lever, a supplemental housing, slidably secured to said first named housing, means which hold said supplemental housing normally in projected position, means carried by said supplemental housing which normally engage said rack, means to hold said last named means in engagement with the teeth on said rack, and a permanent stop against which said supplemental housing abuts when the brakes are set.

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