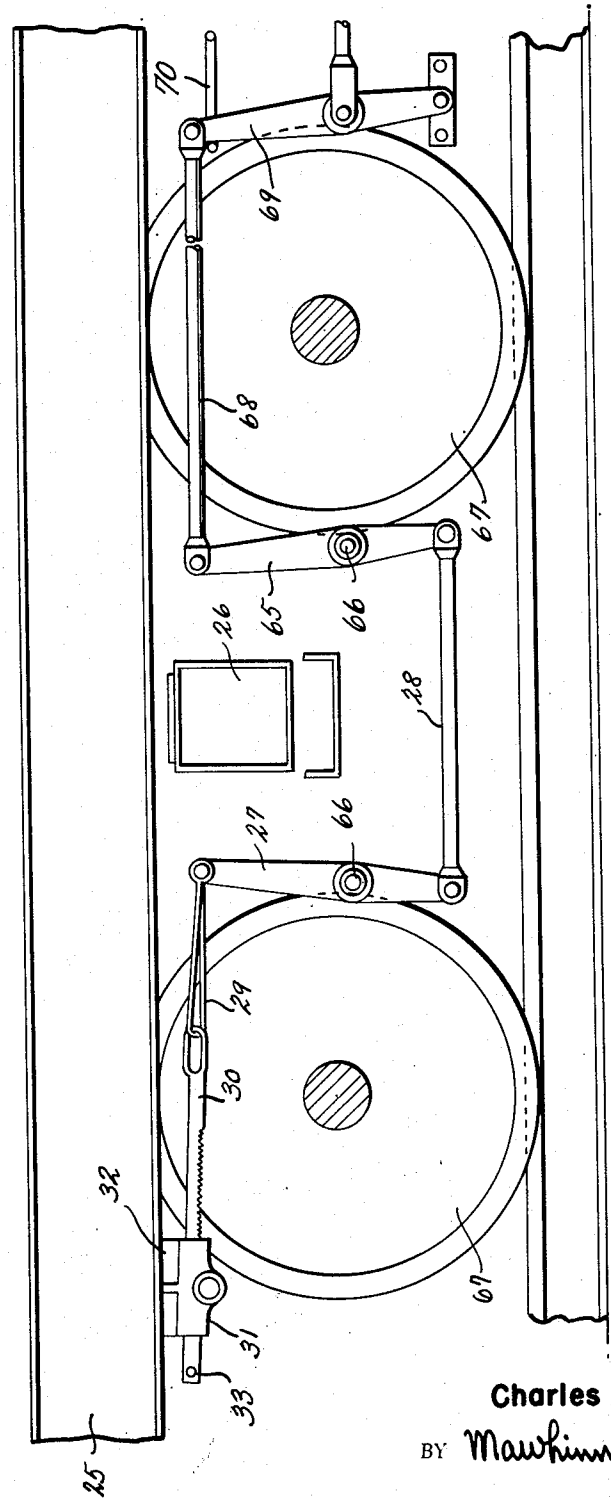
April 20, 1954 C. M. O'BOYLE 2,675,894

SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

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FIG. 1.



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April 20, 1954 C. M. O'BOYLE 2,675,894

SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

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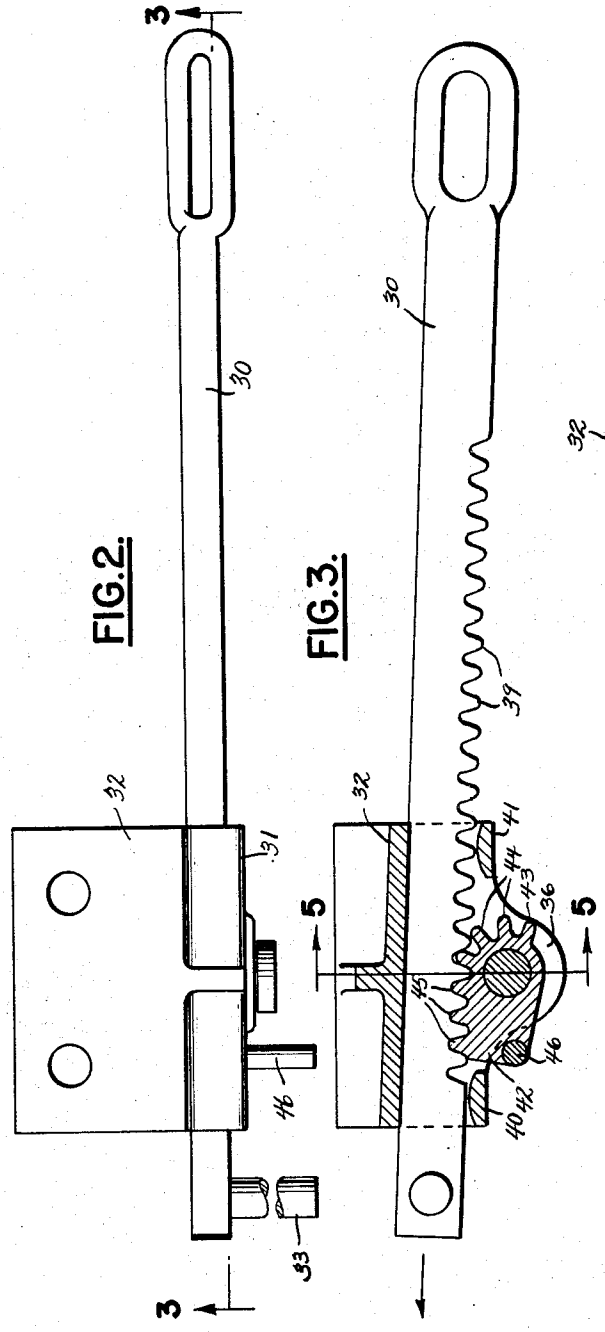


FIG. 2.

FIG. 3.

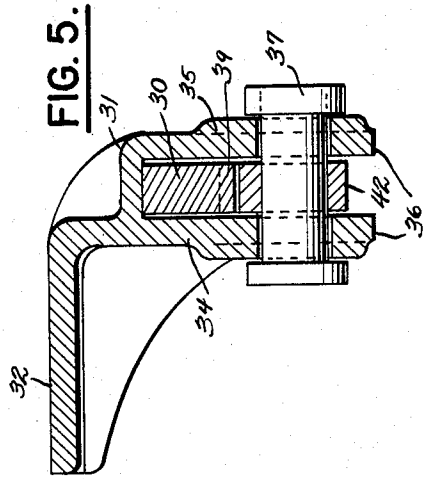


FIG. 5.

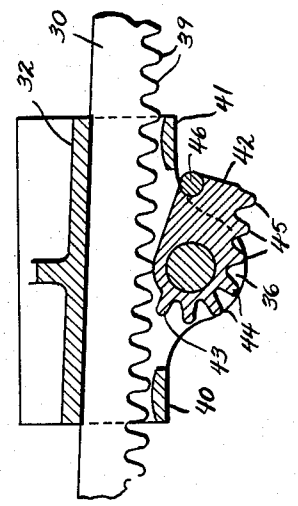


FIG. 4.

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SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

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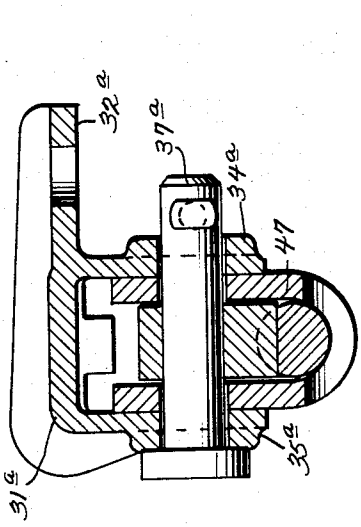


FIG. 9.

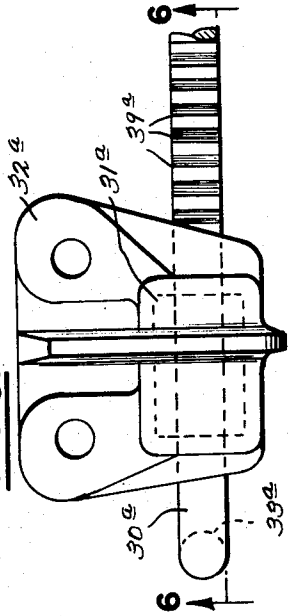


FIG. 7.

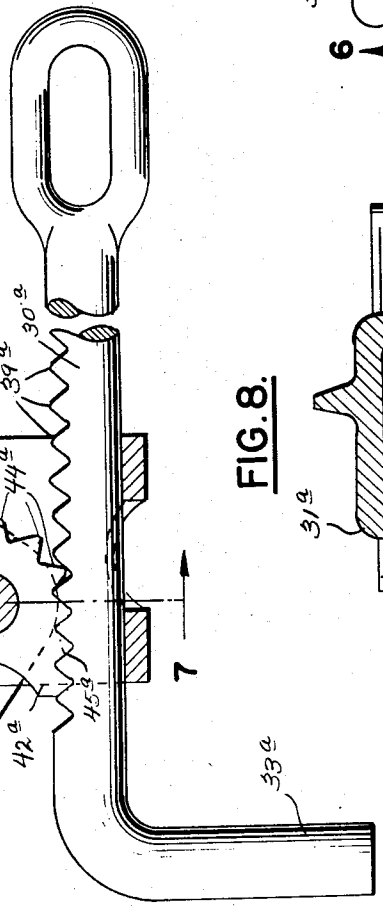
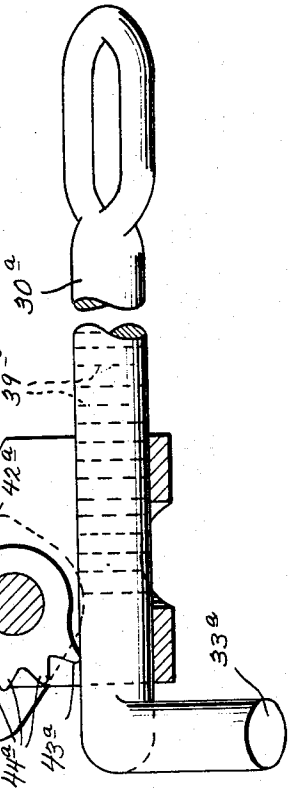


FIG. 6.

FIG. 8.



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SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

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FIG. 10.

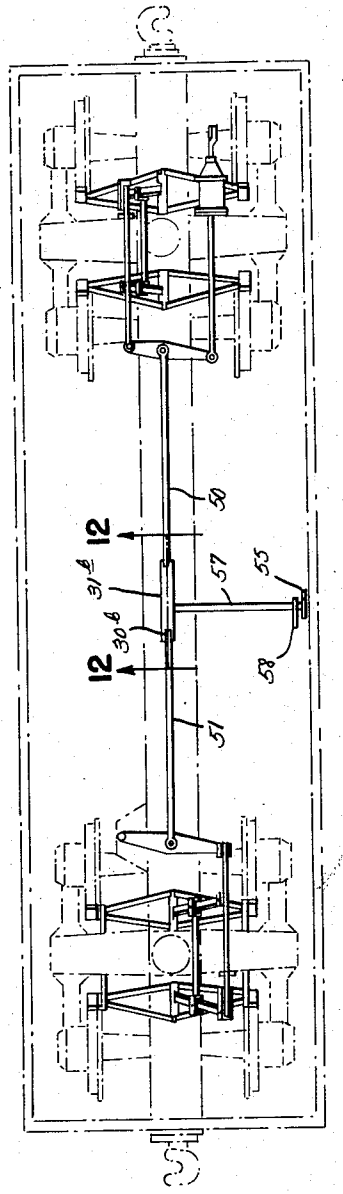
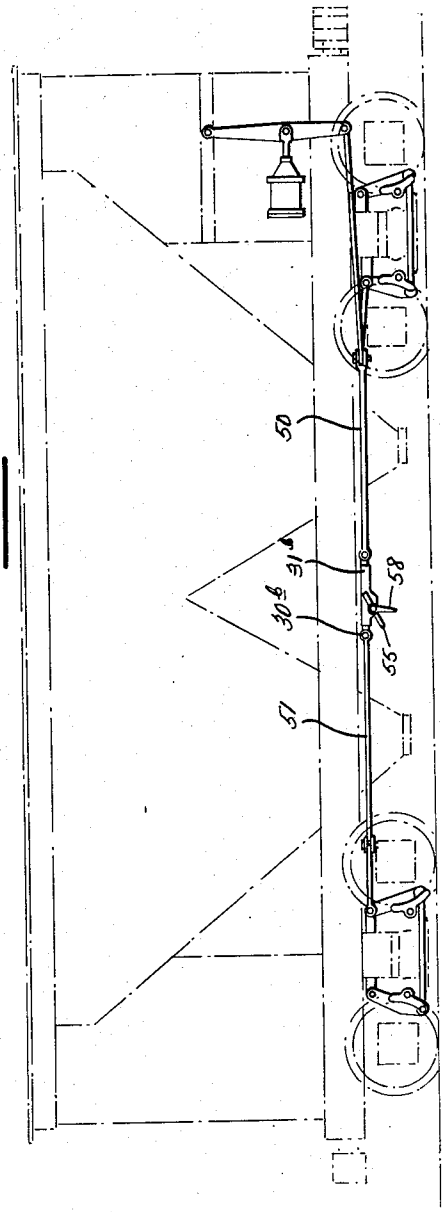


FIG. 11.



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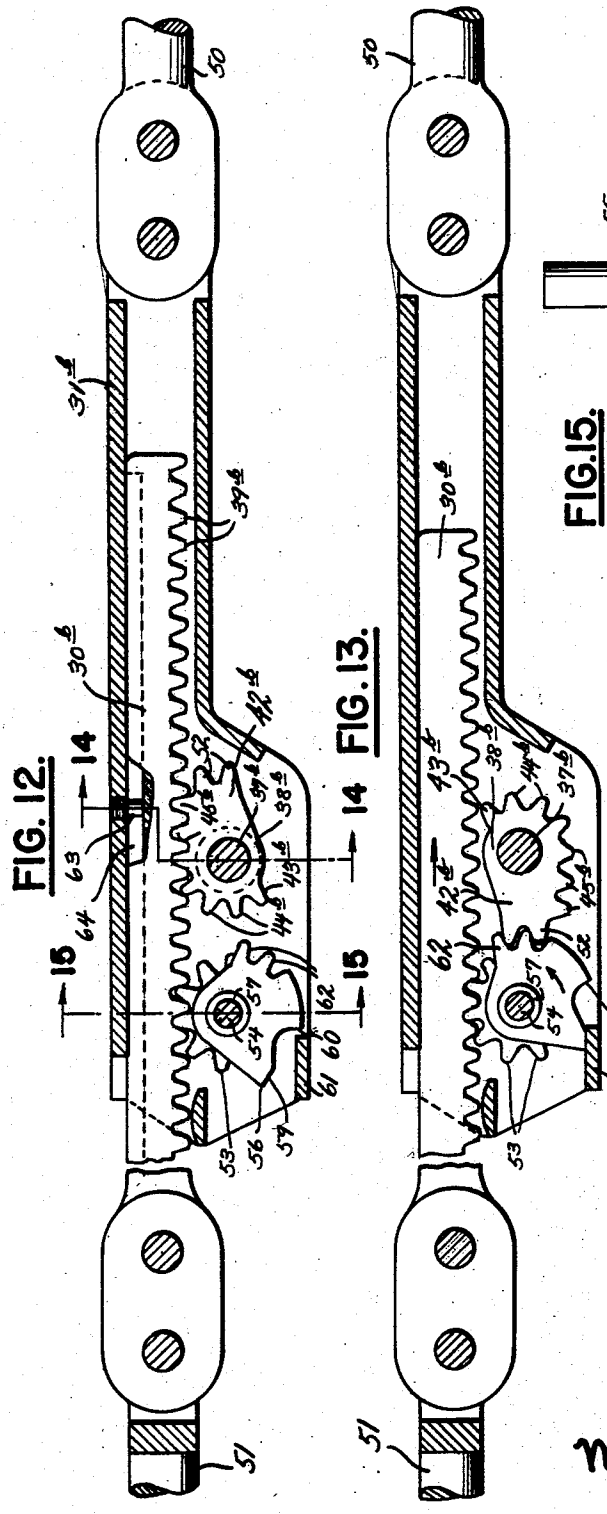
Mawhinney & Mawhinney

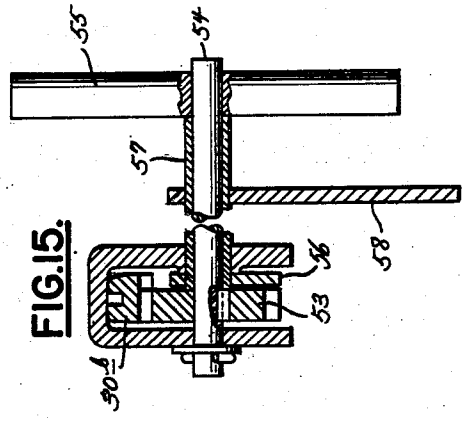
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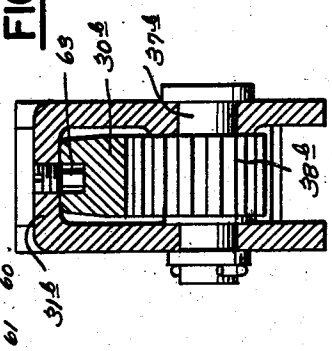
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SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

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SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

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FIG. 16.

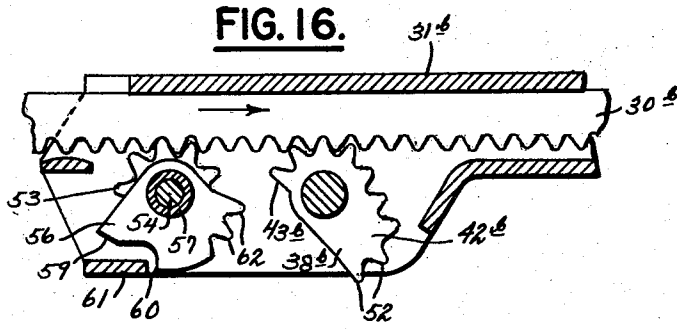


FIG. 17.

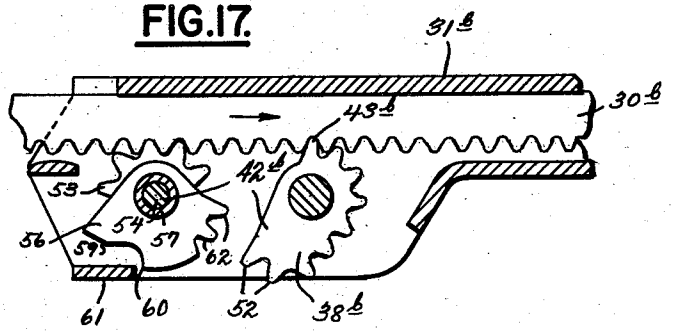
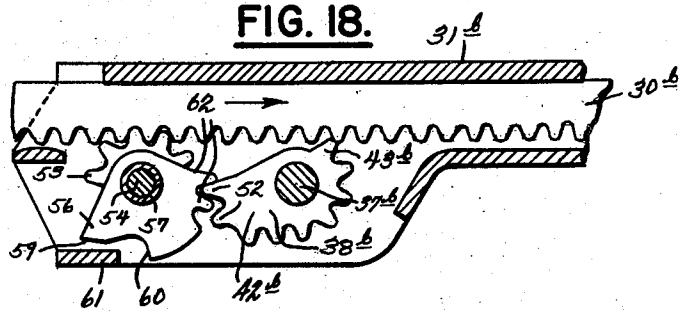


FIG. 18.



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SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

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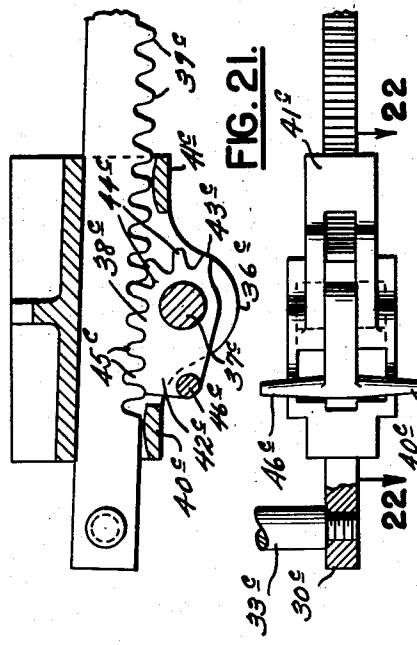


FIG. 20.

FIG. 21.

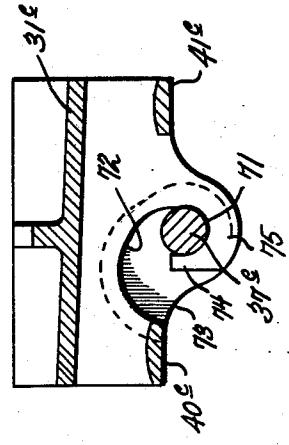


FIG. 22.

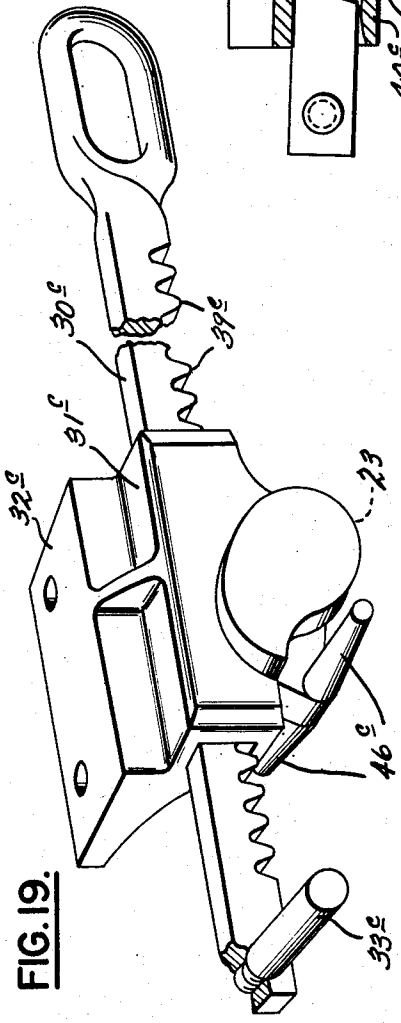


FIG. 19.

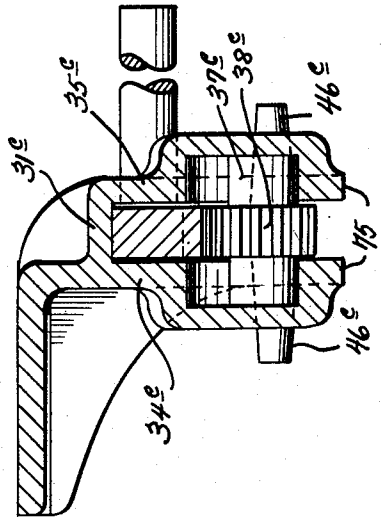


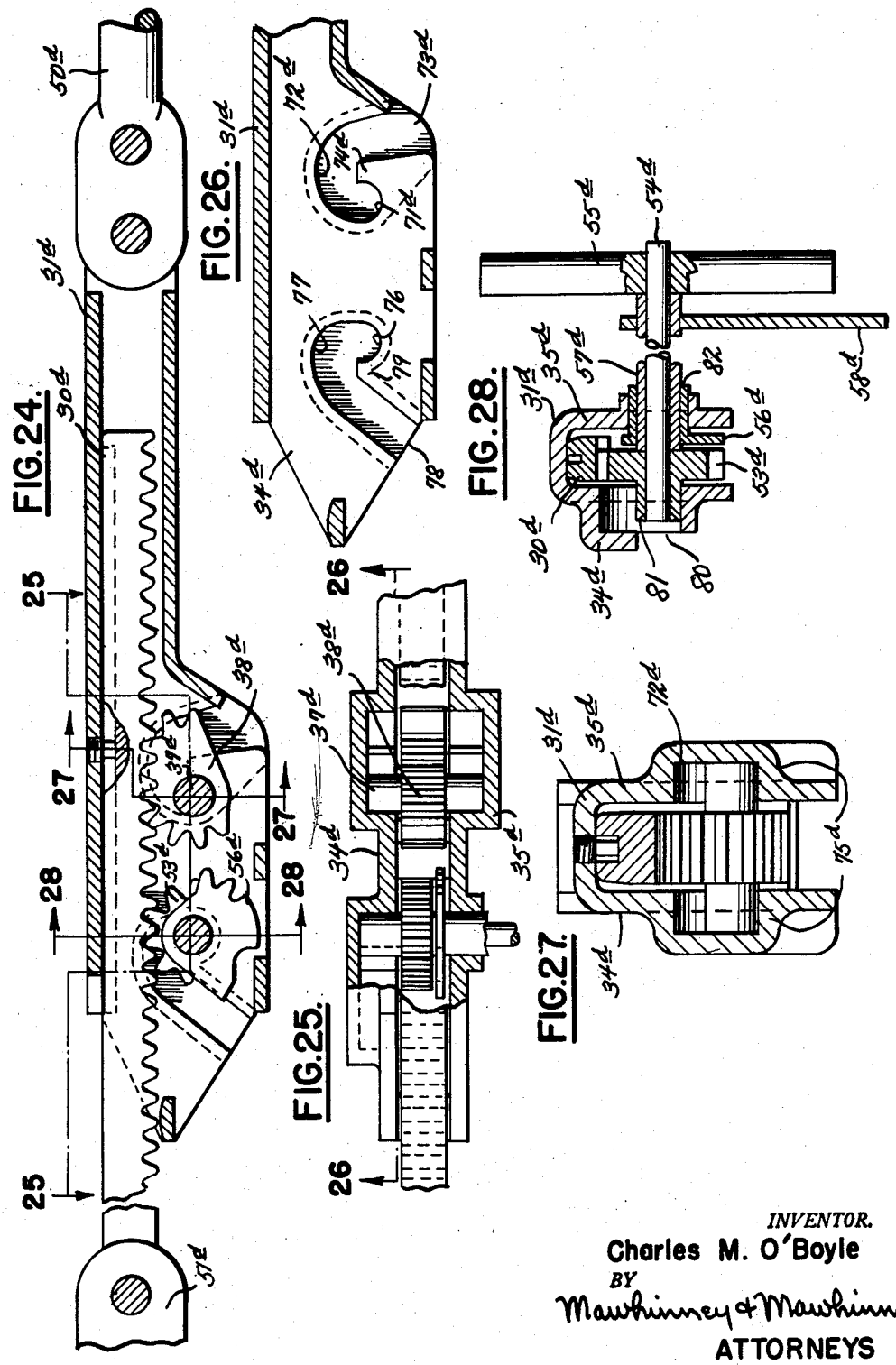
FIG. 23.

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SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

Filed Nov. 15, 1949 9 Sheets-Sheet 8



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SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

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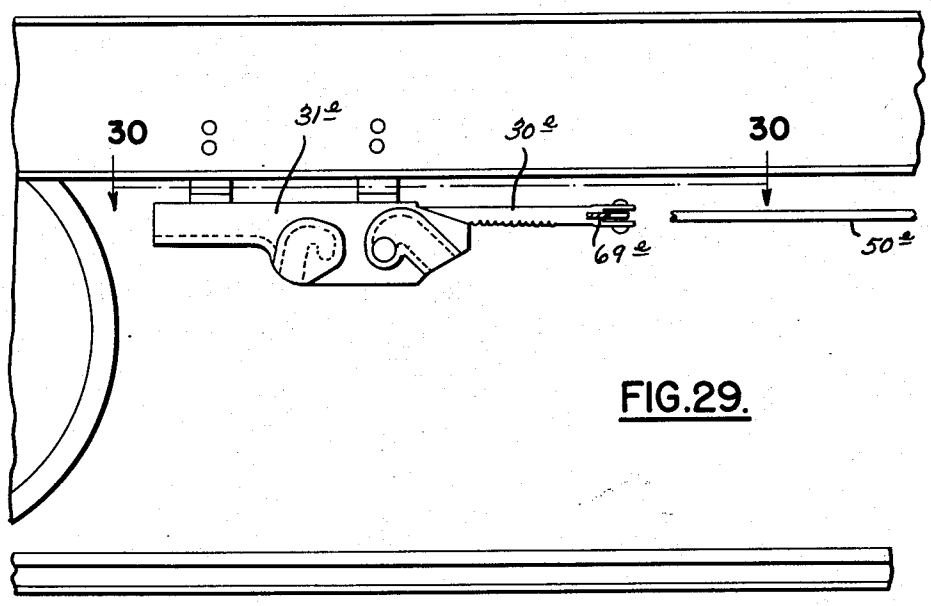


FIG.29.

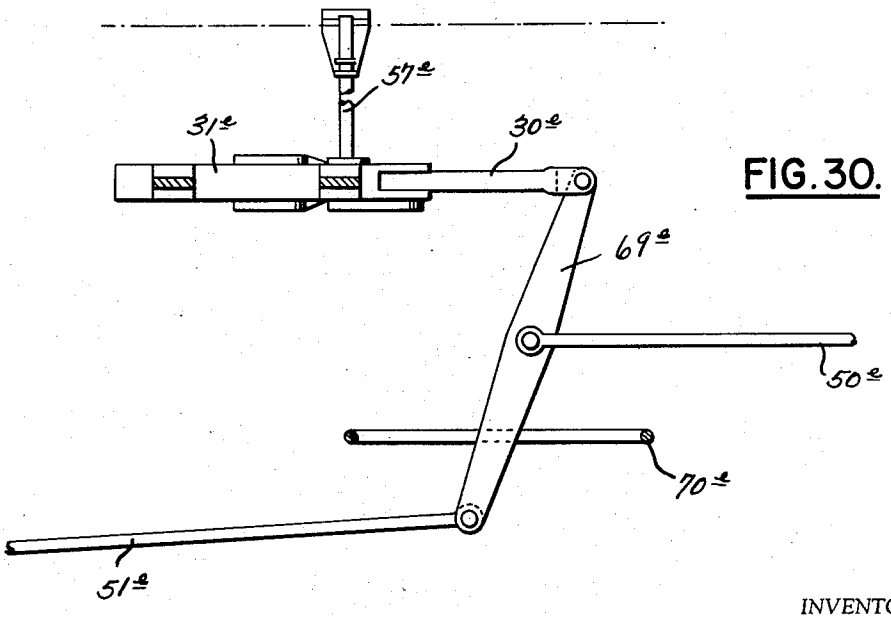


FIG.30.

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Patented Apr. 20, 1954 2,675,894

UNITED STATES PATENT OFFICE

2,675,894

SLACK ADJUSTER FOR RAILWAY CAR FOUNDATION BRAKES

Charles M. O'Boyle, Wilmington, Del.

Application November 15, 1949, Serial No. 127,342

19 Claims. (Cl. 188—200)

1

The present invention relates to improvements in slack adjuster for railway car foundation brakes and more particularly consists in certain improvements over such prior patents as 1,612,781 granted December 28, 1926, and 1,681,057 granted August 14, 1928.

In common with the objects of the above prior patents and other Sauvage patents, it is the general purpose and object of the present invention to provide a device adapted to take up the slack in the brake rigging incident to wear on the brake shoes in order to restore at any time the proper relationship between brake shoe clearance and piston travel of the piston in the brake cylinder.

Another object of the invention is to improve the form and construction of prior devices intended to accomplish this same purpose by simplification in both structure and mode of operation, and in promoting greater achievements in reliability and efficiency in operation.

A further object of the invention is to provide an improved slack adjuster adapted to automatically align with the connection to the brake rigging or to the upper end of the dead lever to the end that the slidable and rotatable rack bar of the improved adjuster will not bind in the saddle bearing and will at all times be comparatively easy to operate.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein the symbols refer to like or corresponding parts throughout the several views,

Figure 1 is a fragmentary side elevational view, with parts broken away and parts shown in section of a truck of a railway freight car showing a portion of the brake rigging including the dead lever to which is connected by a clevis or the like a novel form of slack adjuster constructed in accordance with the present invention.

Figure 2 is a top plan view of one form of slack adjuster in accordance with the present invention with parts broken away and parts shown in section.

Figure 3 is a longitudinal sectional view taken on the line 3—3 in Figure 2 and showing the rack bar in an inner position.

Figure 4 is a similar view with portions of the rack bar broken away and shown in an outer position free of the pawl.

Figure 5 is a transverse sectional view taken on the line 5—5 in Figure 3.

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Figure 6 is a longitudinal sectional view taken on the line 6—6 of Figure 9 and showing a modified form of slack adjuster with the rack bar locked against further inner movement by the pawl.

Figure 7 is a cross-sectional view taken on the line 7—7 of Figure 6.

Figure 8 is a view similar to Figure 6 with a portion of the rack bar broken away and shown as rotated about its longitudinal axis to remove its teeth from engagement with the teeth of the pawl.

Figure 9 is a top plan view of the slack adjuster according to Figures 6, 7 and 8 with the end of the rack bar broken away.

Figure 10 is a diagrammatic plan view showing in broken lines a railway freight car and its trucks with a form of foundation brake rigging shown connected with a central or side operated form of slack adjuster according to the present invention.

Figure 11 is a side elevational view of the same.

Figure 12 is a longitudinal sectional view taken through the central form of slack adjuster with the rack bar locked against further outward movement.

Figure 13 is a similar view with the pawl disengaged from the rack bar and the rack bar movable outwardly.

Figure 14 is a cross-section taken on the line 14—14 of Figure 12.

Figure 15 is a similar view taken on the line 15—15 in Figure 12.

Figures 16, 17 and 18 are fragmentary vertical sectional views showing subsequent phase movements in the operation of this form of the invention.

Figure 19 is a perspective view of a still further modified form of the device with a completely enclosed trunnion support for the pawl instead of the pin support.

Figure 20 is a longitudinal section taken through the housing of Figure 19 with the rack bar in the inwardly pushed position.

Figure 21 is a bottom plan view of Figure 20.

Figure 22 is a longitudinal section taken on the line 22—22 of Figure 21 with the rack bar and pawl removed but showing in section one of the pawl trunnions in the pocketed bearing.

Figure 23 is a cross-section taken on the line 23—23 in Figure 19.

Figure 24 is a longitudinal section taken through a modified form of the center slack ad-

juster showing an arrangement of enclosed trunnion bearings for both the pawl and pinion.

Figure 25 is a horizontal sectional view taken on the line 25—25 of Figure 24.

Figure 26 is a vertical section taken on the line 26—26 of Figure 25 with the pinion and pawl removed.

Figure 27 is a cross-section taken on the line 27—27 of Figure 24.

Figure 28 is a similar view taken on the line 28—28 of Figure 24.

Figure 29 is a fragmentary side elevational view of a freight car showing the application of center regulator to floating lever in box car brake, and

Figure 30 is a horizontal section taken on the line 30—30 in Figure 29.

Referring more particularly to Figure 1, 25 represents a longitudinal sill or other frame portion of a railway freight or other car truck and 26 indicates a transverse truck bolster of any ordinary four-wheel freight car truck, for example, to one side of which is positioned a dead lever 27 which in practice normally occupies a diagonal position of substantially 45° with respect to the three intersecting right angle planes. This dead lever is connected at its lower end to one end of a push or bottom rod 28, the offset end of which rod is pivotally connected to the lower end of a live truck lever 65. These levers are, of course, provided with brake beams and supporting connections 66 adapted to carry the usual brake shoe heads and shoes (not shown) for engagement with the wheels 67. The upper end of the live lever 65 is provided with a pull rod 68 connected to the outer end of a horizontally disposed cylinder lever 69 which moves back and forth on a supporting stop 70.

This supporting stop may be of the common U-shaped type of hanger depending from the underside of the car or draft sill although the stop locations may be provided by an elongated slot in the draft sills or by any other form of stop arrangement common in this art. The essential feature of this supporting stop, regardless of the form it may take, is either in its accurate positioning or the provision of means therewith for limiting the relative movement of the cylinder lever 69 as shown toward the left, that is, to normal position of release. With the truck brake rigging properly adjusted, this cylinder lever 69 should lie snug against the left end of the supporting stop 70. All of these parts are old and well-known and need no further detailed description.

The upper end of the dead lever 27 is anchored against relative movement towards the right during the application movement of the brake by means of a regulator attached to the car sill 25. One form of this regulator or slack adjuster is shown more particularly in Figures 2 to 5 inclusive.

A clevis 29 is shown as coupling the upper end of the dead lever 27 to the inner end of a rack bar 30 of the improved slack adjuster.

The rack bar is fitted to slide through a housing 31 affixed to the longitudinal sill or frame 25 in any suitable manner. In this instance a flange 32 of the housing is bolted to the sill 25. The housing is closed at its upper end as shown in Figure 5 and is open at opposite ends, as shown in Figure 3, for the free sliding movement of the rack bar 30 therethrough. A handle 33 on the outer end of the rack bar facilitates this sliding movement.

As shown in Figure 5 the parallel spaced side plates 34 and 35 of the housing are open at their lower central portions, the plates being formed with centrally and downwardly offset portions 36 to constitute bearings for a pin 37 by means of which a pawl 38 is rotatably mounted in such position that its teeth are adapted to mesh with the teeth 39 in the lower edge of the rack bar 30.

End bars 40 and 41 extend across the lower opposite end portions of the side plates 34, 35 and preferably have their upper surfaces rounded in a longitudinal direction so that the rack bar 30 and its teeth 39 may freely slide over these surfaces and receive support from them when the pawl is withdrawn from the rack bar teeth 39. The rounded surfaces of the end bars 40 and 41 will avoid any sharp corners or the jamming of the rack bar in the housing.

The pawl has an offset part 42 which eccentrically weights the pawl so as to set up therein a condition of stable equilibrium in which this weighted offset part 42 will seek by gravity the lowermost position in the rotation of the pawl about the pin 37.

The pawl has an initial pawl tooth 43 which is concentric with the pawl center as are also the companion pawl teeth 44. The offset portion 42 also has one or more tangential teeth 45. These teeth 43, 44, and 45 are spaced apart in a manner complementary to the teeth 39 of the rack bar and the edges of the teeth are preferably rounded in order to facilitate engagement and disengagement and the subsequent re-engagement of the teeth.

A pawl pin 46 projects from a corner portion of the offset part 42 remote from the teeth 45. Otherwise stated this pawl pin 46 projects laterally from the leading edge of the pawl offset part 42 in reference to the counter-clockwise rotation of the pawl from the position shown in Figure 3 to that shown in Figure 4.

In the operation of this form of the invention, in order to adjust piston travel, the handle 33 is pulled in the direction of the arrow shown in Figure 3 toward the end of the car as far as possible and subsequently the handle 33 is pushed back towards the center of the car until its motion is arrested.

Now when the handle is pulled to the left from the position of Figure 3 the rack teeth 39 meshing with the pawl teeth cause the pawl to execute an anti-clockwise movement with the lateral pawl pin 46 moving about beneath the curved dropped intermediate wall 36 of the outer side plate 35. This rotary motion of the pawl will continue until only the initial tooth 43 is in engagement with the rack bar teeth 39 at which angular position of the pawl the offset weighted part 42 will be to the right side of the center of the pawl rotation so that this weight, tending by gravity to descend back in the clockwise direction will maintain the initial pawl tooth 43 in engagement with the rack bar teeth 39. As the rack bar 30 is pulled out to the left, this initial pawl tooth 43 will ride over the teeth 39 of the rack bar 30 and by virtue of the weighted offset 42 will immediately re-engage the next presented notch between the rack bar teeth 39, so that after the rack bar 30 has been pulled out to the extreme limit permissible by the brake rigging after all the slack has been taken up and is then pushed back, the initial pawl 43 in concert with the weighted offset part 42 having kept all the while the tooth engagement between rack bar and pawl tooth, such return movement of the rack bar

will necessarily be attended by the clockwise rotation of the pawl 38 establishing progressively re-engagement of the concentric pawl teeth 44 with the rack bar and finally the re-engagement of the offset tangential teeth 45. When the position of Figure 3 is arrived at the tangential offset 42 will assert its second function of a stop. In other words when this position of Figure 3 is reached the pawl 38 can rotate no longer in a clockwise direction under the urge of the inward movement of the rack bar 30 unless the rack bar 30 could rise to permit the passage of the offset pawl part 42 therebeneath, but the closed upper end of the housing 31 prevents this lifting of the rack bar 30. Consequently the rack bar can only be pushed in a distance controlled by the offset stop 42.

In order to change brake shoes, the handle 33 is pulled in the direction of the arrow shown in Figure 3 towards the end of the car as far as possible. The pin 46 is then grasped in the hand of the operator and pushed upwards until it strikes the lower edge of the front plate 35 of the housing which will act as a stop. In this position, as shown in Figure 4, the initial pawl tooth 43 is completely disengaged from the rack bar teeth 39. Thereupon the rack bar 30 without interference from the pawl 38 is pushed toward the center of the car as far as possible. This introduces the maximum slack in the brake rigging so that the brake shoes may be moved to a sufficient distance from the wheels to enable the old worn shoes to be removed and new brake shoes applied.

After the application of the new shoes the pin 46 is released and the rack bar 30 pulled outwardly in the direction of the arrow in Figure 3 toward the end of the car as far as possible, the initial pawl 43 simply clicking over the rack bar teeth 29. Thereafter the rack bar 30 is pushed back toward the center of the car until the stop offset 42 arrives in the position of Figure 3 and arrests further inward movement of the rack bar 30. The new shoes are thereupon brought to correct clearance position with respect to the wheels in a proper relationship to the piston travel of the brake cylinder piston.

It will be understood that one or more teeth 45 may be provided on the tangential projection of the pawl 38.

Referring more particularly to Figures 6 to 8 inclusive, the rack bar 30^a is round in cross-section so as to be both longitudinally slidable and rotatable in the lower closed portion of a substantially U-shaped saddle 47.

The saddle 47 is pivoted on the pin 37^a which rotatably supports the rotary pawl 38^a. In this instance the pawl 38^a is disposed above the rack bar 30^a of the teeth 39^a of which are adapted to mesh with the teeth 43^a, 44^a and 45^a of the pawl 38^a and its weighted offset part 42^a. A handle 33^a on the outer end of the rack bar 30^a is preferably downturned vertically when the teeth 39^a of the rack bar are vertically upward in position to mesh with the teeth 43^a, 44^a and 45^a of the pawl.

The pin 37^a is journaled in inner and outer side plates 34^a and 35^a of a housing 31^a closed at its upper portion and having a lateral perforated flange 32^a by which the device may be bolted, riveted or otherwise affixed to a flange of the center or other sill of a railway freight car.

A stop 48 in the housing is adapted to encounter the heel 49 of the pawl offset part 42^a.

In the use of the device, to adjust piston travel, the handle 33^a is pulled toward the left in Figure 6 causing the rack bar 30^a to be moved in this direction until a desired amount of slack is taken up in the foundation brake rigging. It is understood that the brake rigging in general use on freight cars is so arranged that all movement to the brake levers is operated by a single brake cylinder and provision must be made to effect brake adjustments at each end of the car so that the brake rigging can be adjusted to avoid developing acute angles of the levers. Stops 10 are ordinarily provided to maintain the correct angles of the brake levers, which stops limit the movement of the brake levers towards release position. When operating the brake adjuster, the operator pulls the operating handle 33^a out or to the left in Figure 6 until the brake shoes are tight against the wheels and one body brake lever is pulled against its stop position. See Figure 1. The stop location prevents the body brake levers and live truck levers from being pulled to an acute angle and has the effect of maintaining a proper balance on the foundation brake rigging. The stop is the end portion of the lever guide. The lever guide is located so that one end forms a stop position for the movement of the lever.

During this operation the tangential section 42^a of the pawl moves out of contact with the rack bar 30^a and the arcuate teeth 44^a maintain contact with the teeth of the rack bar a predetermined distance before permitting the rack bar to move freely towards the operator to take up the slack in the brake rigging. In other words when the rack bar 30^a is shifted to the left in Figure 6 it causes clockwise rotation of the pawl 38^a until the offset portion 42^a has arrived at the upper portion of the circle and with the initial tooth 43^a alone in mesh with the rack bar teeth 39^a; but the center of mass or the center of gravity of the offset part 42^a does not pass the vertical dead center so that the initial tooth 43^a is maintained in the teeth 39^a of the rack bar. In other words as the rack bar moves to the left this initial tooth 43^a slides up and down on the walls of the rack bar teeth 39^a permitting of the movement of the rack bar 30^a to the left but still maintaining with the entrainment of the teeth of rack bar and pawl so that on reverse movement of the rack bar the pawl will be rotated back down to the position shown in Figure 6 where the offset part 42^a forms a lock stop preventing the further inward movement of the rack bar 30^a.

After the handle 33^a has been pulled out to the desired distance it is simply released whereupon the weight of the brake rigging causes the rack bar 30^a to move in the opposite direction and the pawl 38^a being counter-weighted by the offset part 42^a again engages the rack bar and permits movement of the rack bar a specified distance before locking the rack bar and pawl against movement by the engagement of the tangential teeth 45^a with the rack bar teeth.

When necessary to release the adjuster to provide for additional slack in the foundation brake, for instance in applying new brake shoes, the rack bar 30^a is pulled out by the operating handle 33^a a sufficient distance to throw the arcuate teeth 44^a out of engagement with the rack bar, at which time the rack bar is given a rotary or angular movement, for instance one-eighth of a turn, to rotate the rack bar teeth 39^a out of engagement with the teeth of the pawl so that the rack bar can be moved inwards from the operator to its full initial position. This action is shown in Figure 8 in which the initial tooth 45^a of the pawl is riding upon the rounded blank surface of the rack bar 30^a.

In this position the heel 49 of the pawl engages the housing stop 48 to prevent the overthrow of the offset part 42a beyond the upper dead center position which would throw it out of proper relationship with the rack bar. When the rack bar is pushed all the way in as shown in Figure 8 the maximum slack is permitted in the rigging to pull the brake shoes to a maximum distance away from the wheels whereby new brake shoes may be easily substituted.

After the substitution the slack is adjusted in the usual manner by pulling out on the rack bar and subsequently releasing the rack bar so that it may be pulled back by the weight of the brake rigging a distance permitted by the stop offset part 42a.

The swiveling of the saddle 47 around the pin 37a in the housing permits a vertical movement of the inner end of the rack bar to maintain proper alignment of the rack bar with the tops of truck levers of varying heights above the top of the rail to maintain the alignment due to spring deflection of the trucks or other causes.

Referring more particularly to Figures 10 to 18 inclusive, a device is shown adapted to be coupled into the brake rigging at a central position and for operation centrally at one side of the car. In this case a housing 31b is coupled to one member 50 of the central connecting rod of the brake rigging and a rack bar 30b is coupled to the second member 51 of the brake rigging central rod. In other words the slack adjuster is included in the central connecting brake rigging rod 50, 51. The rack bar 30b slides freely within the housing 31b and has its teeth 39b disposed in mesh with the teeth of a pawl 38b. This pawl is mounted to rotate about a pawl shaft or pin 37b journaled cross-wise in the housing. The pawl has an initial pawl tooth 43b, radial teeth 44b and tangential teeth 45b in an offset portion 42b. In addition the end wall of the offset part 42b is provided with additional teeth 52. As shown in Figure 14 the axial width of the pawl 38b may be as great as the width of the rack bar 30b.

A pinion 53 is shown as disposed in mesh with the teeth 39b of the rack bar 30b, such pinion being fixedly mounted on a pinion shaft 54 journaled laterally through the housing 31b and having a handle 55 on its outer end accessible for rotation at the central side portion of the freight car as indicated in Figures 10 and 11.

Arranged coaxially of the pinion and within the shaft is a trip member 56 fixed upon a sleeve 57 which rotates about the pinion shaft 54 and has an independent handle 58 accessible for rotation at the central side portion of the freight car as shown in Figures 10 and 11.

The trip member 56 has shoulders 59 and 60 angularly spaced apart and adapted to abut against a stop 61 in the housing to limit the angular or rotary movement of the trip member 56 in both directions. At one peripheral portion namely that disposed toward the pawl 38b, the trip member 56 is formed with teeth 62.

In Figure 15 the pinion 53 is shown as being narrower in width than the width of the rack bar 30b in order to provide lateral space beside the pinion 53 for the accommodation of the trip member in the same plane as the pawl 38b to permit meshing of the end wall pawl teeth 52 and the teeth 62 of the trip member 56.

In the operation of this form of the device, Figure 12 shows the regulator in the locked (applied) position in which the rack bar 30b and the housing 31b cannot be further separated due to the fact that the offset part 42b of the pawl is in engagement with the lower side of the rack bar. In this position the shoulder 60 of the trip member 56 is against or substantially against the stop 61 so that the teeth 62 and the teeth cavities of the trip member 56 are disposed in a lowermost position adapted to receive the complemental end wall teeth 52 of the pawl 38b when the same shall have been rotated clockwise to a position to mesh with the same.

Figure 16 shows the rack bar 30b having been moved in the direction of the arrow with respect to the housing 31b, causing a partial rotation of the pawl 38b in a clockwise direction. The rack bar 30b is started and moved toward a release position by turning the handle 55 on the pinion shaft 54 in a right hand direction.

Figure 17 shows that the handle 55 has been rotated to a further position and that the rack bar 30b has advanced to a further degree within the housing 31b so that the pawl 38b has now been rotated to a point where its offset 42b has passed the vertical line and is now exerting its weight to maintain the initial tooth 43b of the pawl in the teeth of the rack bar 30b. The pawl teeth 52 are approaching the trip teeth 62.

In Figure 18 the rack bar has moved further inwardly toward release position by the continued turning of the pinion shaft handle 55. The pawl end teeth 52 are now in mesh with the trip teeth 62 and the trip has started to move in a counter-clockwise direction so that its shoulder 60 has moved away from the stop 61.

In Figure 13 the rack bar has moved further towards release position by the further turning of the pinion 53, pinion shaft 54 and handle 55. At this point the rack bar 30b has ceased to move the pawl 38b. The trip handle 58 is now moved counter-clockwise to rotate the trip member 56 in the direction of the arrow indicated in Figure 13. This movement further shifts the pawl 38b and disengages its initial tooth 43b entirely from the rack bar, thus permitting movement of the rack bar 30b in either direction by rotation of the pinion handle 55.

The movement of the trip handle 58 may be continued until shoulder 59 of the trip member 56 engages the stop 61. Thereupon the trip handle 58 is reversed in direction, causing the trip member 56 to return in a clockwise direction to the position of Figure 17 until arrested by its shoulder 60 encountering the stop 61. Such movement of the trip member causes the pawl 38b to reversely rotate in a counter-clockwise direction and reengage the initial tooth 43b with the rack bar 30b. The pawl 38b may now be rotated back to locked position (Figure 12) by turning the pinion shaft handle 55 in a direction to move the rack bar 30b outwardly of the housing 31b.

In Figure 18 the initial pawl tooth 43b is shown entering a cut in rack bar 30b to make a one-tooth take up. One or more teeth can be taken up by rotating pinion shaft handle 55 first toward release position as far as possible and then back to the locked position of Figure 12. The trip handle 58 does not have to be used to take up the slack in the brake rigging. It is used only to let out the regulator when brake shoes are changed.

A stop pin 63 may be mounted through the top wall of the housing 31 and entered into a groove 64 in the upper end of the rack bar 30b to entrain the rack bar and housing against casual or accidental separation. This stop pin 63 is preferably in the form of a screw plug which can be removed from housing and from the groove

64 whenever it is desired to disassemble the parts.

Referring more particularly to Figures 19 to 23 inclusive, the rack bar 30c is slidable in the housing 31c which is attached by flange 32c to a sill or other part of the framework of the car. The handle 33c is detachable from the rack bar 30c as by screw threading.

The housing 31c has side plates 34c and 35c with central downwardly-offset portion 36c formed to accommodate the trunnions 37c of the pawl 38c. The teeth 39c of the rack bar may ride on the upper curved surfaces of the end bars 40c and 41c which connect the lower edges of the side walls 34c and 35c at the end portions only of the housing, leaving the major space between the end bars 40c and 41c open downwardly and to provide a space for receiving the pawl 38c which has a weighted offset part 42c. The initial tooth of the pawl is designated at 43c the companion concentric pawl teeth 44c and the tangential teeth 45c on the offset part 42c. Pawl pins 46c project out in opposite direction from the offset part 42c of the pawl.

The side walls 34c and 35c are completely blank and have no openings therein but they are offset outwardly to provide pocketed bearings 71 which are at the ends of volute channels 72 having the open channel mouths 73. Vertical walls 74 separate the bearings 71 from the mouths 73. Curved bottom walls 75 form continuations of the vertical wall 74 and provide the bottoms of the bearings 71.

It will be noted that in this form of the device the trunnions 37c replace the pins of the other forms, which pins projected through openings in the side walls of the housing. In assembling the device, with the rack bar 30c removed from the housing 31c, the two trunions 37c which project in opposite directions from the pawl 38c are introduced upwardly into the channel mouths 73 and moved through the volute channels 72 until the trunnions 37c arrive over the pocketed bearings 71, from which point such trunnions will descend by gravity into the pocketed bearings 71 and be retained therein by the vertical walls 74. When the rack bar 30c is subsequently introduced into the housing 31c it will form an obstacle for preventing the pawl 38c lifting to an extent which would permit the trunnions 37c to escape upwardly over the vertical walls 74.

This form of the device provides a completely closed housing for preventing foreign deleterious substances from getting into the bearings and trunnions and freezing the device into inoperativeness.

The trunnions 37c may be cast integral with the pawl 38c or the trunnions may be manufactured separately from the pawl, in which case the pawl will be provided with a hole or opening to receive the trunnion pin which may be held therein by any suitable means, for instance by cotter key or collars welded in place.

The purpose of this form of the device is to provide a housing without any openings except the end openings through which the rack bar slides. The purpose also is to avoid any pins or shafts projecting to the exterior walls of the housing or casing which might expose crevices or slots in which corrosive chemicals or other deleterious substances might find their way into the trunnions and bearings and other internal parts, rusting, eating or otherwise so attacking the same that the parts will become immobile from freezing or from the concentrated hardening accumulations of these chemicals or other substances.

The opening in the bottom parts of the housing not only permits the introduction and removal of the trunnions and the pawl but also forms an exit or evacuation opening whereby any foreign material that might accidentally find its way into the casing, for instance through the end openings, would fall by gravity and thus be automatically evacuated.

It is to be noted that the housing is open for the major portion of its length all the way along its bottom wall which permits any accumulations of foreign matter to drop through; it being understood that these accumulations tend to become dislodged by the reciprocation of the rack bar which has the effect to also draw these accumulations clear of the pawl so that the same may drop through the open bottom of the device. In addition to the open bottom, the mouths of the trunnion slots or bearing openings provide for the evacuation of any accumulations of foreign material in the bearing portions of this device. The natural vertical oscillation and vibration of the car while in motion will provide a means for eliminating any foreign substances that might tend to accumulate within the housing.

The trip or release pin 46c is applied to both sides of the pawl in all cases whether the trunnions are cast on the pawls or a pin is used instead of the trunnions. The reason for the double trip or release pin 46c is that the same increases the counter-weight effect of the trip pin and also provides an additional pin in the event of one being broken.

Referring more particularly to Figures 24 to 28 inclusive, the trunnion principle is shown as applied to the center type regulator in which 30d indicates the rack bar which is attached to one member 51d of the brake rigging extending to one truck, and 31d represents the housing in which the rack bar slides and which housing is attached to the other member 50d of the brake rigging extended to the other end of the car.

In this instance the pawl 38d is provided with trunnions 37d and the side walls 34d and 35d of the housing 31d are blank walls except as later referred to.

Such side walls 34d and 35d are offset outwardly, as indicated in Figure 27, to provide pocketed bearings 71d (Fig. 26) for the trunnions 37d of the pawl 38d. Such trunnions are moved into the bearings through volute channels 72d, the trunnions being introducible through mouths 73d of the channels which open downwardly through the bottom portion of the device. Vertical walls 74d divide the bearings 71d from the mouths 73d and form a pocketed bearing arrangement for holding the trunnions 37d in place with the aid of the rack bar 30d which prevents the pawl 38d from rising to any considerable extent. The bottom walls 75d form supports for the bearings and close the lower sides of the pocketed bearings 71d.

The pinion 53d is fixed to the pinion shaft 54d which extends outwardly transversely of the car and to the side thereof at the central portion of the car where such shaft is provided with a handle 55d. Similarly the trip member 56d is carried by a sleeve 57d which freely rotates about the shaft 54d and is operable by a handle 58d adjacent the handle 55d.

The pinion 53d is provided with a hollow trunnion 81 at the side opposite the sleeve 57d and

this trunnion is adapted to be rotatably mounted in a pocketed bearing 76 in an offset portion of the housing side wall 34d. The pocketed bearing is accessible through a volute channel 77 having a mouth 78 at the lower portion of the housing. A vertical wall 79 separates the bearing 76 from the mouth 78. An opening 80 in this side wall 34d is made for purposes of assembly of the sleeve, shaft and other parts. The other side wall 35d has a bearing 82 for the sleeve 57d.

The operation of this form of device is the same as that described in connection with Figures 12 to 18 inclusive.

Referring more particularly to Figures 29 and 30 an application is shown of the center regulator to floating lever of box car brake in which the floating lever is designated at 69e and its lever guide at 70e; this lever being coupled by the rods 50e and 51e to the brake rigging at opposite ends of the car. One end of this lever 69e is pivoted to the rack bar 30e of the improved center regulator, which rack bar slides in the housing 31e attached to the under frame of the car at its central portion. At 57e is indicated the trip sleeve and pinion shaft assembly.

Although I have disclosed herein the best form of the invention known to me at this time, I reserve the right to all such modifications and changes as may come within the scope of the following claims.

What I claim is:

1. A slack adjuster for railway car foundation brakes comprising a movable rack bar having slack take-up and slack-restoring strokes and adapted to be connected to the brake rigging, a rotary pawl having a segment of radial teeth meshing with the rack bar teeth for driving the pawl from the rack bar in relatively opposite directions incident to the stroke movements of the rack bar, said rotary pawl having a blank toothless segment brought opposite the rack bar when the pawl is rotated in slack take-up direction to permit the rack bar to move relatively to the pawl in the act of taking up slack in the rigging, and a stop weight on the pawl positioned to encounter the rack bar as a stop to arrest the rotary movement of the pawl and consequently the degree of slack-restoring movement of the rack bar incident to the entrainment of the rack bar with the radial teeth of the stopped pawl and to be moved on the slack take-up stroke of the rack bar to an angular position where its weight mass will bias the initial tooth of the pawl adjacent the blank portion to constant entrainment with the rack bar to permit the rack bar to advance relatively to the pawl on a slack take-up stroke but to prevent loss of entrainment of the pawl with the rack bar.

2. A slack adjuster for railway car foundation brakes comprising a movable rack bar having slack take-up and slack-restoring strokes adapted to be connected to the brake rigging, a rotary pawl having a segment of radial teeth meshing with the rack bar for driving the pawl from the rack bar in relatively opposite directions incident to the stroke movements of the rack bar, the teeth of said segment all being struck on the same circle to which the rack bar teeth are tangent, said rotary pawl having a blank toothless segment brought opposite the rack bar when the pawl is rotated in slack take-up direction to permit the rack bar to move relatively to the pawl in the act of taking up slack in the rigging, and a stop weight on the pawl positioned to encounter the rack bar as a stop to arrest the rotary movement of the pawl and consequently the degree of slack-restoring movement of the rack bar incident to the entrainment of the rack bar with the radial teeth of the stopped pawl and to be moved on the slack take-up stroke of the rack bar to an angular position where its weight mass biases the initial tooth of the pawl segment to constant entrainment with the rack bar to permit the rack bar to advance relatively to the pawl on a slack take-up stroke but to prevent loss of entrainment of the pawl teeth with the rack bar.

3. A slack adjuster for railway car foundation brakes comprising a movable rack bar having slack take-up and slack-restoring strokes and adapted to be connected to the brake rigging, a rotary pawl having a segment of radial teeth meshing with the rack bar teeth for driving the pawl from the rack bar in relatively opposite rotary directions incident to the stroke movements of the rack bar, said rotary pawl having a blank toothless segment positioned to be brought opposite the rack bar when the pawl is rotated in slack take-up direction to permit the rack bar to move relatively to the pawl in the act of taking up slack in the rigging and for the purpose of freeing the rack bar from the pawl to allow the rack bar to move all the way on a slack-restoring movement to an origin position, and a stop weight on the pawl positioned to encounter the rack bar as a stop to arrest the rotary movement of the pawl and consequently the degree of slack-restoring movement of the rack bar incident to the entrainment of the rack bar with the radial teeth of the stopped pawl and to be moved on the slack take-up stroke of the rack bar to an angular position where its weight mass biases the initial tooth of the pawl adjacent the blank portion to constant entrainment with the rack bar to permit the rack bar to advance relatively to the pawl on a slack take-up stroke but to prevent loss of entrainment of the pawl teeth with the rack bar.

4. A slack adjuster for railway car foundation brakes comprising a movable rack bar having slack take-up and slack-restoring strokes and having means to connect the same to the brake rigging, a rotary pawl having a plurality of continuous radial teeth all struck on the same circle to which the rack bar is tangent and meshing with the rack bar teeth for driving the pawl from the rack bar in relatively opposite directions incident to the stroke movements of the rack bar, said rotary pawl having a blank toothless portion adjacent the radial teeth angularly positioned to be brought opposite the rack bar when the pawl is rotated in full slack take-up direction to permit the rack bar to move relatively to the pawl teeth in the act of taking up slack in the rigging and for the purpose of freeing the rack bar from the pawl teeth to permit the rack bar to move all the way on a slack-restoring stroke to an origin position, a stop weight on the pawl angularly positioned to encounter the rack bar as a stop to arrest the rotary movement of the pawl and consequently the degree of slack-restoring movement of the rack bar incident to the entrainment of the rack bar with the radial teeth of the stopped pawl and to be moved on the slack take-up stroke of the rack bar to an angular position where its weight mass will bias the initial tooth of the pawl adjacent the blank toothless portion to constant entrainment with the rack bar to permit the rack bar to advance relatively to the pawl on a slack take-up stroke

but to prevent loss of entrainment of the pawl teeth with the rack bar, and means for rotating the pawl to a position where all of the radial teeth including the initial tooth are disengaged from the rack bar to permit the rack bar without interference from the pawl to move to an origin position in the direction of slack-restoring movement.

5. A slack adjuster for railway car foundation brakes comprising a movable rack bar having slack take-up and slack-restoring strokes and adapted to be connected to the brake rigging, a rotary pawl having a segment of radial teeth meshing with the rack bar teeth for driving the pawl from the rack bar in relatively opposite directions incident to the stroke movements of the rack bar, said rotary pawl having a blank toothless segment adjoining the radial teeth and angularly positioned to be brought opposite the rack bar when the pawl is rotated in slack take-up direction to permit the rack bar to move relatively to the pawl in the act of taking up slack in the rigging, a stop weight on the pawl positioned to encounter the rack bar as a stop to arrest the rotary movement of the pawl and consequently the degree of slack-restoring movement of the rack bar incident to the entrainment of the rack bar with the radial teeth of the stopped pawl and to be moved on the slack take-up stroke of the rack bar to an angular position where its weight mass will bias the initial tooth of the pawl adjacent the blank portion to constant entrainment with the rack bar to permit the rack bar to advance relatively to the pawl on a slack take-up stroke but to prevent loss of entrainment of the pawl teeth with the rack bar, and means on the stop weight positioned to interlock with the rack bar in the stopped position of the weight to assist the radial teeth in resisting further slack-restoring movement of the rack bar.

6. A slack adjuster for railway car foundation brakes comprising a support, a rack bar movable in the support on slack take-up and slack-restoring strokes adapted to be connected to the brake rigging, a rotary pawl having a segment of radial teeth meshing with the rack bar teeth for driving the pawl from the rack bar in relatively opposite directions incident to the stroke movements of the rack bar, said pawl having a blank toothless segment adjacent the toothed segment positioned to be brought opposite the rack bar when the pawl is rotated in slack take-up direction to permit the rack bar to move relatively to the pawl in the act of taking up slack in the rigging, an eccentric weight mass on the pawl, a stop supported by said support in the path of the eccentric weight mass to arrest the rotary movement of the pawl when the pawl has rotated substantially through its toothed segment in slack-restoring direction whereby to arrest further movement of the pawl and consequently further movement of the rack bar incident to the entrainment of the rack bar with the radial teeth of the stopped pawl, said eccentric weight mass being also so angularly related to the initial tooth of the pawl adjacent the blank portion that it will bias such initial tooth to constant entrainment with the rack bar when the rack bar is moved on the slack take-up stroke.

7. A slack adjuster for railway car foundation brakes comprising a rack bar having slack take-up and slack-restoring strokes and adapted to be connected to the brake rigging, a support for the rack bar, a rotary pawl having a plurality of radial teeth all struck on a common circle to which the rack bar is tangent and meshing with the rack bar teeth for driving the pawl from the rack bar in relatively opposite directions incident to the stroke movements of the rack bar, said pawl also having a blank toothless segment adjacent the plurality of teeth positioned to be brought opposite the rack bar when the pawl is rotated in slack take-up direction to permit the rack bar to move relatively to the pawl in the act of taking up slack in the rigging, a weight mass on the pawl, a stop supported by said support in the path of the weight mass to arrest the rotary movement of the pawl when the pawl has rotated substantially through its plurality of teeth in slack-restoring direction whereby to arrest further movement of the pawl and consequently further movement of the rack bar incident to the entrainment of the rack bar with at least one of the teeth of the stopped pawl, said weight mass being so angularly related to the initial tooth of the pawl adjacent the blank portion that it will bias such initial tooth to constant entrainment with the rack bar when the rack bar is moved on the slack take-up stroke.

8. A slack adjuster for railway car foundation brakes comprising a support, a rack bar movable in the support on slack take-up and slack-restoring strokes adapted to be connected to the brake rigging, a rotary pawl having a segment involving a plurality of radial teeth meshing with the rack bar teeth for driving the pawl from the rack bar in relatively opposite directions incident to the stroke movements of the rack bar, said pawl having a blank toothless segment positioned to be brought opposite the rack bar when the pawl is rotated in slack take-up direction to permit the rack bar to move relatively to the pawl in the act of taking up slack in the rigging, a stop supported by said support, stop means on the pawl for encountering the support stop to arrest the rotary movement of the pawl when the pawl has rotated substantially through its toothed segment in slack-restoring direction whereby consequently to arrest further movement of the rack bar incident to the entrainment of the rack bar with at least one tooth of the stopped pawl, and means on the pawl for biasing the initial tooth adjoining the blank portion to constant entrainment with the rack bar when the rack bar is moved on the slack take-up stroke.

9. An improved slack adjuster for railway car foundation brakes as claimed in claim 8 characterized by the fact that said rack bar is also rotatably mounted and is substantially round in cross-section to enable its teeth to be rotated out of alignment with the teeth of the pawl.

10. An improved slack adjuster for railway car foundation brakes as claimed in claim 8 characterized by the fact that the rack bar is substantially round in cross-section and rotatably mounted and its teeth are confined to one sector of the bar whereby rotation of the bar will remove the teeth from engagement with the teeth of said pawl to enable the rack bar to be moved back and forth freely without interference from the stop function of the pawl.

11. A slack adjuster for railway car foundation brakes as claimed in claim 8 in which the said support is pivotally mounted for aligning the rack bar with connectable parts of the brake rigging.

12. A slack adjuster for railway car foundation brakes as claimed in claim 8 in which the

said support is a saddle for slidably supporting the rack bar and holding said rack bar in position where its teeth may be engaged by the teeth of said pawl, said saddle being pivotally supported about the center of rotation of said pawl.

13. A slack adjuster for railway car foundation brakes as claimed in claim 8 in which the last named means is an offset portion of the pawl having a heel, and a stop on the support positioned to encounter said heel to prevent overthrow of the pawl past a dead center position.

14. A slack adjuster for railway car foundation brakes as claimed in claim 8 further comprising a pinion journaled in the support in continuous mesh with said rack bar, means for rotating said pinion in either direction, a trip member rotatably mounted in said support, said trip member and pawl having complementary means for entraining said pawl to move with the trip member, and means for angularly moving said trip member.

15. A slack adjuster for railway car foundation brakes as claimed in claim 8 further comprising means for shifting the rack bar back and forth, a trip member rotatably mounted on said support, said trip member and pawl having complementary means for entraining the pawl to move with the trip member, means for angularly moving said trip member, and stop means on the support and trip member to restrict the angular movement of the trip member in both directions.

16. A slack adjuster for railway car foundation brakes as claimed in claim 8 further comprising a trip member movably mounted on the support, said trip member and pawl having complementary end engaging parts positioned to be engaged when the rack bar rotates the pawl on its full slack take-up stroke, and means to move the trip member to further rotate the pawl in a direction to withdraw all teeth of the pawl from the rack bar to permit the rack bar to be moved back and forth in the support without interference from said pawl.

17. A slack adjuster for railway car foundation brakes as claimed in claim 8 further comprising means for moving the rack bar back and forth, a trip member rotatably mounted in the support, said pawl and trip member having complementary teeth positioned to be engaged when the pawl is rotated to a position where its initial tooth only is engaged with the rack bar, and means to rotate the trip member to cause a further rotation of the pawl to free the initial tooth of the latter entirely from the teeth of the rack bar.

18. A slack adjuster for railway car foundation brakes as claimed in claim 8 further comprising a pinion meshing with the rack bar, means for rotating said pinion to drive the rack bar back and forth, a trip member co-axial with the pinion and independently rotatable, means for rotating said trip member, said trip member and pawl having end engaging teeth adapted to be brought into engagement when the pawl is rotated to a position where the initial tooth only meshes with the rack bar.

19. A slack adjuster for railway car foundation brakes as claimed in claim 8 further comprising a pinion in mesh with the rack bar, a pinion shaft connected to support the pinion and extending to the side portion of the car, a sleeve independently rotatable over said pinion shaft, a trip member fixed to said sleeve, said trip member and pawl having teeth adapted to be brought into engagement when the pawl is rotated to a position in which its initial tooth only meshes with the rack bar, and end handles on said pinion shaft and sleeve accessible at the side portion of the car for independently rotating said pinion shaft and sleeve.

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