July 11, 1950 K. F. NYSTROM ET AL 2,514,588

RAILWAY CAR BRAKE AND SLACK TAKE-UP SYSTEM

Filed April 29, 1946 4 Sheets-Sheet 1

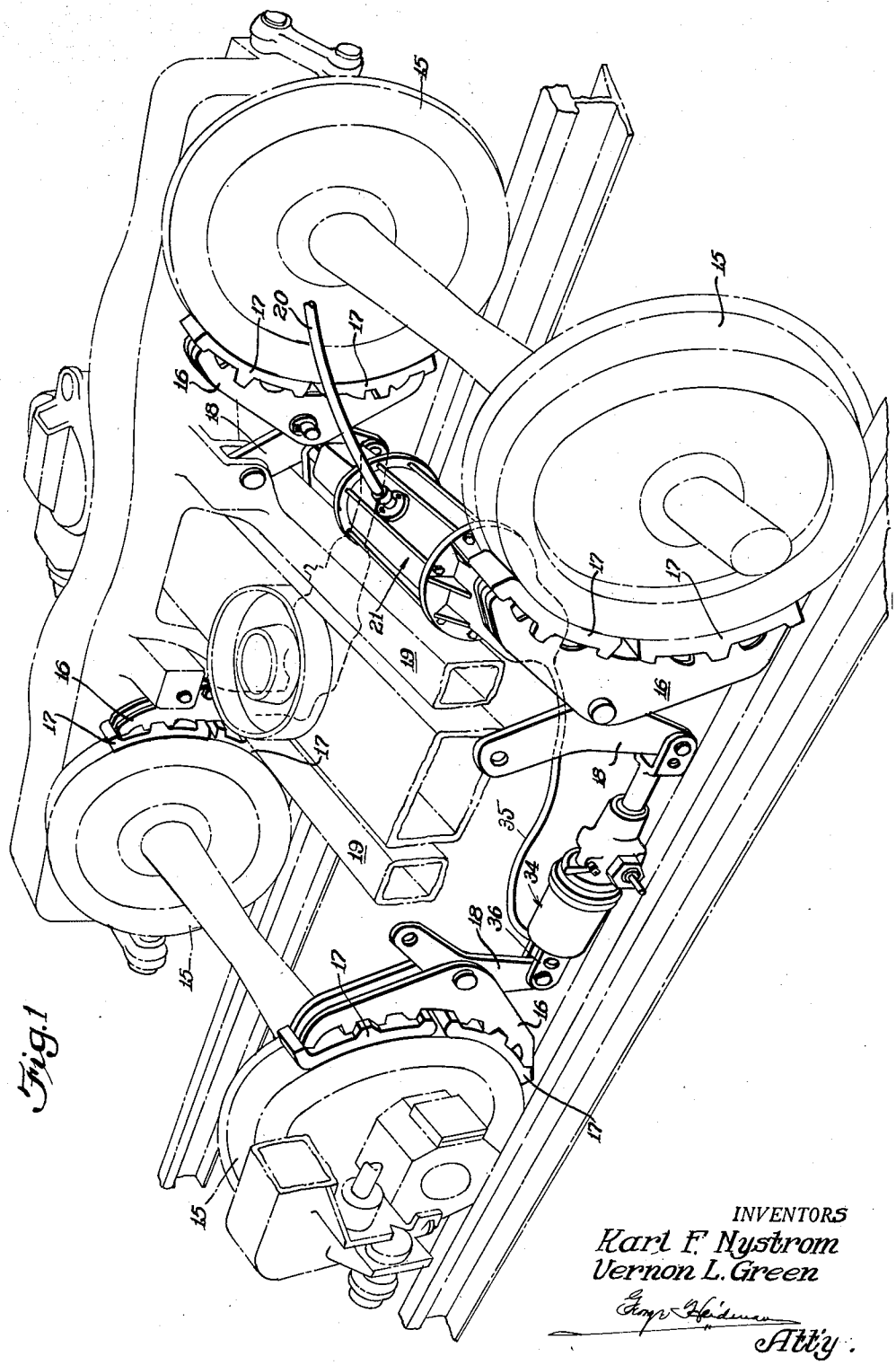

Fig. 1

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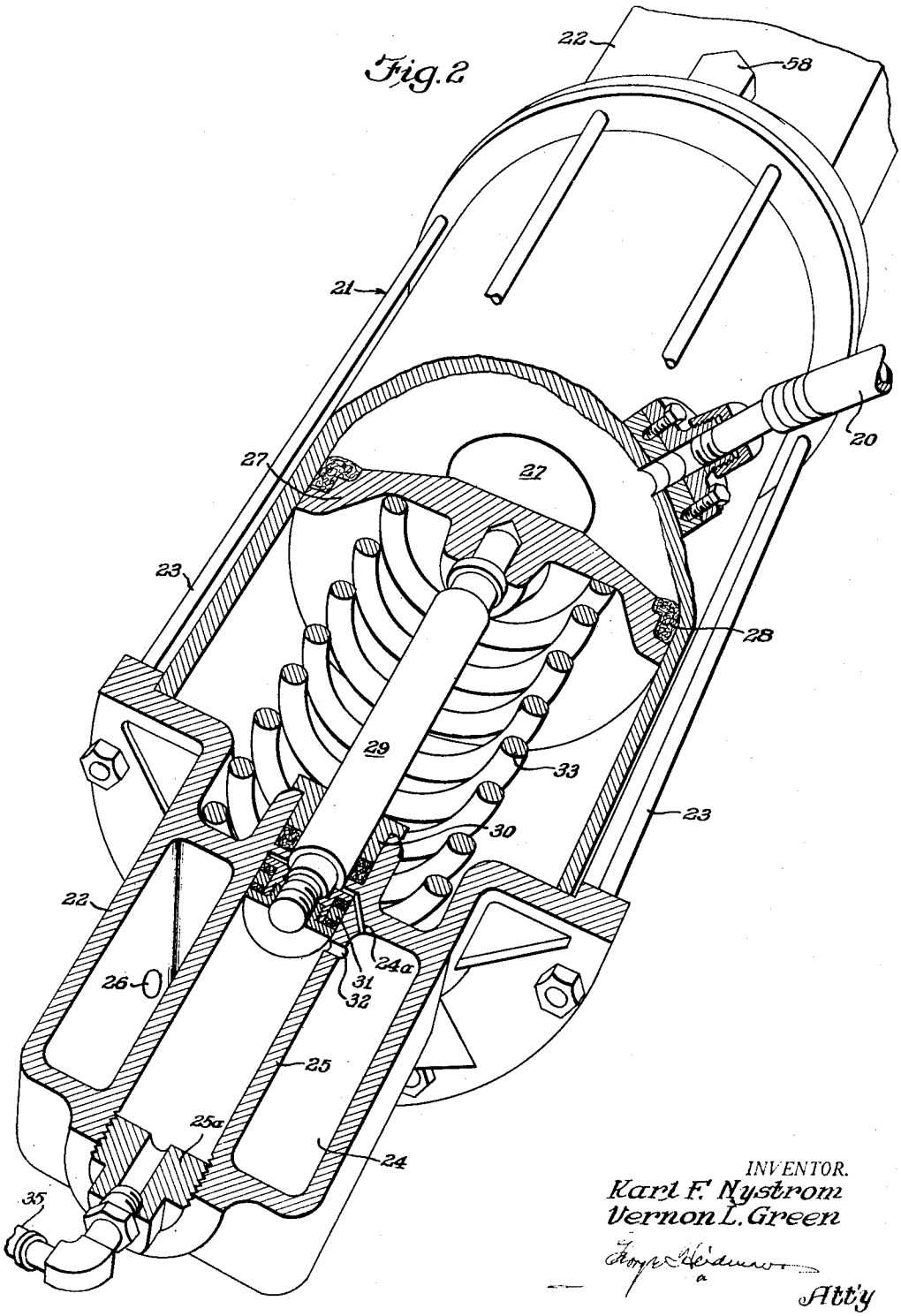
Fig. 2



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RAILWAY CAR BRAKE AND SLACK TAKE-UP SYSTEM

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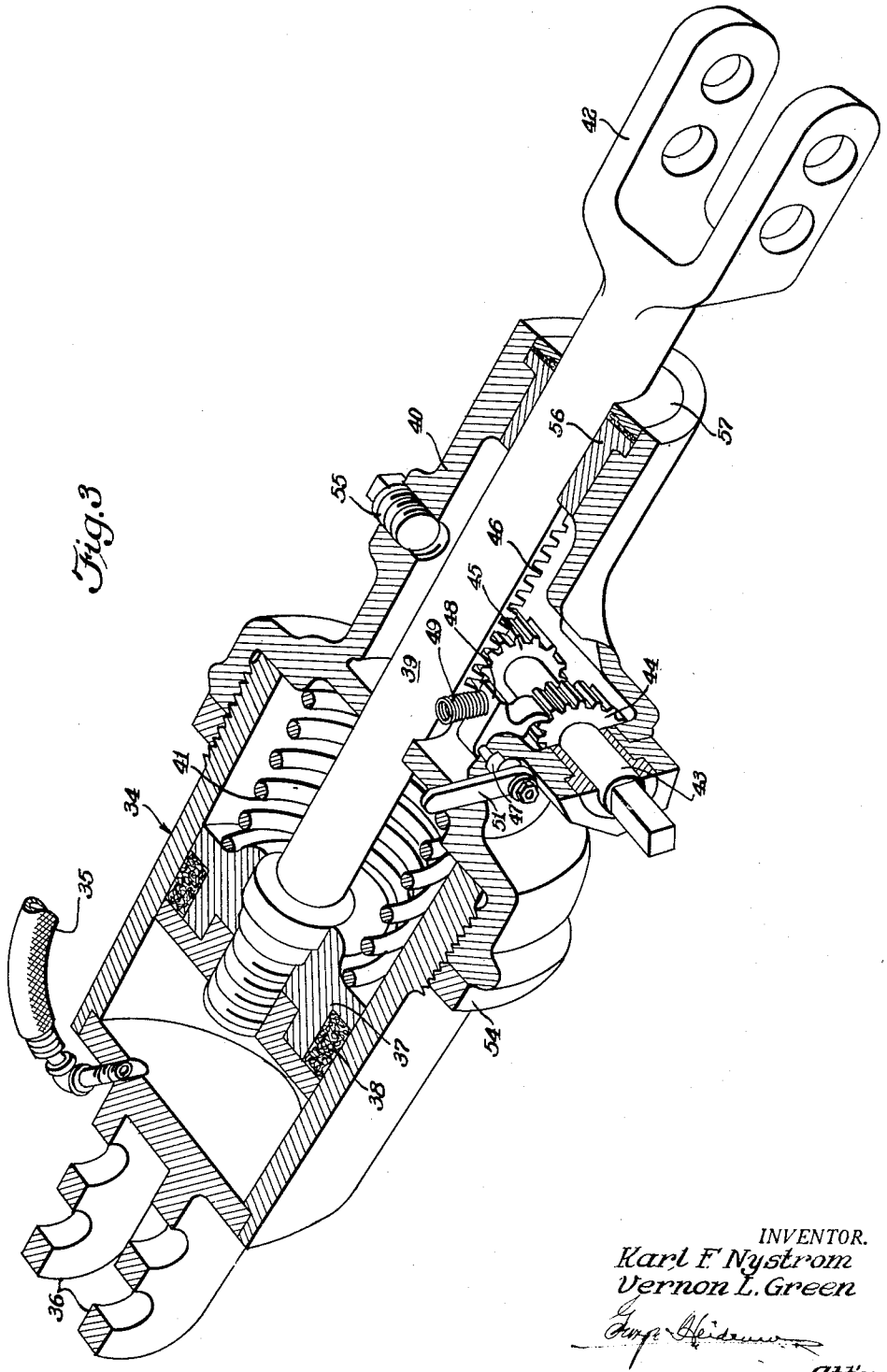

Fig. 3

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RAILWAY CAR BRAKE AND SLACK TAKE-UP SYSTEM

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Fig. 5

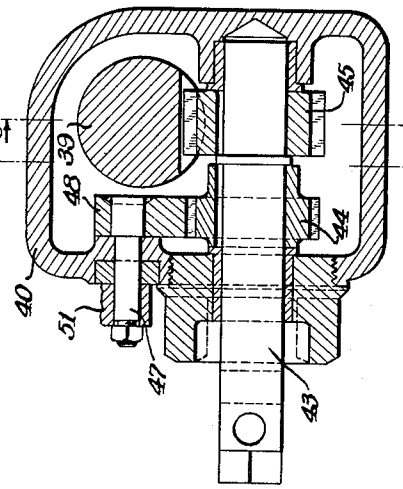


Fig. 7

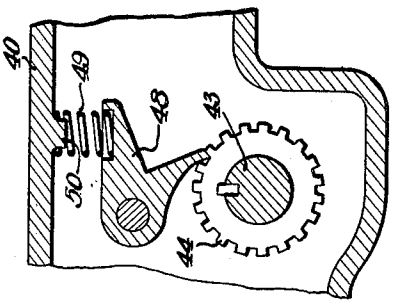


Fig. 4

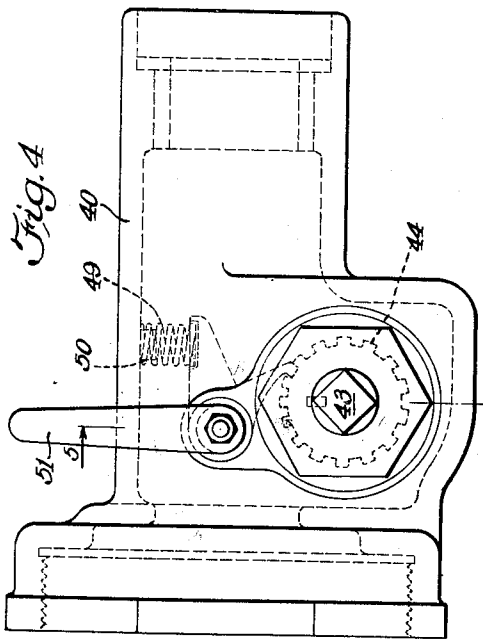
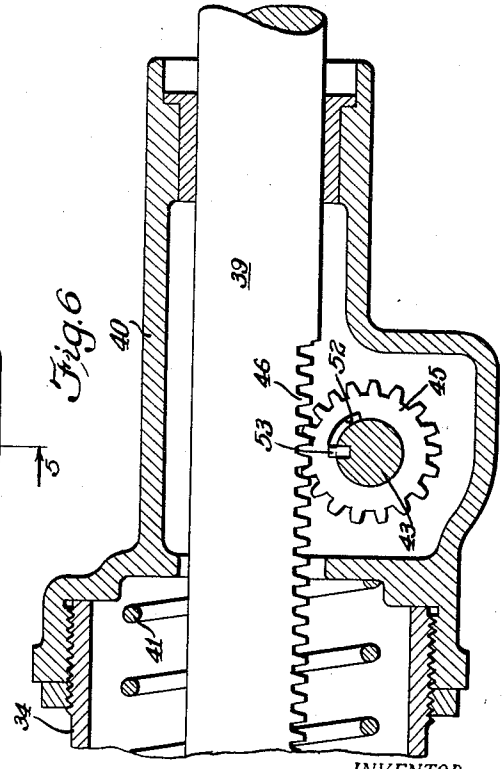


Fig. 6



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UNITED STATES PATENT OFFICE

2,514,588

RAILWAY CAR BRAKE AND SLACK TAKE-UP SYSTEM

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Application April 29, 1946, Serial No. 665,827

5 Claims. (Cl. 188—200)

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Our invention relates to brake systems of the hydro-pneumatic type, more especially intended for railway passenger cars, and contemplating the direct application of the actuating cylinders to the brake heads.

The invention has for one of its objects a brake system wherein the brake means—shoes and hangers—are all mounted between the truck wheels, thereby eliminating the need for any outboard brake shoes and all the auxiliary appurtenances necessary for their attachment and application.

Another object of our invention is the provision of a construction and arrangement wherein the overturn moment on the truck frame due to the hanger forces during brake application will be greatly reduced.

A further object of the invention is the provision of a construction wherein smaller sized actuating cylinders may be employed; the number of pins, levers, brake beams and pull rods materially reduced; and hence a construction and arrangement of less weight provided—a desideratum in high speed operation.

Our invention also contemplates the provision of automatic slack control mechanism whereby the degree of return movement of the actuating cylinder, its piston and associated brakes will be automatically controlled or limited to compensate for small diameter wheels and/or greatly worn brake shoes.

The aforementioned objects and advantages as well as other advantages inherent in our improved brake system will all be readily comprehended from the detailed description of the accompanying drawings, wherein:

Figure 1 is a perspective and more or less schematic view of a railway car truck (with portions which form no part of the present invention broken away) showing application of our improved brake construction.

Figure 2 is a perspective view of the power cylinder, with portions broken away and in section to show internal construction.

Figure 3 is a similar view of one of the actuating cylinders shown in longitudinal section.

Figure 4 is a detail side elevation of the piston rod end of the actuating cylinder as viewed from the near side in Figure 3, with the piston rod omitted.

Figure 5 is a sectional view taken on the offset line 5—5 in Figure 4.

Figure 6 is a horizontal sectional view taken on the line 6—6 of Figure 5.

Figure 7 is a detail sectional view taken on the line 7—7 of Figure 5.

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The particular exemplification of our improved hydro-pneumatic brake system and arrangement shows its application to a railway passenger car truck schematically illustrated in Figure 1 with portions of the side frame members broken away and provided with the usual wheels 15 and the brake heads 16 mounted between the wheels. The brake heads 16 are provided with standard brake shoes 17. The brake heads 16 are pivotally carried by the combination brake levers and hangers 18, of proper angular formation, whose upper ends are pendently supported by the transom members 19 of the truck frame.

The air brake line control may be of the conventional type but instead of the air entering the brake cylinder, it is conveyed by the line or hose 20 to the power cylinder 21, disposed transversely of the truck and suitably secured to the truck frame against movement; the line or air hose 20 being suitably secured to the side of the cylinder 21 at a predetermined point intermediate the ends of the cylinder, as more clearly shown in Figure 2.

The ends of the cylinder shell are closed by similar chambered closure members 22, 22, removably secured in place by the rods 23; the closure members 22 being each provided with a fluid chamber or reservoir 24 surrounding a central auxiliary cylinder portion 25; the reservoir 24 of each closure member 22 being provided with a plugged drain opening at 26.

The cylinder 21 is provided with a pair of similar pistons with beveled heads arranged at opposite sides of the air inlet of hose 20 the beveled heads providing an annular air chamber between the pistons; one piston being shown at 27, provided with a suitable packing element 28. The piston is secured to the piston rod 29 whose opposite end extends through the packing gland 30 and the end of the rod provided with suitable hydraulic packing at 31 to effect fluidtight sliding relation with the auxiliary cylinder 25, which latter at a predetermined point is provided with a port 32 for replenishing the cylindrical chamber 25 with hydraulic fluid from the surrounding reservoir or chamber 24 during piston or brake operations. An auxiliary port 24a is provided to prevent oil being trapped between replenishing port 32 and gland 30.

The piston rod 29 is surrounded with a suitable return or coil spring 33, seated against the closure member 22 and the piston 27 for returning the latter to its normal position when admission of air through hose 20 is shut off.

Horizontally disposed between the lower ends of the combination brake levers and hangers 18, 18, namely beneath the pivotal connections of

said levers and hangers with the brake heads, is an actuating cylinder 34 of comparatively small size, preferably five inches, whose head end is provided with a pipe or preferably flexible hose 35 communicating with the cylinder interior, while the other end of this hose 35 is connected with the outlet plug or nipple 25a of the auxiliary cylinder portion 25 of the power cylinder 21 (a similar connection being made at the opposite end of power cylinder 21 and the actuating cylinder 34—not shown—at the opposite side of the truck).

The head of actuating cylinder 34 is provided with a clevis or pair of apertured lugs 36 whereby the cylinder 34 is pivotally secured to the lower end of one of the combination brake levers and hangers 18. The cylinder 34 is provided with a suitable piston 37, provided with suitable hydraulic packing 38 and secured to the inner end of the piston rod 39 which extends through the other end of the cylinder and through a suitable closure member and guide sleeve portion 40, see Figure 3.

The piston rod 39 within the cylinder 34 is surrounded by a suitable spring 41 whereby the cylinder and piston are returned to normal position when the pressure on the introduced hydraulic medium is no longer existent.

The outer end of the piston rod or stem 39 is provided with a clevis or bifurcated end 42 whereby the piston stem 39 is pivotally connected to the lower end of the other combination brake lever and hanger member 18. As is apparent, the actuating cylinder 34 with its piston is pivotally supported and carried by the lower ends of the two combination brake levers and hangers, so that any relative longitudinal movement between cylinder 34 and piston stem 39 will induce oscillation of the two brake levers and hangers and cause brake head and shoe movement toward and away from the respective or adjacent truck wheels, as the oil or hydraulic medium under pressure entering the actuating cylinder 34 above or at the upper side of the piston 37 will exert its pressure against the cylinder head or end as well as on the piston thereby cause outward movement of both.

As the quantity of oil or hudraulic medium discharged from the inner cylinder or chamber 25 of the power cylinder is more or less limited, it is essential to provide means whereby the return movement of the actuating cylinder and its piston will be limited so as to obviate the necessity for the actuating cylinder and its piston to make a complete distending stroke during brake application; in other words that sufficient pressure on the brake heads and shoes may be obtained to effect proper braking conditions.

Therefore, the guide sleeve portion 40 of the actuating cylinder 34 is shown provided with a transversely disposed shaft 43 provided with a pair of spaced apart pinions 44 and 45 (see Figure 3); the pinion 45 meshing with a rack 46 arranged lengthwise of the piston rod 39.

Secured to the inner end of a loosely mounted pin 47 is a pawl 48 which is held in operative relation with pinion 44 by a suitable spring 49 whose upper end bears against the upper wall of the sleeve portion 40 and is held in place by a stud shown in dotted lines at 50 in Figure 4; the pawl 48 will ride over the teeth of pinion 44 during forward rotation but will prevent backward or reverse movement of pinion 44. The outer end of pin 47 is shown provided with a manually operable hand lever 51, whereby the pawl 48 may be moved out of operative relation with pinion 44, against the action of spring 49 when it is desired to release the piston rod 39 and permit the actuating cylinder 34 and its piston 37 to return to normal contracted condition and thus provide sufficient clearance to enable the car inspector to remove and replace the worn brake shoe or shoes.

In order to provide sufficient independent movement between the piston rod or stem 39 and the pawl and ratchet mechanism 44, 48 commensurate with the authorized or required brake shoe movement from braking position to release position, we provide the inner perimeter of pinion 45 with an arcuate slot or key-way 52 (see (Figure 6) of predetermined length or degrees corresponding to the degree of shoe movement to release position, adapted to receive a Woodruff key 53; the outer end of shaft 43 being shown squared or given angular cross-sectional configuration to receive a suitable hand-crank whereby proper manipulation of the slack take-up mechanism may be had during initial installation and adjustment of the mechanism in keeping with brake-shoe and wheel conditions.

The non-pressure cylinder head or piston rod guide sleeve 40 is held in its proper screwed on position on the cylinder 34 by a locking ring 54; while the guide sleeve 40 is provided with a grease filler opening having a plug as at 55; and the end of the guide sleeve preferably is provided with a guide bushing 56, having a grease and dirt seal 57.

The reservoirs 24 and inner chambers or cylinders 25 at both ends of the power cylinder 21 are initially filled with oil or other suitable hydraulic medium which permits a portion of the medium to flow through the pipe or hose connections 35 toward the pressure head ends of the respective actuating cylinders 34 at opposite sides of the truck.

Upon admission of the compressed air, from the usual compressed air supply of the train, into power cylinder 21 by the connection or hose 20, the two pistons 27 will be forced toward the ends of the cylinder 21 against the action of springs 33. Such movement of the piston 27 will cause the small piston and its packing 31 to close the replenish port 32, thereby placing the oil or hydraulic fluid in inner cylinder or chamber 25 under pressure and forcing it into the pressure head end of the actuating cylinder 34 and inducing extending movement between the cylinder 34 and its piston 37 against the action of the spring 41. Such extending or outward movements of the cylinder and piston will oscillate the combination brake levers and hangers 18, 18 and move the brake heads and associated shoes into braking position. This condition will maintain as long as compressed air is admitted to the power cylinder. During such outward movement of the actuating cylinder 34 and its piston 37, the Woodruff key 53 will be at the left hand end of the keyway or arcuate slot 52 as shown in Figure 6. As soon as pressure on the hydraulic fluid ceases, spring 41 will move the cylinder 34 and piston 37 toward contracted or normal position, causing the piston rod rack 46 to revolve control gear or pinion 45 (which is free to rotate on shaft 43) a degree corresponding with the width or length of the arcuate slot or keyway 52 until the key 53 engages the other or right hand end of the keyway 52, thereby effecting operative relation between pinion 45 and the shaft 43. Further backward rotation of the slack control gear or rack engaging pinion 45 will

be prevented by the pawl 48 and pinion 44 which is immovably secured on the shaft 43 to which the Woodruff key 53 is secured; the length of the slot or keyway 52 being predetermined to provide the prescribed clearance between shoe and wheel while in brake released position. With the limited quantity of hydraulic fluid or volume of oil carried by the power cylinder it is not feasible to require the actuating cylinder and its piston to travel a full stroke. In order to provide a properly workable structure it is necessary to provide the means described whereby a complete return stroke of the actuating cylinder and piston will be prevented.

When the flow of compressed air into power cylinder 21 is shut off, the combined pneumatic piston and hydraulic piston will return to normal position, through the action of spring 33, thereby uncovering the replenishing port 32 and permit flow of the fluid from the reservoir 24 into inner cylinder 25 and fill the latter which is of comparatively small diameter. The actuating cylinder and associated piston having previously been extended or adjusted in keeping with wheel diameter and brake shoe condition, the power cylinder during the next brake application need furnish only enough oil or hydraulic fluid to extend or move the actuating cylinder and piston a comparatively small degree corresponding with the amount of brake release movement permitted during the preceding brake application and controlled by the length of the slot or key-way in the freely mounted pinion 45, provided the brake shoes have not become worn during the preceding brake application.

In the event wear has occured, the actuating cylinder and its associated piston will be extended or moved outwardly, upon the next brake application, a distance corresponding with the amount of brake release plus the brake shoe wear and thus cause the key 53 to rotate slack control shaft 43 and pinion 44, in clockwise direction as viewed in Figure 3, and permit the pawl to engage the succeeding tooth or teeth as the case may be, thereby holding the piston rod against return movement beyond that permitted by the slot-and-key connection between rack pinion 45 and slack control shaft 43.

As is apparent, this operation will take place and be repeated as brake shoe wear increases during subsequent brake applications and the brake shoe wear is sufficient to enable the ratchet pawl to engage the next tooth of ratchet pinion 44. In the event the wear is of a degree less than the width of the pinion tooth, the ratchet pinion will turn backward until the spring pressed pawl engages the original tooth.

By providing the pawl carrying pin or shaft 47 with the release lever 51, the car inspector may release the pawl 48 from the ratchet pinion 44 thereby permitting the actuating cylinder and associated piston, through the action of the spring 41, to return to complete contracted condition and provide ample clearance for removal and application of the brake shoe.

The initial adjustment of the actuating cylinder and associated piston is made by the air brake man in keeping with regulations which require him to make a number of brake set and release operations and tests before the car leaves the terminal; during which tests he must see that every brake shoe properly contacts the wheels.

The closure members 22 at the ends of the power cylinder 21 are each shown provided with a filler and breather cap as at 58, see Figure 2, whereby the oil or hydraulic fluid may be introduced into the inner cylinders 25 and reservoirs 24 and the desired quantity maintained.

The exemplification shown in the drawings is believed to be the simplest adaptation of our invention, but modifications are possible and may be made without, however, departing from the spirit of our invention as defined in the appended claims.

What we claim is:

1. In a railway car brake and slack take-up system involving a source of hydraulic pressure fluid and pendently supported brake heads; brake actuating means comprising a pressure fluid receiving cylinder connected with said source and having a reciprocable piston provided with an elongated stem extending through one end of the cylinder, one end of the cylinder having operative pivotal connection with one of said brake heads while the end of the piston stem has operative pivotal connection with the other brake head; automatic means whereby the cylinder and piston are forced toward normal contracted condition; a rotatable shaft arranged adjacent said piston stem; ratchet mechanism operatively connected with said shaft for holding the latter against reverse rotation; rack and pinion connection between said shaft and said piston stem whereby said shaft rotates forwardly when said piston stem moves outwardly; and means operatively intermediate said pinion and said shaft whereby the pinion and piston stem are permitted a predetermined degree of reverse movement corresponding to the prescribed brake head release movement.

2. In a railway car brake and slack take-up system involving a source of hydraulic pressure fluid and pendently supported brake heads; brake actuating means comprising a pressure fluid receiving cylinder connected with said source and having a reciprocable piston, one end of said cylinder having operative pivotal connection with one of said brake heads while the outer end of the piston stem has operative pivotal connection with the other brake head; means whereby the cylinder and piston are forced toward normal contracted condition; a rotatable shaft disposed transversely of said piston stem; ratchet mechanism for holding said shaft against reverse movement; and mechanism operatively associated with said piston stem and with said shaft whereby the latter is forwardly rotated during outward movement of the piston stem and said piston stem permitted a predetermined degree of reverse movement corresponding to the prescribed brake head release movement.

3. In a railway car brake and slack take-up system involving a source of hydraulic pressure fluid and pendently supported brake heads; brake actuating means comprising a pressure fluid receiving cylinder connected with said source and having a spring controlled reciprocable piston provided with an elongated stem extending through one end of the cylinder, one end of the cylinder having operative connection with one of said brake heads while the outer end of the piston stem has operative connection with the other brake head; a rotatable shaft disposed transversely of said piston stem; a pinion fixedly secured to said shaft to rotate therewith; a pawl arranged in tooth engaging relation with said pinion to hold the latter and said shaft against reverse rotation; a rack and pinion connection between said shaft and the piston stem whereby

forward rotation of said shaft is obtained when the piston stem moves outwardly; and means operatively intermediate said last mentioned pinion and said shaft whereby the shaft and pinion are made to rotate in a forward direction but the pinion and said rack and associated piston stem permitted predetermined limited reverse movement corresponding with the prescribed brake head release movement.

4. In a railway car brake and slack take-up system involving a source of hydraulic pressure fluid and a pair of pendently supported brake heads; brake actuating means comprising a pressure fluid receiving cylinder whose pressure head end is connected with said source and having a spring controlled reciprocable piston provided with an elongated stem extending through the other end of said cylinder, the pressure head end of the cylinder having operative pivotal connection with one of said brake heads while the outer end of the piston stem has operative pivotal connection with the other brake head, said piston stem being provided with a lengthwisely disposed rack intermediate its ends; a rotatable shaft disposed transversely of said piston stem; a pinion arranged on said shaft and in mesh with said rack, the pinion being provided with an arcuate slot or keyway of predetermined length correlated with the prescribed degree of movement of the brakes to release position; a key carried by said shaft to extend into said keyway and of width less than the length of the keyway whereby said shaft is rotated by the outward movement of said piston when the key is at the rear end of said keyway; a ratchet pinion keyed to said shaft; a spring controlled pivoted pawl meshing with said ratchet pinion to hold the latter and said shaft against return or rearward rotation; and a release lever operatively connected with said pawl.

5. In a railway car brake and slack take-up system involving a source of hydraulic pressure fluid and a pair of pendently supported brake heads disposed between the wheels on the same side of the truck; brake actuating means comprising a pressure fluid receiving cylinder connected with said source of pressure fluid and pendently disposed longitudinally between the wheels and operatively connected at one end with a brake-head while the other end of the cylinder is provided with an elongated guide sleeve; a spring controlled piston in said cylinder provided with a stem disposed through said guide sleeve with its outer end operatively connected with the other brake head, the portion of the piston stem within said guide sleeve being provided with a rack; a transversely arranged shaft in the guide sleeve provided with a pinion arranged in mesh with said rack, with the pinion having slot-and-key connection with said shaft, whereby a predetermined reverse movement of the pinion and the piston is permitted to provide for brake shoe release; pawl and ratchet mechanism in said guide sleeve operatively associated with said shaft whereby return of the cylinder and piston to initial contracted condition is prevented; and means whereby the pawl and ratchet mechanism may be released.

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