AUTOMATIC SLACK ADJUSTER

George B. Dorsey, Westmount, Quebec, Canada, assignor to Continental Transport Appliances, Limited, Montreal, Quebec, Canada, a corporation of Canada

Application March 5, 1952, Serial No. 274,953

2 Claims. (Cl. 188—198)

The invention relates to an improved automatic slack adjuster such as employed in railway cars and the like for automatically taking up slack in the parts of the brake system which occurs due to wear of brake shoes, stretching of rods and wear in pin connections.

The improvement is particularly suitable for use in connection with railway cars wherein it is essential that the take up device be positive in operation and secured against accidental release such as may take place when reliance is placed on pawl and ratchet holding devices which are liable to displacement under buffing shocks.

The objects of the invention among others are to provide an improved type of screw operated slack adjuster for automatically shifting the location of the dead lever fulcrum and limit push rod travel within certain predetermined limits; to provide for operating a longitudinally movable take up device by means of a rotatable cross shaft and to control the rotation of said shaft in accordance with the requirements of piston travel; to provide an improved bevel gearing connection between a rotatable cross shaft and a longitudinally movable take up device; to provide a structure wherein an operating spring and associated mechanism are located in alignment with the push rod; to provide an improved mechanism disposed at a location remote from an operating spring for holding the said spring energized and releasing said energy as required; and to provide suitable enclosing housings for enclosing and protecting the screw threaded parts and gearing of the take up device.

The invention further resides in certain details of construction such as will be fully pointed out hereafter and claimed.

For full comprehension of the invention reference may be had to the accompanying drawings wherein:

Figure 1 is a plan view of the brake leverage system of a railway car showing enough of the car structure to illustrate the application of the improvements in combination therewith.

Figure 2 is a longitudinal side elevational view of the lower portion of the structure shown in Figure 1.

Figure 3 is a vertical sectional view taken on a line 3—3 of Figure 1.

Figure 4 is a fractional view of Figure 2 showing the operating shaft lever structure with the pawl in released position.

Figure 5 is a fractional view of Figure 2 showing on an enlarged scale the operating lever and pawl with the spring holding mechanism positioned with the pawl engaging one of the serrated teeth of the connection.

Figure 6 is a vertical sectional view taken on a line 6—6 of Figure 5 showing the brake cylinder with the guide bracket and associated pawl.

Figure 7 is a vertical side view of the spring holding mechanism shown in Figure 5 except that the pawl is shown in releasing position.

Figure 8 is a side elevational view on an enlarged scale of the take up mechanism shown in Figure 1.

Figure 9 is a plan view showing the take up mechanism as viewed on a line 9—9 of Figure 8 and showing a certain part of the tubular housing broken away to better illustrate the screw threaded portion of the take up rod.

Figure 10 is an end elevational view of the take up nut and bevel gear assembly as seen on a line 10—10 of Figure 8.

Figure 11 is a vertical longitudinal sectional view taken through the nut and gear assembly on a line 11—11 of Figure 10.

In said drawings, the invention is shown as applied to a railway car and the structure is indicated as including center sill members 10—10 and a transversely extending cross-bearer 11 which includes a pan shaped diaphragm 12 with top and bottom cover plates indicated at 14 and 15 respectively. The lower portion of the side wall of the car is indicated by an angle member 16.

A brake cylinder 17 is fixedly mounted on the car structure and operable by said cylinder is a longitudinally movable push rod 18 which in turn is pivotally connected at 19 to a brake leverage system.

The brake leverage system includes live and dead levers indicated at 20 and 21 respectively, said levers being interconnected by a center connecting rod 22. Connected with the outer ends of said levers are top rods 23 which in turn lead to the trucks (not shown) at the respective ends of the car.

The dead lever is fulcrumed on pivot 24 and the latter is bodily movable lengthwise to counteract excessive travel of the push rod and compensate for wear in the brake shoes and stretching of rods.

The invention is concerned with the particular method whereby shifting of the pivot fulcrum 24 is automatically effected by mechanism responsive to overtravel of the push rod.

The mechanism whereby adjustment of the brake parts is effected includes longitudinally movable take up mechanism including a rod 25 having a pair of jaws 26—26 between which the dead lever 21 is sandwiched and pivotally connected thereto by pivot 24.

The rod is screw threaded at 27 and a complementary screw threaded nut 28 engages with the said threads 27 of the rod. The rod extends through a box shaped housing 29 having end walls 30 and 31 and side walls 32 and 33 respectively, said respective walls having in the upper portion of the respective walls flanges 30, 31, 32 and 33 being united by a bottom wall 34. Extending laterally outwardly from the side walls 32 and 33 are flanges 35 and 36 which in turn are secured to a plate member 37 by rivets 38.

Extending lengthwise from the respective end walls 30 and 31 are hollow tubular extensions 39 and 40 which are rigidly secured to the housing and operate as supports for the rod and further form enclosures to protect the threaded section of the rod.

Rotation of the nut 28 is effected through the medium of interengaging bevel gears 41 and 42, the latter being formed with a hollow non-circular pocket 43 within which a similarly formed section 44 of the nut 28 is received and the nut and gear assembly thus turn in unison. The nut and gear assembly are restrained against axial displacement relatively to the housing by being confined between the inner face 45 of the housing rear wall 30 and the end wall 46 of the tubular section 40. The said section 40 is extended within the housing to form a support for the bevel gear 42 and also form the abutment wall 46 and to this end a flange 47 is welded to the tubular section 40 at 48 and the said flange 48 is bolted at 49 or otherwise secured to the end wall 31 of the housing. The nut 25 is formed with an enlarged thrust bearing section 50 to engage with the inner bearing face 45 of the rear wall 30 of the housing.

The gear wheel 41 is formed with a hub portion 52 which is received in a bearing section 53 of the housing.
and an operating shaft 54 is mounted through said hub portion 52 and secured thereto at 54a and the end of said shaft projects inwardly to lie with the end face thereof against the extended portion of the tubular section 40. The gear 41 is thus maintained against inward movement by the abutting end face of the shaft and against outward movement by the inner face of the side wall 32 of the housing. The housing when in position against the supporting plate 37 thus forms a complete enclosure for the bevel gearing and associated nut and allows for the application of lubrication to the moving parts.

In order to support the rod 23 beyond the jaws 26 there is provided a guide extension 55 which is preferably in the form of a flat plate welded to the upper jaw at 56 and said guide is extended within an opening 57 formed in a guide bracket 58, which is preferably formed of an angle shaped plate having one flange 59 secured to the underside of the center sill.

The operating shaft 54 which is preferably of rectangular section is extended towards a side wall of the car and adjacent thereto is fitted with a circularly shaped collar 60 which in turn is rotatably mounted in a bracket 61, the latter being preferably mounted on the outer end of the crossbearer 11. The shaft 54 projects beyond the bracket to receive a wrench or wheel 54b for manual operation of the take up device and restoration of slack when applying new brake shoes.

Rotation of the shaft 54 under automatic operation of the slack adjuster is effected through the medium of a ratchet wheel 62 having side hub portions 63–63 on which is loosely mounted lever arms 64–64 having a pivoted pawl 65 pivotally mounted on said lever for intermittent engagement with the teeth 66 of the ratchet wheel 62. The pawl 65 is maintained in engagement with the teeth of the ratchet wheel by a weighted counter-balancing extension 67 and in addition thereto by a tension spring 68 connected at one end to the pawl and at the opposite end to the lever. The shaft 54 is rotated in a direction to operate the take up by a spring 69 which is connected at one end to the lever arms 64 at 70 and at the opposite end at 71 to a bracket 72, said bracket in turn being secured to the center sill at 73.

The spring 69 is energized upon forward movement of the push rod in a brake applying direction and extends from the outer end of the lever arms 64 to connect with an arm 75 which extends downwardly from the push rod and is carried thereby.

The lever arm 64 with the associated ratchet wheel and pawl is disposed substantially in alignment with the push rod to allow the disposition of the connection 74 to lie on a direct line of pull between the push rod and the spring 69 and to this end the arm 75 is extended downwardly vertically to engage with the said connection. The arm 75 is preferably formed of plate sections 76 and 77 welded to a chain clevis 78 and said plate sections are bent to angular shape at 79 and 80 and welded together at 81 to form a unitary member. The section 76 is provided with an opening 82 which is threaded on the push rod and the said section 76 is extended downwardly to form the arm 75.

The connection 74 is formed in a plurality of sections as indicated at 83, 84 and 85, the intermediate section 84 being formed of a pair of plates 86–86 arranged in spaced relation and a series of teeth 87, 88 and 89. The intermediate connection section 84 extends through a guide bracket 91 which is located or otherwise secured to the brake cylinder as indicated at 92 and pivotally mounted on said bracket is a locking pawl 93 for engagement with the teeth 87, 88 and 89 of the connection.

The section 83 of the connection is pivoted at 94 to the end of the lever 64 and the opposite end is screw-threaded at 95 for connection with a screw-threaded nut 96 which is welded to the connection. The section 85 of the connection is pivotally connected at one end with the intermediate section at 97 and the opposite end is extended through the arm 75 and fitted with a shoulder in the form of a threaded nut 98.

The operation of the device is as follows: upon the application of the brake, the push rod moves forwardly taking along the live lever and center connecting rod with the dead lever fulcruming about its pivotal mounting thus drawing the oppositely disposed top rods 23 towards each other. The forward movement of the push rod takes from the connection 74 an engagement with the arm 75 and imparts a partial rotation to the lever 64 and thereby tensions spring 69. The tensioned spring energy is retained by reason of the pawl 93 successively engaging with teeth 87, 88 and 89 and the said teeth are so disposed and related to the pawl 93 as to provide for the said teeth to override the pawl upon excessive travel of the push rod and release the spring energy and thereby rotate the shaft 54 in a take up direction.

The relation between the pawl and teeth is such as to provide for release of the pawl, as indicated in Figure 5 when a predetermined extent of push rod travel has been attained.

The restoration of slack in the brake system, which becomes necessary when worn brake shoes are renewed, is effected by manual rotation of the shaft 54 from a location adjacent the side of the car. In order to effect restoration of slack by reverse rotation of the shaft the pawl 65 is first released from its engagement with the toothed ratchet wheel 62 and this is accomplished by inserting a chock 99 between the edge 100 of the lever 64 and the concave shaped contour 101 of the pawl. The chock 99 may be in the form of a flat bar which can readily be inserted in place and given a partial turn to pry the pawl outwardly as shown in Figure 4.

What I claim is:
1. In a slack adjuster for a brake having a leverage system including interconnected live and dead levers and a cylinder having a push rod connected to the live lever and an adjustably movable fulcrum for the dead lever; the herein described mechanism for moving the dead lever fulcrum to compensate for excessive travel of the push rod, said mechanism including a longitudinally movable element on which the fulcrum is carried, said movable element having a ratcheted threaded section and a complementary threaded rotate nut member cooperating therewith for moving the said element by rotation of the nut member, means for rotating the nut member including a rotatable cross-shaft and interengaging bevel gearing between the cross-shaft and the ratchet wheel, and means for rotating the cross-shaft including a lever having a lost motion connection with the shaft and including a ratchet wheel fixedly carried by the shaft and a pawl pivoted on the lever to engage with the ratchet wheel for rotating the shaft in unison with the lever whereby the shaft is turned in one direction and independent movement of the lever in the other direction produces no turning movement of the shaft; a spring connected to the lever and anchored at a location stationary with respect to the cylinder for rotating the shaft and lever in unison by a swinging movement of the lever; and a connection between the lever and push rod for energizing the spring upon movement of the push rod in a brake applying direction; a guide disposed intermediate the lever and push rod for supporting the connection, and interengaging pawl and ratchet means for maintaining the spring energized until a predetermined extent of travel is attained, said means including ratchet teeth on the connection and a pawl carried by the guide, said ratchet teeth upon movement of the push rod beyond the predetermined extent of push rod travel moving beyond the pawl to override the same and release the spring energy.
2. In a slack adjuster for a brake having a leverage system including interconnected live and dead levers and a cylinder having a push rod connected to the live lever
and an adjustably movable fulcrum for the dead lever, the herein described mechanism for moving the dead lever fulcrum to compensate for excessive travel of the push rod, said mechanism including a longitudinally movable element on which the fulcrum is carried said movable element having a screwthreaded section and a complementary screwthreaded rotatable nut member cooperating therewith for moving the element by rotation of the nut member; means for rotating the nut member including a rotatable cross-shaft and interengaging bevel gears carried by the shaft and nut respectively; means for rotating the cross-shaft including a lever having a lost motion connection with the shaft and including a ratchet wheel fixedly carried by the shaft and a pawl pivoted to the lever to engage with the ratchet wheel for rotating the shaft in unison with the lever whereby the shaft is turned in one direction and independent movement of the lever in the other direction produces no turning movement of the shaft, a spring for rotating the shaft, said spring being connected to the lever and anchored at a location stationarily disposed with respect to the cylinder; a connection between the lever and push rod whereby upon movement of the push rod in a brake applying direction the spring is energized; a guide carried by the cylinder for supporting the connection; and interengaging pawl and ratchet teeth carried by the guide and connection respectively for maintaining the spring energized until a predetermined extent of push rod travel is exceeded, said ratchet teeth upon movement of the push rod beyond the predetermined extent of travel moving beyond the pawl to override the same and release the spring energy.

References Cited in the file of this patent

UNITED STATES PATENTS

490,357 Marshall ..................... Jan. 24, 1893
685,378 Johnson ..................... Oct. 29, 1901
733,648 Wands ..................... Mar. 1, 1904
1,509,225 Broluska .................. Sept. 23, 1924
1,815,859 Martin .................... July 21, 1931
1,935,607 Anderson .................. Nov. 21, 1933
2,612,240 Moeller et al. ............. Sept. 30, 1952

FOREIGN PATENTS

381,721 France ..................... Jan. 18, 1908