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BRAKING ARRANGEMENT FOR RAILWAY HOPPER CARS

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2 Sheets-Sheet 1

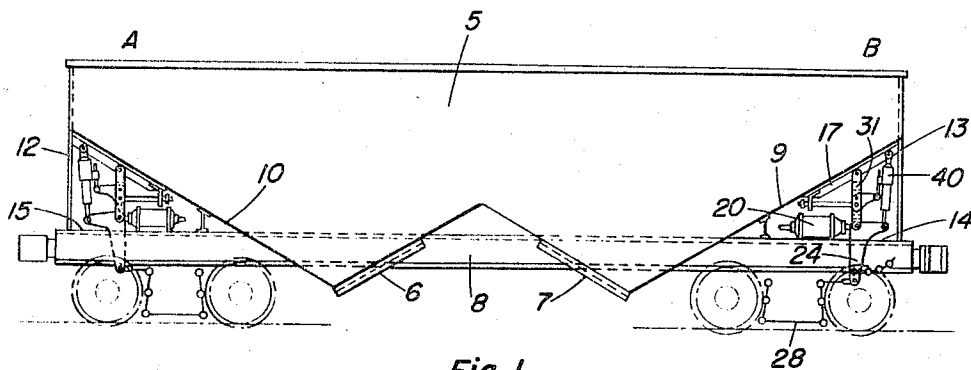
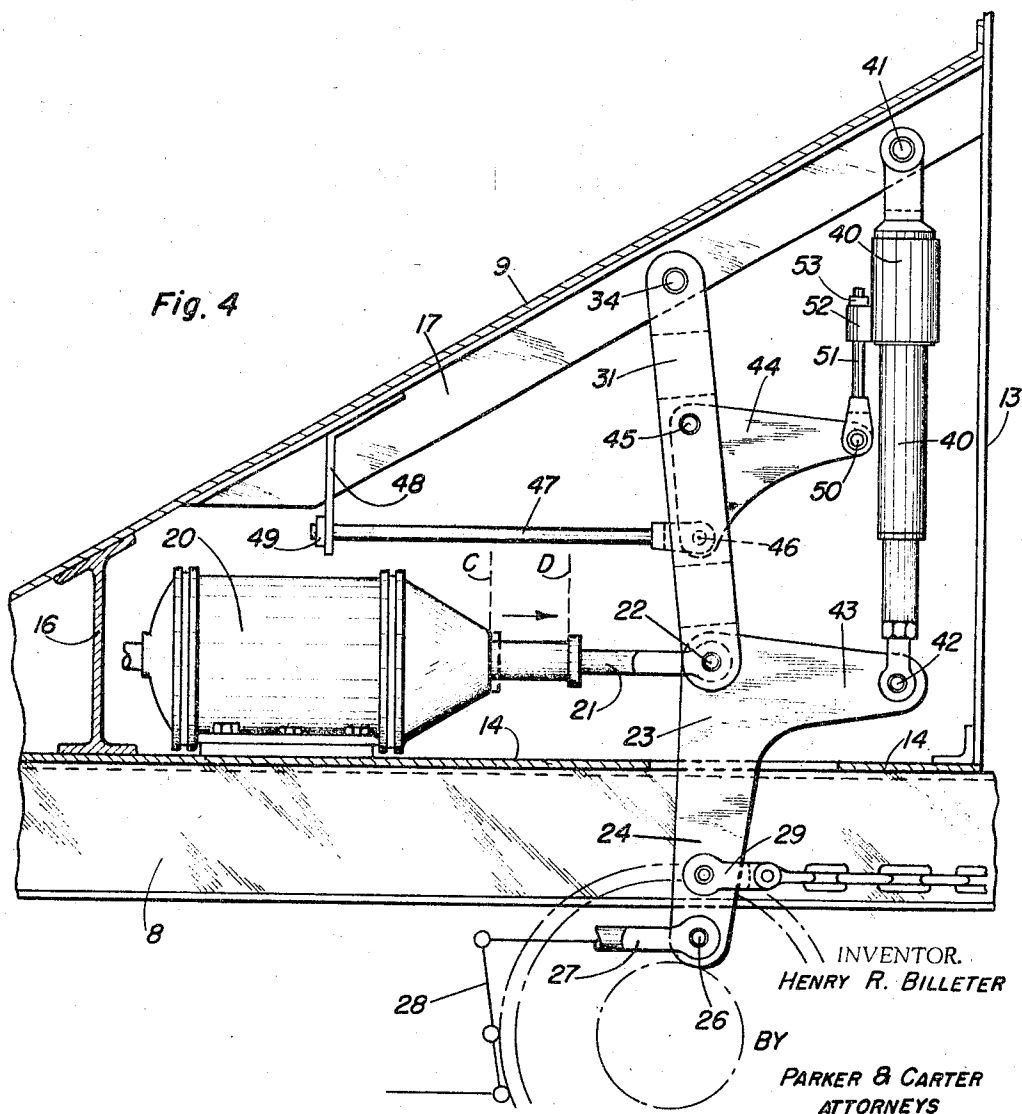


Fig. 1



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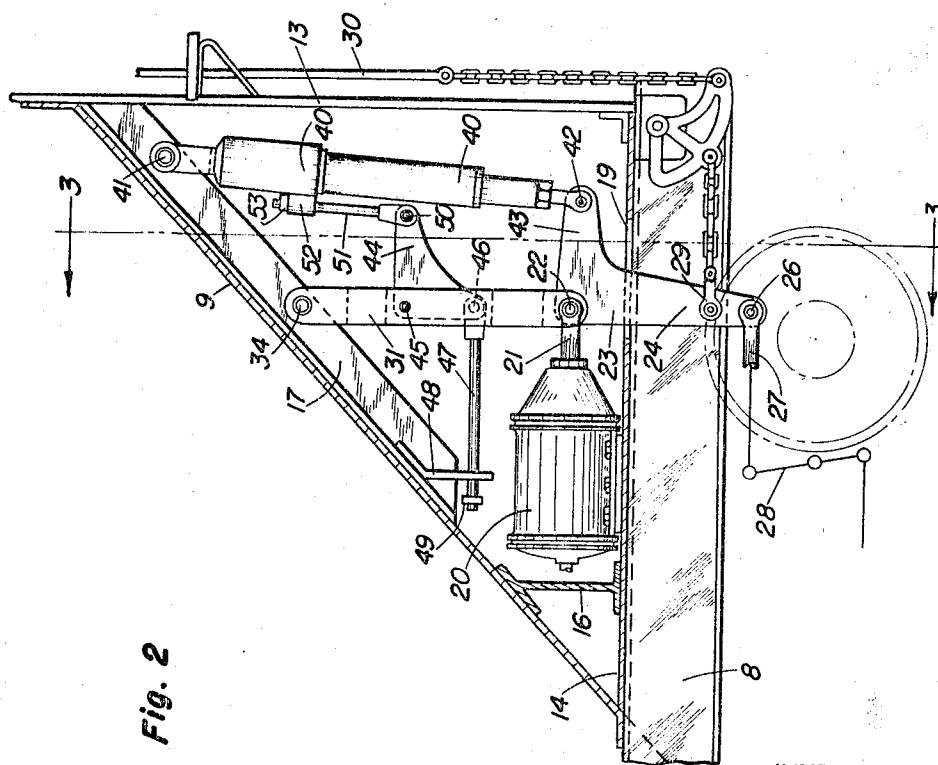
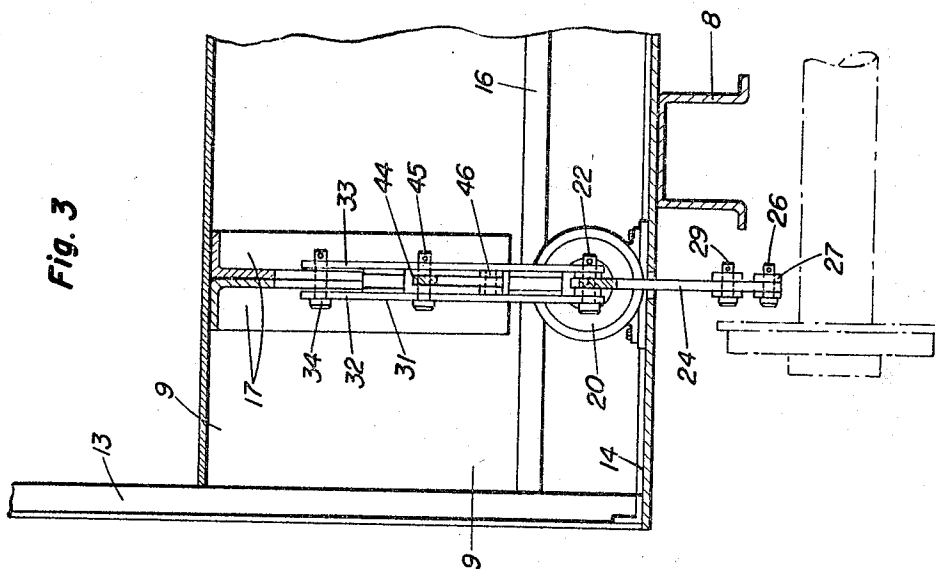
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2 Sheets-Sheet 2



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BRAKING ARRANGEMENT FOR RAILWAY HOPPER CARS

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10 Claims. (Cl. 188—197)

This invention relates in general to braking systems for railway cars but more particularly to a new and improved braking arrangement for hopper type railway cars which is novel in construction and mode of operation.

In the well known hopper type of railway cars the brake controlling equipment including the brake cylinder, reservoirs, control valves and assorted connecting parts are all supported and arranged in the usual manner at one end of the car below the sloped front hopper wall. This necessitates the use of long connecting rods extending beneath the center sill structure of the car to the opposite hopper and truck for control of the brakes at that end. This arrangement often rendered it difficult and unsuitable to provide and install automatic slack adjusters. Furthermore the aforesaid braking equipment and tie rods were exposed at all times to weather conditions, flying stones and dust tending to damage and clog the parts and rendering it difficult to install, service and maintain the equipment. The present trend in hopper type cars is to extend their length considerably and this generally aggravates the problems encountered.

It is accordingly a primary object of the present invention to design a new and improved brake controlling arrangement to overcome the above and other disadvantages encountered on hopper type cars.

An object of the invention is to provide entirely separate and individual sets of braking equipment for each end of a hopper car, which equipment is associated with and controls the brakes of only that end of the car, thereby eliminating the excessively long rods and reducing the numerous levers and brake rigging formerly required across the full length of the car. The advantages accruing from this object includes a reduction of the possibility of damage to the linkage, by flying stones, eliminates sagging and looseness of the rods and linkage, and greatly reduces the weight and friction load of the brake rigging, effecting the braking force.

Another object is to design a new and improved mounting arrangement for the control braking equipment on a hopper car in which the equipment is entirely supported and protected from damage by flying objects, weather conditions and fires, the latter being sometimes employed in thawing out the frozen contents of the hopper car. In accordance with this object a deck or floor above the car frame at the sloped end of the hopper car is provided for supporting the equipment. A further advantage is thereby attained by rendering the braking equipment readily accessible from the hopper car end for maintenance and service, and easy installation.

A further object is to provide a new and improved automatic slack adjuster in a novel braking arrangement for a hopper car which can be easily accommodated under the sloped end wall of the car, which is not a direct part of the braking linkage, requires small effort to operate, and therefore does not rob the braking system of energy.

A further object is to design a new and improved slack adjuster in a braking arrangement which is smaller and shorter in length than conventional slack adjusters and therefore less expensive and of reduced weight. A particular feature of this slack adjuster is that it is pivoted at one end in a vertical position from the car frame and swingable about its pivot. It is also automatically ad-

justable in a longitudinal direction to compensate for slack conditions.

Due to the novel arrangement according to the present invention, of providing individual and separate slack adjusters and brake cylinders as well as other equipment at each end of a hopper car, the power stroke of the brake cylinder is considerably less than formerly required since it is effective on only one set of brakes on a single truck. The size of the brake cylinder can, therefore, be much smaller. It would be entirely practical however to use the conventional type brake cylinders which would therefore operate with a shorter stroke and provide more reliable power and on less air pressure. As a further result of the shorter stroke of the brake cylinder the slack adjuster need only compensate for the shorter slack conditions and therefore it is made shorter and easily fits into the sloped end of the hopper car. With this arrangement it will also be apparent that failure of the braking equipment at one end of the hopper car will not affect the braking equipment on the other end of the car, so that a certain measure of braking can be effected if needed, in emergency.

The invention contemplates the use and arrangement of simple link and bell crank members pivotally interconnected with the push rod of the brake cylinder, and with the slack adjuster, and the brake linkage for applying the brakes. The slack adjuster is preferably mounted vertically and pivoted at its upper end to the car frame for swinging movement at its lower end about the pivot. A link member arranged parallel to the slack adjuster is also pivoted at its upper end to the car frame and has its lower end pivotally connected to the push rod of the brake cylinder. A bell crank lever pivotally connects its short leg with the lower end of the slack adjuster, while the longer leg extends longitudinally from the end of the link member and connects with the brake rigging. The brake cylinder is arranged horizontally and its push rod pivotally connects with the mid-point of the bell crank member. Actuation of the push rod accordingly swings the lower ends of the link member and slack adjuster outward about their pivots. Because of the ratios between the levers as well as their arrangement with respect to each other, the effect of angularity upon the push rod, encountered against the former linkages, is greatly minimized and considerably reduced. The push rod by its straight forward thrust therefore has its effectiveness increased without detracting from the forces exerted by the brake cylinder.

Other objects and features of the present invention will be apparent from the following description together with the accompanying drawings which show a preferred embodiment of the invention and the principles thereof. Other embodiments employing the same or equivalent principles may be used or contemplated and structural changes may be made as desired by those skilled in the art without departing from the spirit and scope of the invention and the purview of the appended claims.

Referring now to the drawings;

FIGURE 1 is a side view of a hopper type railway car showing the braking equipment on each end thereof;

FIGURE 2 is an enlarged side view of one end portion of the hopper car showing the braking equipment concerned with the present invention;

FIGURE 3 is an end view of the hopper car taken along the line 3—3 of FIGURE 2, while;

FIGURE 4 is an enlarged view similar to FIGURE 2 showing the brakes applied position of the apparatus.

In describing the invention only those parts and elements essential to a clear understanding of the same have been illustrated. Other parts actually present in the hopper cars to which the present invention appertains, have either

been shown diagrammatically or eliminated as unnecessary for an understanding of the same to those skilled in the art.

The invention is illustrated in connection with a conventional type hopper railway car 5 having the usual hoppers 6 and 7 and the center sill structure 8 extending between the two ends of the car and which is straddled by the hoppers. The sloped front walls 9 and 10 on each end of the car are connected to the upright supports 12 and 13 supported on the bottom end upon the decks 14 and 15 on the under frame of the car and above the center sill 8. The decks 14 and 15 are preferably arranged to completely close off the bottom of each end of the car to serve as a support for the various elements of the brake control equipment and also to protect the same from flying stones, weather conditions and the heat from fires thawing the car contents when frozen. Suitable struts such as 16 between the sloped wall 9 and deck 14 and another pair of struts 17 clamped together along the sloped wall 9 are provided for reinforcing and supporting purposes and may be suitably riveted or welded in place as desired.

In the following description the equipment and its operation will be described with reference to only one end of the hopper car, for example the end indicated at B, and it will be understood that the opposite end indicated at A is substantially a duplicate thereof and that there are no interconnecting brake controlling equipment such as rods, levers, etc., between the two ends of the car, except the usual air hose, not shown.

The brake cylinder 20 is mounted in a horizontal position and bolted to the deck 14 so that its push rod 21 extends outwardly where its clevis is pivoted at 22 to an intermediate portion of a bell crank member 23. The leg 24 of the bell crank 23 extends downwardly through an opening 19 in the deck plate 14 and at its lower end has a pivot 26 to which the brake tie rod 27 is connected. The brake rod 27 in turn is connected to the conventional brake foundation gear and levers diagrammatically indicated at 28 for actuation against the two sets of car wheels of the truck associated with only that one end of the car. The hand brake linkage indicated at 29 is pivoted to the long leg 24 and extends outwardly and upwardly at 30 to the top end of the hopper car in the usual manner where the hand brake wheel is located.

A link member 31 consisting of two identical spaced apart and elongated pieces 32 and 33 (see FIGURE 3) are pivoted together by pin 34 at their top ends on each side of the struts 17. The lower end of the link member 31 is connected to and is pivoted for movement about the push pin pivot 22. A slack adjuster indicated at 40 is pivoted by pin 41 at its upper end to the car struts 17 and its lower end is connected to pivot pin 42 which pin in turn is connected to the short leg 43 of bell crank 23. Both the slack adjuster 40 and link member 31 are arranged substantially parallel to one another and perpendicular to the horizontally mounted brake cylinder 20. The slack adjuster 40 is provided with trigger means for controlling the actuation of the slack adjuster. This consists of a bell crank member 44 arranged between the two links 32 and 33 and pivoted at its center by pin 45. One leg of bell crank 44 is connected by pivot pin 46 to a trigger rod 47. The opposite end of trigger rod 47 extends slidably through a bracket 48 attached to the car strut 17 on the sloped wall 9. An adjustable nut 49 is threaded adjacent the end of rod 47 and is arranged to act as a stop for the trigger rod 47 when it engages the bracket 48. The bell crank 44 is arranged between the two members 32 and 33 of link member 31 for free swinging movement therebetween. The bell crank 44 has its other leg connected by a pivot pin 50 to another trigger rod 51 slidable within a bracket 52 attached to the housing of the slack adjuster 40. An adjustable nut 53 on rod 51 is adapted to engage the bracket 52 and effect control of the slack adjuster under certain conditions of slack.

The slack adjuster 40 may be of the same construction and operation as that shown in applicant's prior application Ser. No. 464,381, filed June 16, 1965. In the present instance, however, the slack adjuster 40 is swung about and supported from its upper pivot 41 on the car frame in contradistinction to other slack adjusters which are usually arranged as part of the center rod or other structure between the dead and live levers of the brake rigging. As shown the slack adjuster 40 is not included directly as part of the brake linkage or rigging and therefore cannot rob the brake system of any of its energy. No rods, linkage or levers formerly required are necessary, because of the direct connection between the push rod 21, the lower end of the slack adjuster 40 and the brake system connected at 27 all of which are connected to the bell crank 23.

FIGURE 2 shows the braking equipment in the running position of the car while FIGURE 4 shows the displacement of the elements during a braking application. In describing the operation of the equipment it is pointed out that the ratios and forces applied are carefully calculated so that the maximum possible braking effort is applied to the brakes with a minimum movement of the elements. Since the braking equipment is associated with only one truck of the hopper car it is not necessary for the push rod 21 to be extended so as to operate within the standard distance of 8 inches as required by the railroad regulations. In the present instance this distance is shortened to $3\frac{1}{2}$ inches and the brake cylinder consequently shortened and made smaller without impairing brake efficiency. In addition, the length of the slack adjuster 40 can be considerably reduced due to its novel support and arrangement. Normally the brake cylinder 20 exerts a force of about 4000 pounds upon its pivot 22 and this force is transmitted through the long leg 24 of bell crank 23 so that a pull of about 4444 pounds is exerted on the pivot 26 where the brake linkage 27 is connected. There is a two to one ratio between the long leg 24 and short leg 43 of bell crank 23 so that the pivot 42 connected to the lower end of the slack adjuster 40 will move the adjuster downward a shorter distance than the lower end of long leg 24 pulls the brake rigging upon actuation of the push rod 21.

Assume the car to be in the running position and the braking equipment as shown in FIGURE 2, air pressure is admitted into brake cylinder 20 in the usual manner to project the push rod 21 forward. If normal wear is on the brake shoes and rigging, the movement of the push rod extends from the position indicated at C in FIGURE 4 to position D. The trigger mechanism is also rendered effective at this time by pivot pin 45 shifting bell crank 44 so that its lower leg 46 pulls the rod 47 forward until nut 49 stops the movement. When this occurs, pivot pin 50 on the other leg of bell crank 44 pulls down on the trigger rod 51 so that stop 53 engages bracket 52, and the outer housing on the slack adjuster is shifted downward slightly, to lock the unit. The internal detailed action of the slack adjuster is pointed out in the aforesaid prior application to which reference is made.

As a further result of the outward movement of push rod 21 and since the link lever 31 and slack adjuster 40 are now fixed as a solid link, the lower end 24 of the bell crank 23 to which the brake rod 27 is connected, is effective to apply the brakes through the rigging 28 to the wheels in the usual manner.

In the event that new brake shoes have been installed, the action of the brake control equipment is such that slack is let out during brake application. The push rod 21 through the medium of bell crank 23 pulls the brake rod 27 until the brake shoes engage the wheels of the car, thereby increasing tension in the system. The clutch in the slack adjuster 40 is thereby freed and the slack adjuster lengthens as the slack is let out. When the push rod has traveled to the point indicated at D, the slack adjuster is locked up and acts as a solid link so the full braking

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power can be applied to the brakes. This locking-up action occurs when the bell crank 44 pulls the rod 51 downward so the nut 53 engages trigger bracket 52 to shift the slack adjuster housing downward. Upon brake release, the power spring in the slack adjuster, as well as the weight of the braking equipment, restores the elements to running condition.

It will be noted that the full force of the brake cylinder push rod 21 is applied directly to the braking effort without loss of power because of the slack adjuster. The slack adjuster merely controls the extent of rotation of the bell crank 23 about its pivot 22 to alter the position of the lower leg 24 with respect to the excess or lack of slack which may exist in the braking system. The ratios and angularity between the slack adjuster 40, bell crank 23 and push rod 21, are such that only a small movement of the slack adjuster is necessary to correct the slack. It can, therefore, be made much smaller and easily fits in the end of the hopper car.

As the brake shoes become worn and looseness develops in the braking system, the push rod 21 will necessarily be projected beyond the point D in its travel, indicating an excess of slack. The slack adjuster is arranged to take up the slack upon brake release so that the next brake application will be normal. Upon excess slack occurring, the slack adjuster acts as a solid link when the brake shoes engage the wheels and tension is built up in the system, overcoming the power spring in the slack adjuster. The slack adjuster locks up when the trigger member 53 engages the slack adjuster after $3\frac{1}{2}$ inches of travel of the push rod 21. Upon release of the brakes, the power spring of the slack adjuster then forces the slack adjuster outward lengthening the same to take up the increased amount of slack. Upon the next brake application, the brake system will be normal and the push rod operated between the points C and D.

The important advantage of the present invention is the total absence of the long brake rods and rigging, the relatively short levers employed, the small movements of the elements to accomplish the braking action, as well as reliable correction of slack conditions. In addition, and of great importance, is the minimizing of the effect of angularity upon the push rod 21 over former types of push rods and levers, there being only a straight forward movement of the push rod employed. The entire equipment is protected from damage which may be received from below the car and all parts are readily accessible from the end of the car for installation and servicing. Since each truck has its individual brake control equipment, the failure of one set will not effect the equipment on the other end of the hopper car. The slack adjuster and brake cylinder can be made much smaller so that economies in cost are realized as well as space saving at the end of the hopper car for better accommodation of the other brake control equipment such as the AB control valve, reservoirs, brake cylinder release valve, retainer valve, etc.

While there has been illustrated and described a preferred embodiment of the invention, it is to be understood that this is capable of many variations and modifications, and it is desired, therefore, not to be limited to the precise details set forth, but only to those changes and variations as may fall within the purview of the appended claims.

What is claimed is:

1. In a brake mechanism for hopper cars, a brake cylinder and an automatic slack adjuster both arranged below the sloped front wall of one hopper on the car, said brake cylinder and said slack adjuster being arranged generally perpendicularly with respect to one another, said slack adjuster being pivoted to the sloped wall of said car for swinging movement about its pivoted end and its other end arranged adjacent the push rod of said brake cylinder, pivoted linkage means connecting the push rod with the said other end of said slack adjuster, said

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pivoted linkage means also being connected to the brake rigging for actuation by said brake cylinder.

2. In a brake mechanism for a hopper car having a front sloped wall and a closed deck below said sloped wall, a brake cylinder horizontally mounted on said car deck and having a push rod therein, a slack adjuster pivoted at its upper end to said car below said sloped wall and arranged generally perpendicularly to said brake cylinder, the lower end of said slack adjuster being swingable about the pivoted end thereof, a first link member arranged generally parallel to said slack adjuster and being pivoted at its upper end to said car, the lower end of said first link member being swingable about the pivoted end thereof, and a common link member to which the lower ends of said first link member, said slack adjuster, and said push rod are pivotally connected, said common link member being also connected to the brake rigging of said car whereby brake application and slack conditions are controlled.

3. In a braking arrangement for a hopper car having a front sloped wall on each end of the car, each end of the car having individual braking linkage associated with the braking equipment of only that end of the car, an individual brake cylinder mounted horizontally on each end of the car below said sloped wall, an individual slack adjuster at each end of the car arranged perpendicularly of said brake cylinder and pivoted at its upper end to the sloped wall, individual pivoted bell crank means having pivotal connection with the other end of each slack adjuster and with each brake cylinder, said pivoted bell crank means also having pivotal connection with said individual braking linkage on the end of the car, and an individual link member arranged parallel to said slack adjuster and pivoted at its upper end to said car sloped wall and at its lower end to said bell crank means.

4. In a braking arrangement for a hopper car having a front sloped wall on each end of the car, each end of the car having individual braking linkage associated with the braking equipment on only that end of the car, an individual brake cylinder mounted horizontally on each end of the car below the sloped wall, an individual slack adjuster arranged vertically on each end of the car below the sloped wall, said slack adjuster pivoted at its upper end to said sloped wall, individual pivoted bell crank means on each end of the car having pivoted connection with the lower end of each slack adjuster and with each brake cylinder, said bell crank means also having pivotal connection with said individual braking linkage whereby the operation of said brake cylinder transmits braking forces to said braking linkage and said slack adjuster compensates for slack condition, an individual link member pivoted at one end to said sloped wall and having its other end pivotally connected to said bell crank, said link member being arranged parallel to said slack adjuster and movable therewith, and trigger linkage means connecting said link member with said slack adjuster for controlling the operation of the same.

5. In a braking arrangement for a hopper type car having a front sloped wall on a deck below said sloped wall, a brake cylinder and associated push rod mounted horizontally in said car deck, a slack adjuster pivoted at its upper end to said sloped wall, said slack adjuster suspended vertically with respect to said brake cylinder, a link member pivoted at its upper end to said sloped wall and suspended vertically with respect to said brake cylinder and parallel to said slack adjuster, a bell crank having a short leg and a long leg extended therefrom, the lower end of said slack adjuster being connected to said short leg, the brake rigging on said car being connected to the end of said long leg, said long leg and said link member being arranged in alignment with one another, said bell crank having a pivot at the junction of said long and short legs, said push rod connected to said pivot and extending laterally from said pivot junction into said brake cylinder, said push rod effective to apply braking force

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against said pivot junction upon a brake application, to swing said link member and said slack adjuster about their upper pivoted ends whereby the braking action is effected by the long leg of said bell crank and slack adjustment takes place through the short leg attached to said slack adjuster.

6. In a braking arrangement for a hopper type car having a front sloped wall and a deck below said sloped wall, a brake cylinder and push rod mounted horizontally on said car deck, a slack adjuster pivoted at one end to said sloped wall, and arranged perpendicular of said brake cylinder, a link member pivoted at one end to said sloped wall and arranged parallel to said slack adjuster, a bell crank having one leg pivoted to the other end of said slack adjuster and the other leg connected to the brake rigging of said car, a pivot at the junction of the two legs of said bell crank to which said push rod and the lower end of said link member are connected, whereby the push rod is adapted to apply braking force to said bell crank pivot and effect braking action, and said slack adjuster control slack conditions, a second bell crank pivoted to said link member having a stop rod connected to one leg of said last bell crank, and the other end of the stop rod to said sloped wall, the other leg of said second bell crank being connected to said slack adjuster for control thereof.

7. In a braking arrangement for a hopper type car having a front sloped wall and a deck below said sloped wall, a brake cylinder and associated push rod supported horizontally on said car deck, a slack adjuster pivoted at one end to said sloped wall and arranged perpendicularly of said brake cylinder, a link member pivoted at one end to said sloped wall and arranged parallel to said slack adjuster, a bell crank having a pivoted connection with said brake cylinder push rod, and with the other end of said link member, said bell crank also having other separate pivotal connections with the other end of said slack adjuster and with the brake rigging of the car, whereby movement of said push rod is effective to cause a brake application in cooperation with said bell crank and said link member, and a trigger mechanism for controlling the action of said slack adjuster, said trigger mechanism comprising a second bell crank pivoted to said link member

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and having one leg with a connection to said slack adjuster for control of the same after a predetermined movement of the push rod, the other leg of said second bell crank lever having an adjustable connection to said sloped wall for limited sliding movement therewith.

8. In a hopper car and a braking assembly therefor, and in combination with the car frame, an independent braking assembly for the end of the hopper car, such assembly being beneath one of the forwardly or rearwardly inclined end hopper bottoms and having a closed deck therebeneath, a brake cylinder mounted beneath such hopper end and above such deck and having a suitable push rod, a generally upright slack adjuster depending from beneath each such hopper bottom, a link depending from beneath the hopper bottom, a bell crank having an intermediate portion pivoted to said link and to said push rod, said bell crank having one arm pivoted to the lower end of the depending slack adjuster and having a downwardly extending other arm formed and adapted to operate a brake rod located beneath such deck.

9. The structure of claim 8 characterized by and including a trigger connection for said slack adjuster formed and adapted to be actuated in response to movement of the push rod.

10. The structure of claim 8 characterized by and including a trigger connection for said slack adjuster formed and adapted to be actuated in response to movement of the push rod, the trigger connection including a trigger element movably mounted on the hopper, a trigger element movably mounted on the slack adjuster, and a connection therebetween including a lever movably mounted on the depending link.

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