Dec. 3, 1929. W. H. SAUVAGE 1,738,485

FOUNDATION BRAKE RIGGING

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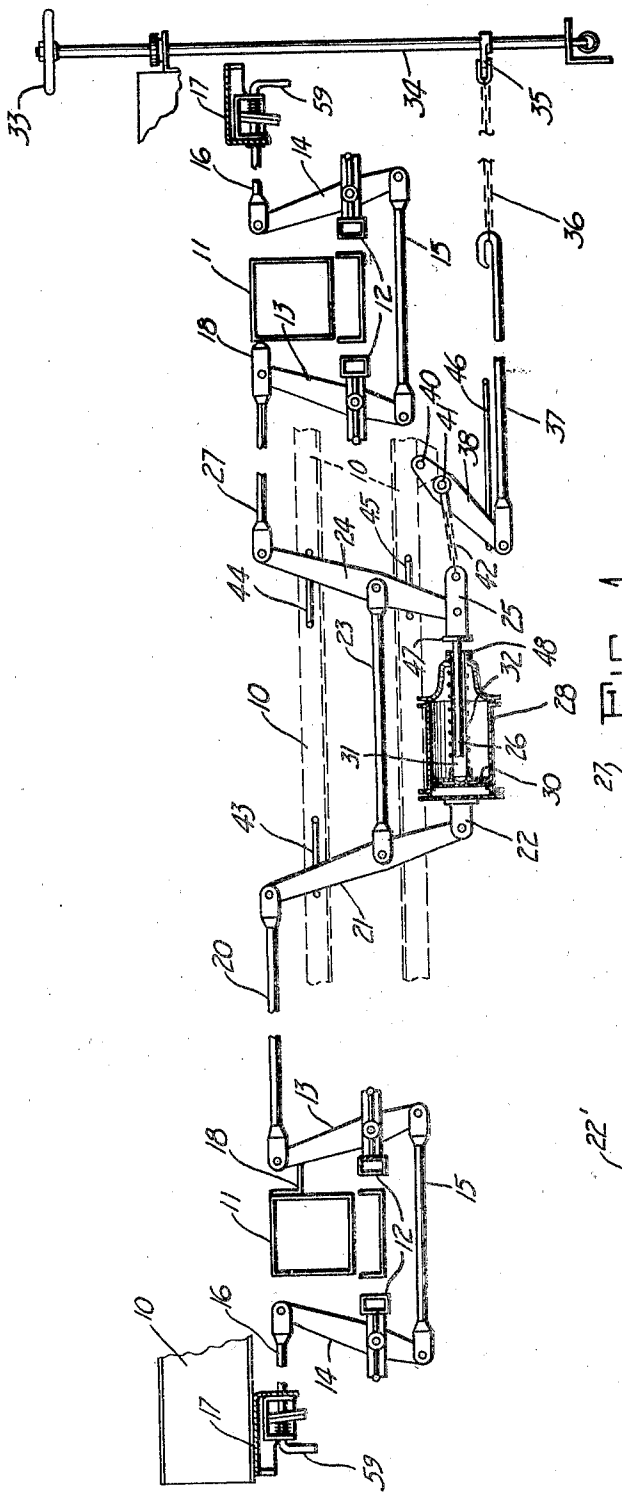


FIG. 1

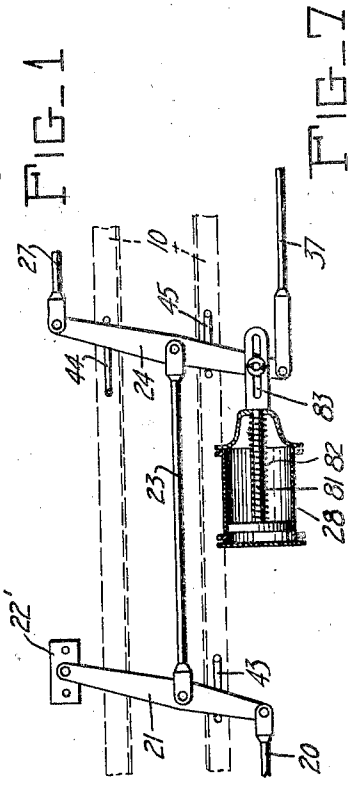


FIG. 7

INVENTOR
W. H. SAUVAGE
BY
ATTY.

Dec. 3, 1929. W. H. SAUVAGE 1,738,485

FOUNDATION BRAKE RIGGING

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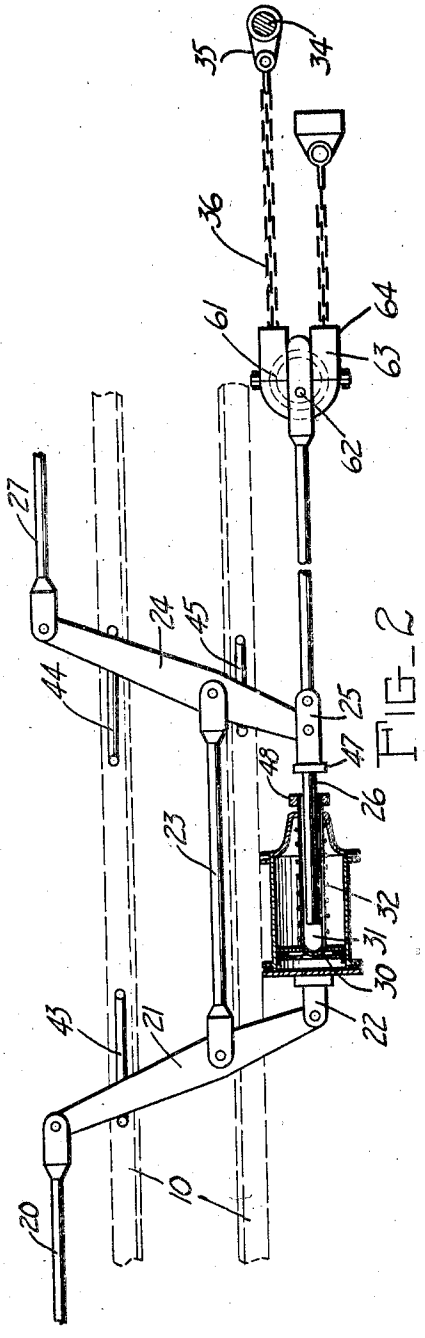


FIG. 2

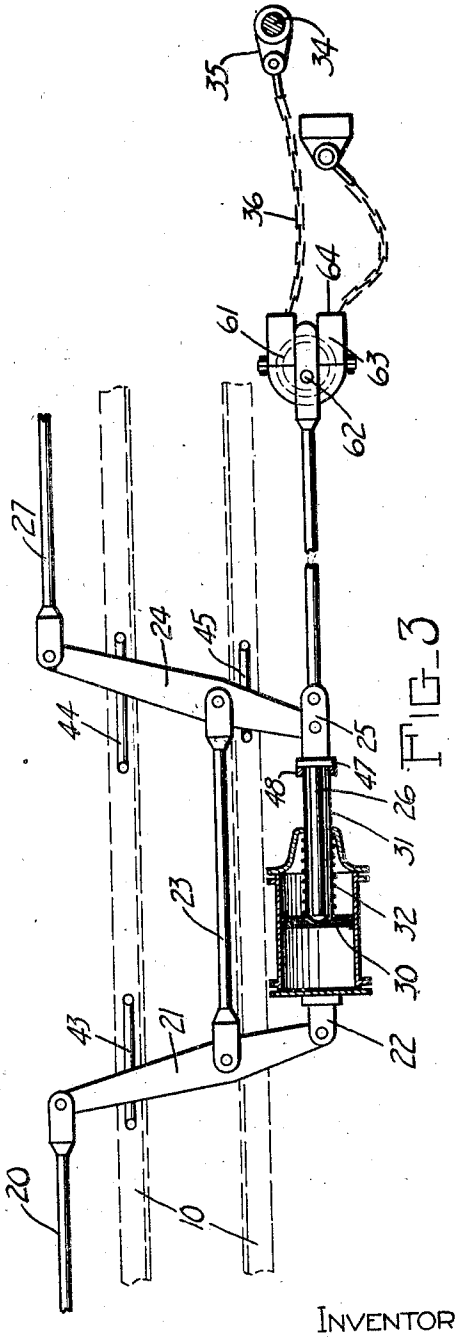


FIG. 3

INVENTOR

W.H. SAUVAGE

BY P. A. Klein

ATTY.

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FOUNDATION BRAKE RIGGING

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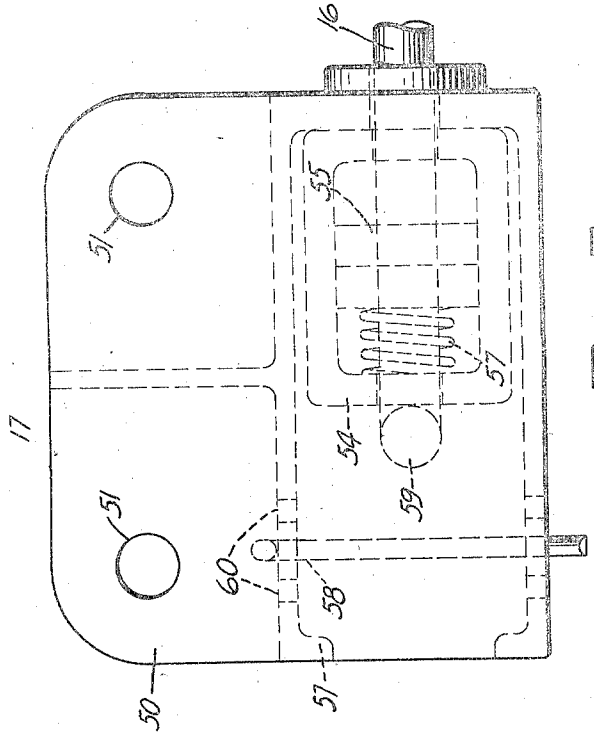


FIG. 5

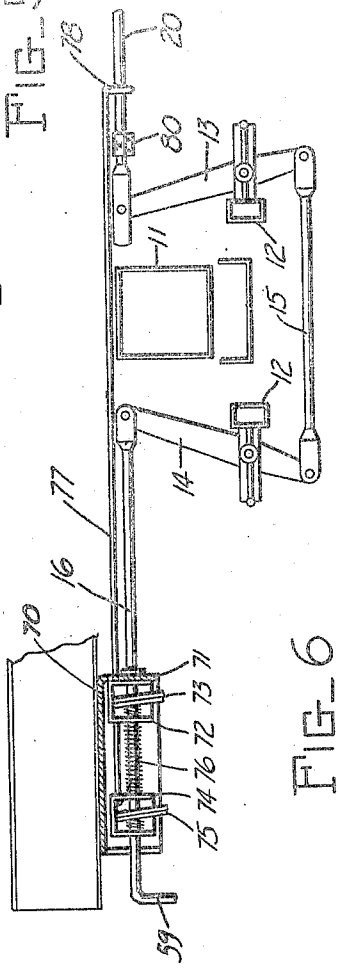


FIG. 6

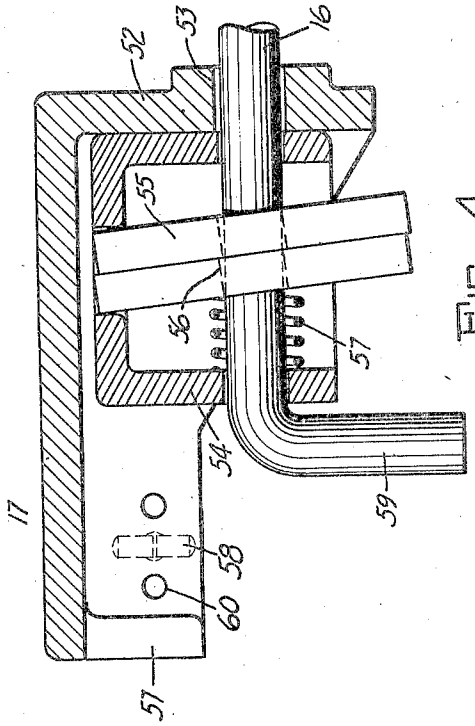


FIG. 4

INVENTOR

W. H. SAUVAGE

BY

ATTY.

Patented Dec. 3, 1929 1,738,485

UNITED STATES PATENT OFFICE

WILLIAM H. SAUVAGE, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO ROYAL RAILWAY IMPROVEMENTS CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

FOUNDATION BRAKE RIGGING

Application filed October 14, 1926. Serial No. 141,574.

This invention relates to improvements in foundation brake rigging for railway vehicles, and, for convenience of illustration, will be hereinafter described with relation to its application to an ordinary two truck railway freight car, altho it is, of course, to be understood that with only slight modifications, it may be applied to any type of railway vehicle equipped with either hand or power brakes, or both.

One of the objects of the present invention is to provide a foundation brake rigging system of the above general character which will be fool-proof in operation and which will result in greater safety to the car and its cargo either by itself or the entire train with the cars of which it is associated.

A further object is to provide a brake system of the above general character which will operate with maximum efficiency and instantaneously without shock either to the brake shoes or to the car and its contents.

A further object is to provide a brake system which will permit uniformity in both application and release of the brakes, either manually or under air pressure.

A further object is to insure uniform piston travel and consequent elimination of breakage and shocks due to irregular piston travel, dragging brakes, etc.

A further object is to provide a system which will compel the complete quick release or let-out of the dead lever fulcrums when new brake shoes are applied and permit instantaneous and absolutely correct readjustment.

A further object is to provide a brake system which is simple and practical in construction, will be strong and durable in use, and which will result in maximum power application when the brakes are applied, either manually or by air, without the use of auxiliaries, such as pick handles so frequently employed in actuating the hand brake gear.

Other objects will be in part obvious and in part hereinafter pointed out in connection with the following analysis of this invention, wherein is illustrated one of the various possible embodiments of the present invention, together with certain modifications in detail.

In the accompanying drawings wherein similar reference characters denote corresponding parts—

Figure 1 is a diagrammatic view, partly in plan, partly in elevation, and partly in section, showing the complete brake system in so far as this invention is concerned.

Figure 2 is a detail plan view of the central part of the brake system with a modified form of hand brake power multiplying device, the parts being shown in released position.

Figure 3 is a view similar to Figure 2 with the air brakes applied.

Figures 4 and 5 are detail sectional views taken at right angles of one form of regulator.

Figure 6 is an elevational view partly in section showing a modified type of regulator which may be actuated either manually or automatically.

Figure 7 is a modification of Figure 2.

Referring now to these drawings, and particularly to Figure 1, 10 indicates the draft sills of the car frame being shown in plan in the middle of the figure and in elevation at each end. At each end of the car there is provided the usual truck which is indicated diagrammatically by the bolsters 11 and associated truck brake rigging. This brake rigging comprises beams 12 carried by a live lever 13 and a dead lever 14. The lower ends of these levers are connected by a bottom rod 15, and the upper end of the dead lever 14 is provided with an anchor rod 16 held in relatively fixed position by means of regulator 17. This regulator, which will be hereinafter described more in detail, permits the rod 16 to be adjusted by an outward pull towards the end of the car, but will prevent relative inward movement or towards the center of the car as the brakes are applied.

Intermediate the truck bolster 11 and the upper end of the live lever 13, there is provided alternative stop means 18 limiting the return of the upper end of the live lever 13. A pull rod 20 extends from the top of the live lever to one end of one cylinder lever 21, the opposite end of which is fixed to the air brake cylinder or other suitable support 22. A tie rod 23 connects an intermediate point of the lever 21 with a corresponding point on the other cylinder lever 24. One end of this cylinder lever 24 is connected with a jaw 25 or air brake piston push rod 26 while the opposite end is connected by means of pull rod 27 with the live lever 13 of the opposite truck. The air brake cylinder, indicated at 28, is provided with a piston 30 having a sleeve 31 surrounding the piston rod 26. A return spring 32 normally holds the piston in full released position. Further details of construction regarding the air brake cylinder and associated parts and its coactive relation to the rest of the system will be given later.

At one end of the car, there is provided the usual hand brake mechanism which in the present form contemplates a hand wheel 33 at the upper end of a chain drum or staff 34. Near the lower part of this staff is a quick take-up arm 35. The outer end of this arm is pivotally connected to one end of chain 36, the purpose being that a half turn of the brake wheel will, by reason of the arm 35, take up most of the slack in the brake rigging and bring the brake shoes quickly into contact with the peripheries of the various wheels, after which the chain wraps around the staff 34 at low radius, and gives a slower rate of pull but greatly increased power.

The chain 36, in Figure 1, is preferably connected to a pull rod 37 which in turn is pivotally connected to the outer end of the rotary lever 38 having its inner end fulcrumed at 40 on any fixed part, such as the center draft sill. Intermediate the ends of this rotary lever and preferably at a ratio of about two or three to one, there is connected at 41 a chain 42, which in turn is connected to the outer end of the piston push rod 26. Thus it will be seen there is provided a second power multiplying device between the brake wheel and the cylinder piston rod, both of which have a limitedly increasing effective movement, for which reason it is highly desirable that positive and accurate brake regulating means or a regulator such as indicated at 17 should be provided to insure a proper relative positioning and functioning of the entire brake rigging with respect to the car wheels when the brakes are in full released position. Otherwise, should there be abnormal or insufficient travel of the rotary lever 38, for example, during a manual application of the brakes, and the maximum efficiency is not obtained, because when the lever 38 is at right angles to the center sills, then the maximum power and greatest efficiency is obtained. As this lever moves beyond a right angle position, other factors being the same, the power delivered begins to decrease. Likewise, the arm 35 on the brake staff should have passed to its maximum effective quick take-up movement to the point when shoes engage the wheels, after which the chain 36 begins to wrap around the staff at a much lower radius of action, thus giving the usual desired powerful pull upon the chain 36. It may be said that these power multiplying devices really act in series to produce the best results. Cooperating with the regulator 17 in the proper relative positioning of the brake levers with respect to the trucks, there is provided a number of brake lever hangers, for example, as at 43, 44 and 45. These hangers, which are accurately positioned, are preferably of flat U-shaped construction and as herein shown depend from the under side of the center sills. They are adapted to act as stops for the several levers on their full release position. Thus, when the regulator 17 is actuated, for example, the cylinder levers cannot possibly move beyond the positions shown in Figure 1 by reason of their engagement with the stops 43. Likewise, the opposite end of the live lever 24 is held against complete inward movement by engagement with one end of the hanger 44. In this manner, the shoes are just out of contact with the wheels, and it is impossible to wedge in a new shoe to replace a worn out shoe without releasing the dead lever fulcrum or regulator 17 which has most important advantages. The hanger 45 also holds the rotary lever 38 in its proper relative release position. Were it not for the hangers 43 to 45, particularly, the entire brake gear would be thrown out of angularity or position when one regulator 17 was actuated; that is, a continued pull on the upper end of the dead lever 14 would react thru the entire brake rigging to take up all of the slack throughout both truck brake riggings and distort the angular relation of the truck levers at the opposite end of the car to such an extent that a proper application of the brakes would be well-nigh impossible. The exact positioning of these supports has never heretofore been fully appreciated.

Referring back to the construction of the air brake cylinder, it will be noted that a space is provided between the piston head 30 and the piston rod 26. Also, that the tubular piston rod 31 is provided with a collar 48 adapted to coact with a shoulder 47 on the pivot jaw 25, and absorb the shock of emergency application. Thus the piston has a predetermined travel before the brake rigging is actuated. This predetermined travel should be approximately from two to three and a half inches, whereupon the brake levers are moved a further three or four inches to set

the brakes around seven inches standing piston travel, this feature being clearly shown in the normal and actuated positions, Figures 2 and 3.

It is customary to provide substantially seven inches piston travel for normal brake actuation when the car is standing or an eight inch piston travel when the car is running, the difference being due to a large extent, to the lost motion occasioned by the relative movement of the trucks, pedestals, journal boxes, etc., with respect to the car body at the king-pin point of connection.

The regulator, which is shown in detail in Figures 4 and 5, contemplates a casting bracket 50 riveted or otherwise secured to the center car sill or car body, as by means of the fastening device indicated at 51. This supporting plate or casting has a depending box 52 provided with a hole 53 thru which the regulator holding rod 16 is adapted to pass. This permits a relative swinging or universal joint movement to occur between the rod 16 and the hanger 52 as the trucks turn relative to the car body on rounding a curve.

Mounted upon and supported by the rod 16 is a depending U-shaped member 54 adapted to carry the regulator take-up dogs or clutch 55. These dogs are preferably of rectangular shape having an opening 56 thru which the rod 16 passes, the edges of the holes being case-hardened whereby they will bite into the rod when relative movement of the rod 16 towards the right tends to occur, but will permit free movement in the opposite direction. These dogs are held in canted position by means of spring 57. It is to be understood that this is only one of various possible forms of regulator, and no claim is made herein to the details of construction thereof except in so far as they may enter into the combinations hereinafter set forth; in fact, almost any of the so-called "slack adjusters," illustrated and described in a number of my expired patents, using chains, ratchets and screws, would answer the purpose with only slight modifications, the principal point being the provision of predetermined means which will permit a free relative movement of the rod in one direction, but prevent normal movement thereof in the opposite direction. Thus shims or ratchets, for example, could be used if desired, altho perhaps with less accuracy.

It will be noted that there is considerable space provided between the inside, left hand portion of the member 54 and the left hand side 57 of the depending wall anchor supporting member 52. This predetermined lost motion, regulated by pin 58 passing thru one of several holes 60, insures the proper brake shoe clearance between all of the brake shoes and the wheels with which they coact. In other words, a movement of the handle 59 towards the left carries with it the holding means and the box 54 until the box 54 engages the pin 58. At the end of this amount of travel if the brakes are in adjusted position, no further movement is permitted as the brake shoes are tight against the wheels, but if this is not the case, then the rod 16 moves farther relatively towards the left thru the holding dogs 55 which take up and permanently hold this excess motion. Incidentally, the actuation of handle 59 will bring the cylinder lever 21 snug against the left hand end of its lever guide or hangar 43, thereby preventing any further transmission of this regulating movement to the truck brake rigging at the opposite end of the car.

When the regulator 17 at the opposite end of the car is actuated, the same adjustment of the truck brake rigging occurs and in no way influences the relative positioning or angularity of the levers on the opposite truck due to the lever hangers.

In Figures 2 and 3, there is shown a modified form of power multiplying device interposed between the brake cylinder and the hand brake staff. In this construction there is shown the brake staff 34 about which the pull chain 36 is adapted to be wound as the brakes are manually applied. The opposite end of the chain 36 is anchored to any fixed part of the car as indicated after passing around a rolling lever 61 supported either directly or indirectly from the piston rod jaw 25.

This rolling lever is in the form of an eccentric chain sheave wheel pivoted off-center as at 62 and is preferably provided with a guard 63 adapted to prevent removal of the chain at all times, and especially when the piston is actuated, thereby causing slack to occur in the chain between the piston jaw and the brake staff; see Figure 3. This guard is preferably formed of two parts of stamped or cast metal which together form a flat cylinder enclosing the periphery of the rolling lever between its support and is provided with funnel ports 64 thru which the ends of the chain pass.

It will be noted that this eccentric rolling lever is so positioned and arranged with respect to the normal release position of the piston as to cause quick take up and then a gradual increasing power delivery as the chain wraps around the brake staff accompanied by a progressively decreasing rate of movement. These functions occur up to a certain point, and the lever may, therefore, be said to have a limited increasing effective movement. After the point of greatest eccentricity is passed, then the rolling lever delivers a gradual decreasing power accompanied by relatively increasing rate of movement. This, of course, is not entirely undesirable after the brake shoes have engaged the peripheries of a wheel for overloading is as bad as underloading. Consequently the importance of the regulator, above described, and the accurate relative location of the cyl-

inder lever hangers or hanger stops will be apparent, for these parts must occupy a normal predetermined position at rest with relation to the position of the rolling lever at that time. All of the parts, above mentioned, are so inter-related and coactively associated with each other to provide a complete brake mechanism having maximum efficiency.

In Figure 6, there is shown a modification of one of the truck brake riggings provided with a manually and automatically operating regulator. It is unnecessary to show the remaining parts of the system as the opposite end truck brake rigging is the same, and cylinder lever construction and hand brake actuating mechanism are all substantially the same as shown in Figure 1. In this construction the main parts of the truck brake rigging are as above described, and repetition is unnecessary. The regulator hanger casting 70 is provided with a depending end wall portion 71 thru which the regulator pull rod 16 is adapted to pass. Supported upon this rod 16 are two housings, one of which, housing 72, is provided with a manually operated take-up means, such as dogs 73, and spaced from this is a second take-up mechanism, or housing 74, having holding means or dog 75. These parts are held in spaced relation by means of a coiled spring 76 surrounding the rod 16, and the regulator 74 is connected by means of rod 77 with an eye 78 surrounding the pull rod 20. It will be noted that the dogs 73 and 75 are substantially the same in construction and operation as those described in connection with Figures 4 and 5.

The operation of this mechanism is as follows: When the handle 59 is actuated, both take-up mechanisms move relatively towards the left until the eye 78 coacts with the fastening device 80 or adjustable clamp near the connection of rod 20 with the live lever 13, but at the same time the brake levers 13 and 14 are moved to substantially applied position. Assuming, however, that some excess travel is present, then the pull rod 16 slides relatively thru the holding dogs 73 and 75 to entirely absorb this excess movement, and on release of the handle 59, the parts move back to the position shown, in which position the brakes are in absolutely perfectly adjusted position.

As to the automatic feature of this regulator, an application of the brakes will cause the member 80 to move towards the right, taking up the entire lost motion between this member and the eye 78. Any excess movement, however, causes the eye 78 to move relatively towards the right, carrying with it the automatic take-up means 74 and causes the compression of the spring 76. When the brakes are released, the parts tend to move to normal position. The spring 76, if compressed, will then expand and force the holding means 74 relatively towards the left, and the regulator dog 75 carries with it the rod 16 an amount exactly equal to the extent of compression. In this manner, all the excess travel is automatically taken up by this automatic device.

It is, of course, to be understood that at the opposite end of the car, a similar manual and automatic device is provided, thereby positively to insure the correct positioning of the truck brake levers, and, obviously, if these levers are in proper relative position, then those levers associated with the brake cylinder must also be in proper position, and consequently the power multiplying devices interposed between the piston cylinder and the brake staff must be in their normal position to give most efficient action when the brakes are manually applied.

From the above it will be seen that the entire brake system, including both the manual and automatic applying means, provide a highly efficient system and one adapted to fully overcome certain objections heretofore expressed. One of the most important of these is due to the fact that in the present case the cylinder levers, and, of course, the truck brake rigging with which they are connected have a limited range of movement substantially equal to one-half of the movement heretofore permitted, that is, for example, the jaw 25 will have only approximately a four inch travel for a standard seven inch standing travel of the brake cylinder piston or eight inch running travel. Consequently, the brake shoes are likewise held just out of contact with the peripheries of the wheel when in released position and due to their limited possible range of travel, the shocks upon the brake shoes and brake beams due to emergency application and the resultant cracking and breaking of the shoes and shoe heads is eliminated, and, further, due to this limited range of movement, it is impossible to replace a worn brake shoe by inserting a new one without first releasing the truck brake rigging regulator. From this, other advantages are necessarily present, such as the maintenance of the truck brake beams in alinement substanatially parallel to the truck axes, and consequently decreases the racking and warping of these beams, especially in emergency applications, due to unequal brake shoe travel and broken brake shoes.

If the entire train is equipped with a brake system of this character, it will be quite apparent to these skilled in the art that uniform time brake application takes place upon each car; likewise uniform time piston travel and uniform time release; and, consequently, there is no danger of the brakes of one car going on ahead of those on another car, thereby preventing intermediate shocks and internal collisions along the entire length of the train causing the cars to pile up or become derailed. Likewise, upon release of the brakes,

they all release equally, uniformly, and simultaneously, eliminating jerking and bumping of the train when power is applied from the engine. There is no dragging of the wheel, and the consequent troubles incident thereto. The proper angularity of the levers immediately gravitates the shoes away from the wheels. The above are only a few of the many advantages and objects incident to a foundation brake system of this character, and many others will doubtless occur or be obvious to those skilled in the art. The parts are all coactively related, one with the other, to accomplish the above among other objects in a simple, safe, practical, reliable and efficient manner.

In this connection it may be noted that the stop 46, Figure 1, might be omitted if the length of the parts 36 and 37 were accurately determined at the time of installation. Also the parts 18 could be omitted or even substituted for the supports 43 and 44, altho the latter are far more desirable inasmuch as twisting or turning of the trucks when rounding a curve in no way affects the angularity of the truck levers.

Reference is also made to the construction shown in Fig. 7, diagrammatically illustrating an alternative arrangement of cylinder levers. Of course, both Figures 1 and 7 are to a large extent diagrammatic, and the arrangement shown in Fig. 1 is such that the regulator handles 59 will be upon the same side of the car. The arrangement shown in Fig. 7 would result in the regulator handles being upon opposite sides of the car. In other words, the dead lever 21 instead of being anchored at 22 to the rear of the cylinder is secured to any relatively fixed part of the car frame, as indicated at 22'. It will also be noted that the cylinder 28 is in this case provided with a solid piston 81 surrounded by a return spring 82 and having a slotted bifurcated jaw 83 embracing the end of the cylinder lever 24. This slotted jaw is of such length as to permit the piston to move substantially half of its path of travel before actuating the live lever, thus accomplishing substantially all of the objects and advantages associated with the construction shown in Figure 1.

I claim:

1. In a foundation brake rigging of the character described, in combination, truck and cylinder levers and hangers, a cylinder, a piston movable therein, and means permitting said piston to move substantially half of its normal travel before actuating said levers, said means including a two part piston rod, one of which parts is mounted upon the piston, and the other associated with a cylinder lever, said parts having a slidable relation and effectively engage each other outside of said cylinder.

2. In a foundation brake rigging of the character described, in combination, truck and cylinder levers and hangers, a cylinder, a piston movable therein, means permitting said piston to move substantially part of its distance before actuating said levers, said means including a two part piston rod, one of which parts is mounted upon the piston, and the other associated with a cylinder lever, said parts having a slidable relation, and means independent of the cylinder and piston for preventing the second part returning the full distance of the return movement of the piston.

3. In a foundation brake rigging of the character described, in combination, truck and cylinder levers and hangers, a cylinder, a piston movable therein, means permitting said piston to move a substantial part of its distance before actuating said levers, said means including a two part piston rod, one of which parts is mounted upon the piston, and the other associated with a cylinder lever, said parts having a slidable relation, means for preventing the second part returning the full distance of the return movement of the piston, and a hanger or a stop associated with the cylinder lever adapted to limit the return movement of said lever.

4. In a foundation brake rigging of the character described, in combination, truck and cylinder levers and hangers, a cylinder, a piston movable therein, means permitting said piston to move a substantial part of its distance before actuating said levers, said means including a two part piston rod, one of which parts is mounted upon the piston, and the other associated with a cylinder lever, said parts having a slidable relation, and means for preventing the second part returning the full distance of the return movement of the piston, said means including two supporting means for the cylinder levers adapted to limit the return movement thereof and maintain the same in fixed position relative to the truck brake rigging when in released position.

5. In a foundation brake rigging of the character described, in combination, truck and cylinder levers and hangers, a cylinder, a piston movable therein, means permitting said piston to move a substantial part of its distance before actuating said levers, said means including a two part piston rod, one of which parts is mounted upon the piston, and the other associated with a cylinder lever, said parts having a slidable relation, said second part being provided with a jaw to which the cylinder lever is pivotally connected, and a collar on the first part adapted to abut said jaw and move the same after said first part has completed substantially one-half of its application movement.

6. In a foundation brake rigging of the character described, in combination, truck and cylinder levers and stop hangers, a cyl-

inder, a piston movable therein, means permitting said piston to move a substantial part of its distance before actuating said levers, said means including a two part piston rod, one of which parts is mounted upon the piston, and the other associated with a cylinder lever, said parts having a slidable relation, said second part being provided with a jaw to which the cylinder lever is pivotally connected, a collar on the first part adapted to abut said jaw and move the same after said first part has completed substantially one half of its application movement, and a spring within said cylinder adapted to return the first part to full released position.

7. In a foundation brake rigging of the character described, in combination, cylinder levers, a cylinder having a two part piston rod, one of which telescopes with the other, one part being mounted upon the piston and the other part being connected with said levers, and coacting means on said parts adapted to be brought into engagement after the first part has moved a predetermined distance, truck brake rigging connected with said piston, and hangers accurately positioned for supporting certain of said levers whereby their return movement is limited.

8. In a foundation brake rigging of the character described, in combination, cylinder levers, a cylinder having a two part piston rod, one of which telescopes with the other, one part being mounted upon the piston and the other part being connected with said levers, coacting means on said parts adapted to be brought into engagement after the first part has moved a predetermined distance, truck brake rigging connected with said piston, hangers accurately positioned for supporting certain of said levers whereby their return movement is limited, and a regulator associated with each truck brake rigging adapted to take up any excess travel existing in said rigging.

9. In a foundation brake rigging of the character described, in combination, cylinder levers, a cylinder having a two part piston rod, one of which telescopes with the other, one part being mounted upon the piston and the other part being connected with said levers, coacting means on said parts adapted to be brought into engagement after the first part has moved a predetermined distance, truck brake rigging connected with said piston, hangers accurately positioned for supporting certain of said levers whereby their return movement is limited, and a regulator associated with each truck brake rigging adapted to take up any excess travel existing in said rigging, said regulators being connected with the car body and permitting relative movement of each truck.

10. In a foundation brake rigging of the character described, in combination, cylinder levers, a cylinder having a two part piston rod, one of which telescopes with the other, one part being mounted upon the piston and the other part being connected with said levers, coacting means on said parts adapted to be brought into engagement after the first part has moved a predetermined distance, truck brake rigging connected with said piston, hangers accurately positioned for supporting certain of said levers whereby their return movement is limited, a regulator associated with each truck brake rigging adapted to take up any excess travel existing in said rigging, said regulators being connected with the bar body and permitting relative movement of each truck, and means adapted to prevent actuation of one regulator from influencing the position of the levers associated with the other truck.

11. In a foundation brake rigging of the character described, in combination, cylinder levers, a cylinder having a two part piston rod, one of which telescopes with the other, one part being mounted upon the piston and the other part being connected with said levers, coacting means on said parts adapted to be brought into engagement after the first part has moved a predetermined distance, truck brake rigging connected with said piston, hangers accurately positioned for supporting certain of said levers whereby their return movement is limited, a regulator associated with each truck brake rigging adapted to take up any excess travel existing in said rigging, said regulators being connected with the car body and permitting relative movement of each truck, and means adapted to prevent actuation of one regulator from influencing the position of the levers associated with the other truck, said means including hangers for the cylinder levers adapted to act as stops for limiting their return movement beyond predetermined position.

12. In a foundation brake rigging of the character described, in combination, a cylinder, a two part piston mounted therein, one of which parts is adapted to be engaged and moved by the other part after said other part has completed substantially one-half of its range of travel, and a manually operated hand brake mechanism connected with one of said parts whereby it may be moved independently of the other.

13. In a foundation brake rigging of the character described, in combination, a cylinder, a two part piston mounted therein, one of which parts is adapted to be engaged and moved by the other part after said other part has completed substantially one-half of its range of travel, a manually operated hand-brake mechanism connected with one of said parts whereby it may be moved independently of the other, and power multiplying de-

vices interposed between said parts and the manually actuated brake mechanism.

14. In a foundation brake rigging of the character described, in combination, a cylinder, a two part piston mounted therein, one of which parts is adapted to be engaged and moved by the other part after said other part has completed substantially one-half of its range of travel, a manually operated hand brake mechanism connected with one of said parts whereby it may be moved independently of the other, and power multiplying devices interposed between said parts and the manually actuated brake mechanism, said power multiplying devices including a lever mechanism having a limited effectively increasing power delivery.

15. In a foundation brake rigging of the character described, in combination, an air brake cylinder, a two part piston mounted therein, one of which parts telescopes with respect to the other and is effective only after completing substantially one-half of its range of movement, and a quick acting manually actuated hand brake element connected with said part having the shorter range of movement whereby it may move rapidly without moving said piston.

16. In a foundation brake rigging of the character described, in combination, an air brake cylinder, a two part piston mounted therein, one of which parts telescopes with respect to the other and is effective only after completing substantially one-half of its range of movement, and a quick acting manually actuated hand brake element connected with said part having the shorter range of movement whereby it may move rapidly without moving said piston, the connections between said piston and hand-brake element including two power multiplying devices, both having limited increasingly effective movements.

17. In a foundation brake rigging of the character described, in combination, an air brake cylinder, a two part piston mounted therein, one of which parts telescopes with respect to the other and is effective only after completing substantially one-half of its range of movement, and a quick acting manually actuated hand brake element connected with said part having the shorter range of movement whereby it may move rapidly without moving said piston, the connections between said piston and hand brake element including two power multiplying devices, both having limited increasingly effective movements, one of said power multiplying devices including a leverage mechanism adapted to give progressively increasing power at progressively decreasing rate of movement up to a certain predetermined amount of travel.

18. In a foundation brake rigging of the character described, in combination, an air brake cylinder, a two part piston mounted therein, one of which parts telescopes with respect to the other and is effective only after completing substantially one-half of its range of movement, a quick acting manually actuated hand brake element connected with said part having the shorter range of movement whereby it may move rapidly without moving said piston, the connections between said piston and hand brake element including two power multiplying devices, both devices having limited increasing effective movements, one of said power multiplying devices including a leverage mechanism adapted to give progressively increasing power at progressively decreasing rate of movement up to a certain predetermined amount of travel, and regulator means associated with said system whereby full application of the brakes, either manually or by air, is co-incident with the maximum power delivery of said second power multiplying device.

19. In a foundation brake rigging of the character described, in combination, a brake cylinder, a piston mounted therein, levers connected with said piston, truck brake rigging connected with said levers, and a manually operable hand brake mechanism connected with one of said cylinder levers, said connection including a bodily movable power multiplying device adapted to give gradually increasing power with gradually decreasing rate of movement up to a certain maximum, and a regulator associated with the truck brake rigging in such position that full application of the brakes will be co-incident with the point of maximum power delivery.

20. In a foundation brake rigging of the character described, in combination, a brake cylinder, a piston mounted therein, levers connected with said piston, truck brake rigging connected with said levers, and a manually operable hand brake mechanism connected with one of said cylinder levers, said connection including a power multiplying device adapted to turn about a pivot and to give gradually increasing power with gradually decreasing rate of movement up to a certain maximum, and a regulator associated with the truck brake rigging in such position that full application of the brakes will be co-incident with the point of maximum power delivery, said regulator including means for normally anchoring one of the levers of the truck brake rigging against movement in one direction but adapted to permit movement thereof in the opposite direction.

21. In a foundation brake rigging of the character described, in combination, a brake cylinder, a piston mounted therein, levers connected with said piston, truck brake rigging connected with said levers, and a manually operable hand brake mechanism connected with one of said cylinder levers, said connection including a power multiplying device adapted to give gradually increasing power with gradually decreasing rate of

movement up to a certain maximum, a regulator associated with the truck brake rigging in such position that full application of the brakes will be co-incident with the point of maximum power delivery, said regulator including means for normally anchoring one of the levers of the truck brake rigging against movement in one direction but adapted to permit movement thereof in the opposite direction, and means associated with the regulator whereby a regulating movement of the dead lever may be accomplished if excess travel beyond a predetermined amount occurs.

22. In a foundation brake rigging of the character described, in combination, a cylinder, a two part piston mounted therein, said parts having a telescopic relation, the outer of said parts being adapted to be engaged by the inner of said parts after the inner part has moved a predetermined distance out of the cylinder under air pressure, a spring for returning the said inner part to normal position, cylinder levers connected with said outer part adapted to transmit motion to the truck brake levers, and a manually actuated hand brake member connected with said outer part of said piston whereby motion may be manually transmitted to the truck brake rigging.

23. In a foundation brake rigging of the character described, in combination, a cylinder, a two part piston mounted therein, said parts having a telescopic relation, the outer of said parts being adapted to be engaged by the inner of said parts after the inner part has moved a predetermined distance out of the cylinder under air pressure, a spring for returning the said inner part to normal position, cylinder levers connected with said outer part adapted to transmit motion to the truck brake levers, and a manually actuated hand brake member connected with said outer part of said piston whereby motion may be manually transmitted to the truck brake rigging, means adapted to prevent the brake levers from returning to a position beyond normal, and a regulator associated with the truck brake rigging and cooperating with said means whereby full return movement and no more may be definitely established.

24. In a foundation brake rigging of the character described, in combination, a cylinder, a two part telescoping piston mounted therein, a spring for returning the said inner part to normal position, cylinder levers connected with said outer part adapted to transmit motion to the truck brake levers, and a manually actuated hand brake member connected with said outer part of said piston whereby brake applying motion may be manually transmitted to the truck brake rigging.

25. In a foundation brake rigging of the character described, in combination, truck and cylinder levers, a cylinder, a piston movable within said cylinder, a piston rod actuated by the piston and having a lost motion connection interposed between the piston and the cylinder lever whereby the piston moves substantially half of its range of travel before actuating said cylinder lever, and means independent of said cylinder and piston for limiting the return movement of the cylinder lever when the brakes are released.

26. In a foundation brake rigging of the character described, in combination, truck and cylinder levers, a cylinder, a piston movable within said cylinder, a piston rod actuated by the piston and having a lost motion connection interposed between the piston and the cylinder lever whereby the piston moves substantially half of its range of travel before actuating said cylinder lever, and means for limiting the return movement of the cylinder lever when the brakes are released, said means including supporting guides for said cylinder lever.

27. In a foundation brake rigging of the character described, in combination, truck brake rigging and cylinder levers connected therewith, regulators for maintaining the desired angularity thereof, a cylinder, a piston movable therein and having a lost motion connection with one of said cylinder levers, whereby the piston moves substantially half of its path of travel before actuating said levers, and cylinder lever supports so positioned and arranged as to limit the movement of said levers when said regulators are actuated.

28. In a foundation brake rigging of the character described, in combination, truck brake rigging and cylinder levers connected therewith, regulators for maintaining the desired angularity thereof, a cylinder, a piston movable therein and having a lost motion connection with one of said cylinder levers, whereby the piston moves substantially half of its path of travel before actuating said levers, cylinder lever supports so positioned and arranged as to limit the movement of said levers when said regulators are actuated, and means adapted to limit the return movement of the live lever to substantially half the range of movement of the piston when the brakes are released.

29. In a foundation brake rigging of the character described, in combination, an air brake cylinder, a piston mounted therein having a lost motion connection with said rigging whereby it is effective to actually apply the brakes only after completing substantially half of its range of movement, and a quick acting manually operated hand brake element connected with said rigging whereby it may be moved approximately the last half of the normal application travel of the piston without moving said piston.

30. In a foundation brake rigging of the character described, in combination, truck

and cylinder levers, an air brake cylinder, a piston movable therein, means permitting said piston to move substantially half of its normal actuating movement before actuating said levers, and regulating means associated with said levers for maintaining their normal angularity whereby uniform piston travel and predetermined brake shoe clearance are maintained.

31. In a foundation brake rigging of the character described, in combination, a cylinder, cylinder levers connected therewith, a two part telescoping piston mounted therein, one of which parts is adapted to be engaged and moved by the other part during substantially the last half of its range of travel, a manually operated hand brake mechanism connected with the inner telescoping part of said piston, whereby it may move independently of the other, and regulating means associated with the rigging for maintaining the normal angularity of said cylinder levers.

32. In a foundation brake rigging of the character described, in combination, truck and cylinder levers, a cylinder connected therewith, a piston movable within said cylinder, a piston rod actuated by the piston and having a lost motion connection therewith, whereby the piston rod is moved during substantially the last half of the range of travel of the piston, and regulating means connected with the cylinder levers for maintaining their angularity and insuring proper brake shoe clearance at the truck levers.

33. In a foundation brake rigging of the character described, in combination, truck and cylinder levers, an air brake cylinder, a piston movable therein, means permitting said piston to move substantially half of its normal actuating movement before actuating said levers, and substantially instantaneously and manually operable regulating means associated with said levers for changing their normal angularity as wear occurs whereby uniform piston travel and predetermined brake shoe clearance are maintained.

34. In a foundation brake rigging of the character described, in combination, a cylinder, cylinder levers connected therewith, a two part telescoping piston mounted therein, one of which parts is adapted to be engaged and moved by the other part during substantially the last half of its range of travel, a manually operated hand brake mechanism connected with the inner telescoping part of said piston, whereby it may move independently of the other, and substantially instantaneously and manually operable regulating means associated with the rigging for changing the normal angularity of said cylinder levers.

35. In a foundation brake rigging of the character described, in combination, truck and cylinder levers, a cylinder connected therewith, a piston movable within said cylinder, a piston rod actuated by the piston and having a lost motion connection therewith, whereby the piston rod is moved during substantially the last half of the range of travel of the piston, and substantially instantaneously and manually operable regulating means connected with the cylinder levers for changing their angularity as wear occurs thereby insuring proper brake shoe clearance at the truck levers.

Signed at New York, New York, this 16th day of September, 1926.

WILLIAM H. SAUVAGE.