May 8, 1934. H. L. BONE ET AL 1,958,293

RAILWAY CAR RETARDER

Filed May 12, 1932 3 Sheets-Sheet 1

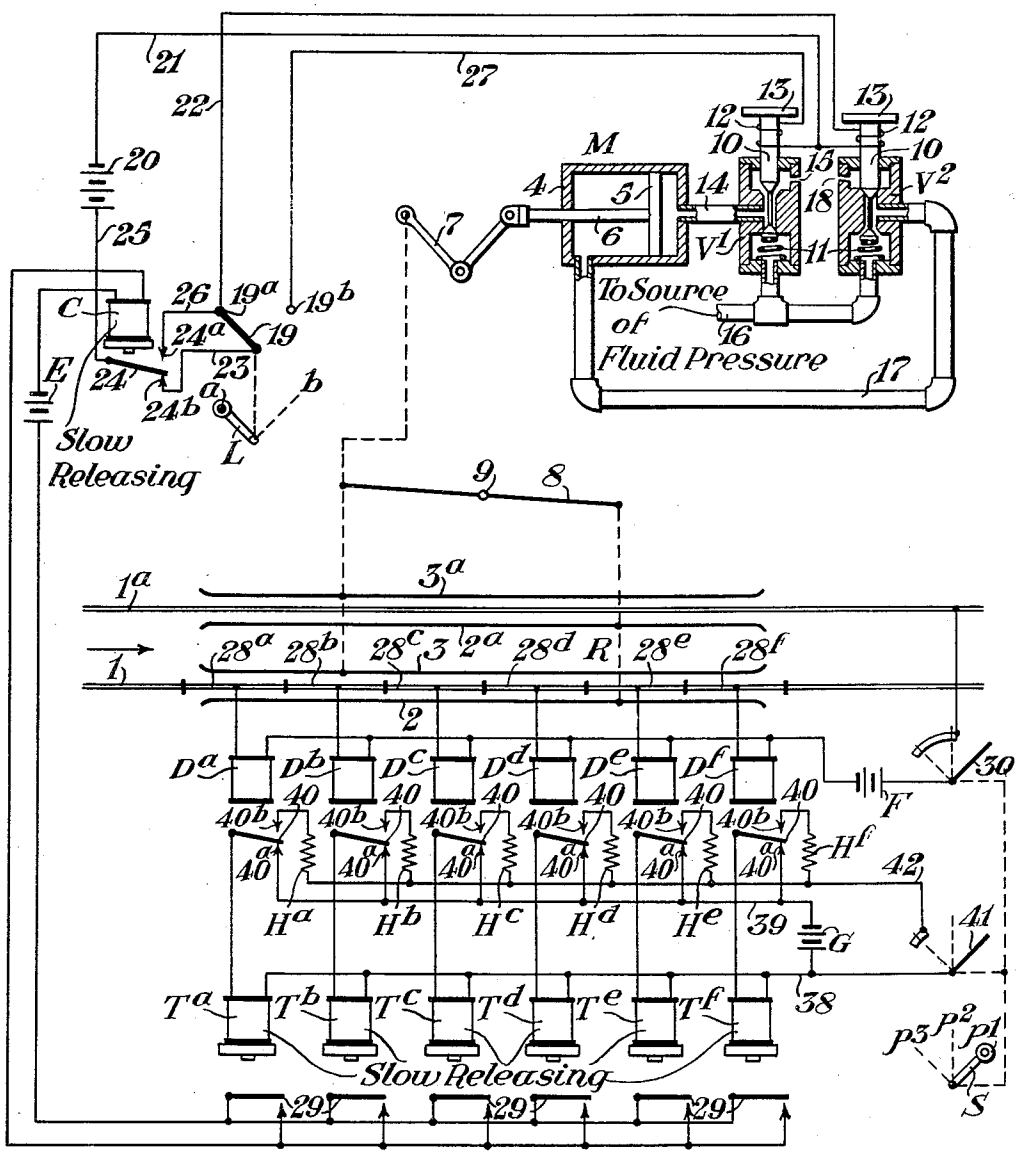


Fig. 1.

INVENTORS
Herbert L. Bone and
BY John W. Livingston.
THEIR ATTORNEY

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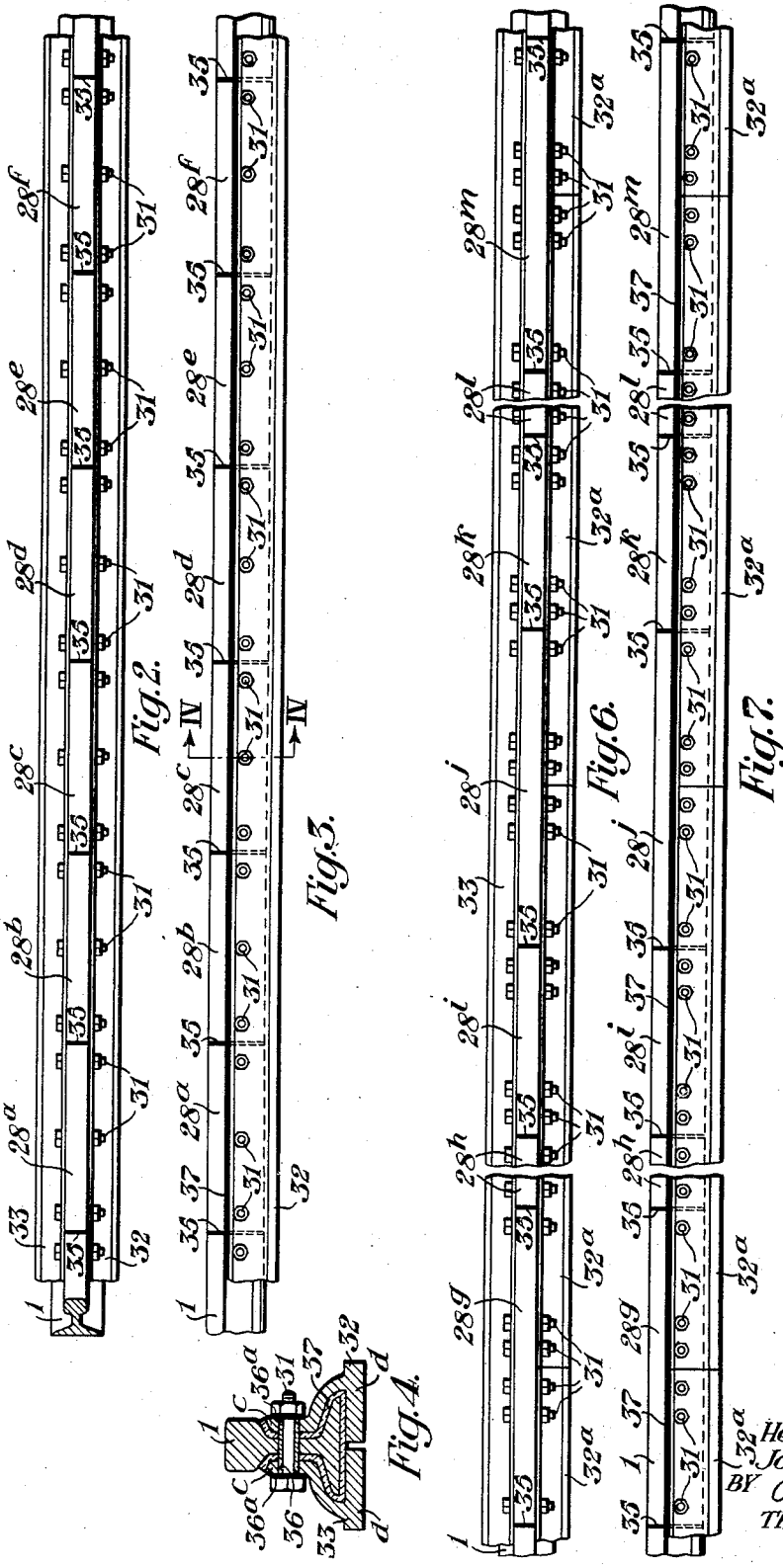


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 6.

Fig. 7.

INVENTORS
Herbert L. Bone and
John W. Livingston.
BY A. R. Verrill
THEIR ATTORNEY

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RAILWAY CAR RETARDER

Filed May 12, 1932 3 Sheets-Sheet 3

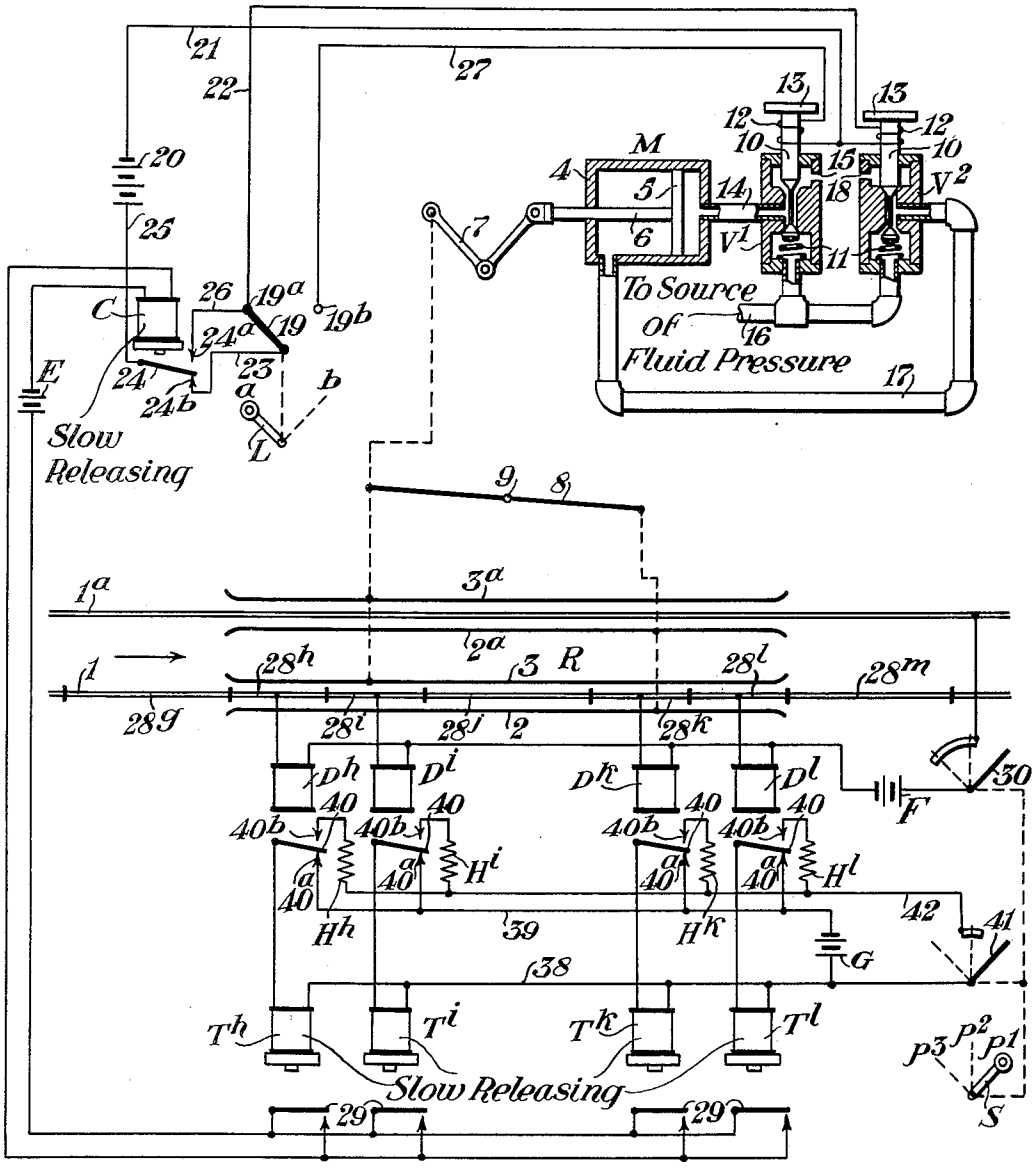


Fig. 5.

INVENTORS.
Herbert L. Bone and
BY John W. Livingston.
A. R. Kenicill
THEIR ATTORNEY

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1,958,293

UNITED STATES PATENT OFFICE

1,958,293

RAILWAY CAR RETARDER

Herbert L. Bone, Swissvale, and John W. Livingston, Wilkinsburg, Pa., assignors to The Union Switch & Signal Company, Swissvale, Pa., a corporation of Pennsylvania

Application May 12, 1932, Serial No. 610,842

16 Claims. (Cl. 303—21)

Our invention relates to railway car retarders, and particularly to car retarders of the track brake type used in classification or hump yards of railroads for controlling the speed of cars.

One object of our invention is the provision of improved automatic apparatus for controlling the braking action of a car retarder of the type described in accordance with the speed of cars approaching or passing through the retarders.

We will describe one form of car retarder controlling apparatus embodying our invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a view, partially sectioned and partially diagrammatic, illustrating one form of aparatus embodying our invention. Figs. 2 and 3 are top plan and side views, respectively, showing a specially built track rail adapted for use in connection with the apparatus illustrated in Fig. 1. Fig. 4 is a sectional view taken on the line IV—IV of Fig. 3. Fig. 5 is a view partly sectioned and partly diagrammatic illustrating a modified form of the apparatus shown in Fig. 1, and also embodying our invention. Fig. 6 is a top plan view showing another form of specially constructed rail adapted for use in connection with the apparatus illustrated in Fig. 5. Fig. 7 is a side view of the rail shown in Fig. 6.

Similar reference characters refer to similar parts in each of the several views.

Referring first to Fig. 1, the reference characters 1 and 1^a designate the track rails of a stretch of railway track over which cars normally move in the direction indicated by the arrow under such conditions that it is desirable to at times control the speed of the cars automatically. For example, the stretch of track here shown might be in a classification yard of the "hump type" through which cars move under the influence of gravity. It is obvious that in service of this kind, the speed of individual cars or strings of cars will vary through wide limits, depending among other things, upon the speed at which they go over the hump, the temperature, the weight of car and contents, and the condition of the car as to whether it is a free running car or otherwise.

In order to control the speed of the cars, the stretch of track illustrated in the drawings is provided with a car retarder R which, in the form here shown, comprises two braking bars 2 and 3 extending parallel with and located on opposite sides of rail 1, and two similar braking bars 2^a and 3^a extending parallel with and located on opposite sides of rail 1^a.

The braking bars 2, 3, 2^a and 3^a are operated by fluid pressure motor M comprising a cylinder 4 containing a reciprocable piston 5 attached to one end of a piston rod 6. The braking bars 2, 3, 2^a and 3^a are operatively connected with the piston rod 6 through suitable linkwork including a bell crank 7 and a lever 8 pivotally supported at point 9. When piston 5 occupies its extreme right-hand position, in which it is illustrated in the drawings, the braking bars occupy their non-braking or ineffective positions in which they are out of engagement with the wheels of a car traversing the rails 1 and 1^a. When piston 5 is moved to its left-hand position, however, as when fluid pressure is admitted to the right-hand end of cylinder 4, the braking bars 2, 3, 2^a and 3^a are moved toward the associated rail to their effective or braking positions in which they will engage the wheels of a car traversing the rails 1 and 1^a, to retard the speed of the car.

The motor M is controlled by two magnet valves V^1 and V^2, each comprising a valve stem 10 biased to an upper position by means of a spring 11, and provided with a winding 12 and an armature 13. When winding 12 of valve V^1 is deenergized as shown in the drawings, valve stem 10 of this valve is moved to its upper position by the spring 11, and under these conditions, the right-hand end of cylinder 4 is connected with atmosphere through a pipe 14 and a port 15. When winding 12 of this valve is energized, however, valve stem 10 is moved downwardly against the bias of spring 11 to disconnect pipe 14 from atmosphere, and to connect this pipe with a suitable source of fluid pressure, usually air, through a pipe 16. When winding 12 of valve V^1 is energized, therefore, the fluid pressure supplied to the right-hand end of cylinder 4 moves piston 5 toward the left, thereby moving the braking bars to their effective or braking positions.

When winding 12 of valve V^2 is deenergized, valve stem 10 of this valve is moved to its upper position, and the left-hand end of cylinder 4 is then connected with atmosphere through a pipe 17 and a port 18. When winding 12 of valve V^2 is energized, however, as shown in the drawings, valve stem 10 is moved downwardly, disconnecting pipe 17 from port 18, and connecting pipe 17 with pipe 16. It will be apparent, therefore, that when valve V^2 is energized, piston 5 of motor M is urged toward the

right, thus holding the braking bars in their ineffective or non-braking positions.

The magnet valves V^1 and V^2 are controlled by means of a normally deenergized slow-releasing control relay C, and by a manually operable lever L. The lever L, in the form here shown, is capable of assuming a left-hand position *a*, in which it is illustrated in the drawings, and a right-hand position *b* indicated by a dotted line in the drawings. Operatively connected with the lever L is a contact arm 19 which engages a fixed contact 19^a or 19^b to close a contact $19—19^a$ or $19—19^b$ according as lever L occupies its *a* or *b* position.

Winding 12 of valve V^2 is provided with a circuit which passes from a suitable source of current, here shown as a battery 20, through wire 21, winding 12 of valve V^2, wire 22, contact $19—19^a$ of lever L, wire 23, back contact $24—24^b$ of relay C, and wire 25 back to battery 20. Winding 12 of valve V^2 is also provided with another circuit which is similar to the circuit just traced with the exception that this circuit includes a wire 26 and a front contact $24—24^a$ of relay C, instead of contact $19—19^a$ of lever L, wire 23, and back contact $24—24^b$ of relay C. It will be apparent, therefore, that winding 12 of valve V^2 will become energized when relay C is deenergized and lever L occupies its *a* position, or when relay C is energized regardless of the position of lever L.

Winding 12 of valve V^1 is provided with a circuit which passes from battery 20 through wire 21, winding 12 of valve V^1, wire 27, contact $19—19^b$ of lever L, wire 23, back contact $24—24^b$ of relay C, and wire 25 back to battery 20. It will be apparent, therefore, that winding 12 of valve V^1 will be energized when and only when lever L occupies its *b* position and relay C is deenergized.

It follows from the foregoing that when relay C is deenergized, the braking bars will occupy their non-braking or braking positions according as lever L occupies its *a* or *b* position, but that, when relay C becomes energized, if the braking bars do not already occupy their non-braking positions, they will automatically be moved to their non-braking positions.

In accordance with our present invention novel and improved means are provided for controlling relay C in such manner that this relay will at times automatically become energized when the speed of a car which is traversing the stretch of track shown in the drawings falls below a speed which depends upon the setting of a manually operable speed control lever S. As here shown, these means comprise a series of relatively short insulated control sections 28^a, 28^b, 28^c, etc., which are formed in the rail 1. These control sections will usually be of uniform length and their lengths may be varied as conditions require, but the lengths of these sections will preferably be such that two wheels of a car cannot occupy the same section at any one time. Furthermore, these control sections may be insulated in a variety of ways, but in order to insure the desired rigidity and the necessary strength of the rail 1, we prefer to insulate these sections in the manner which is illustrated in Figs. 2, 3 and 4. Referring to Figs. 2, 3 and 4, as here shown, the control sections 28 are clamped by means of the usual splice bolts 31 between two splice bars 32 and 33. These splice bars are of uniform cross section throughout their entire length, and are preferably long enough to extend past all of the sections 28, although these bars may be made in several pieces to facilitate their manufacture and handling, if desired. The splice bars are of the usual design, and each consists of an angle bar portion *c* fitting the fishing spaces of the control sections, and a horizontal inwardly extending rail supporting base portion *d*, which is integral with the angle bar portion *c* and which forms therewith the usual flange receiving spaces or pockets for the flanges of the control sections. It will be seen, therefore, that the splice bars engage underneath the heads of the control sections and at the fishing spaces, overlie the flanges of the control sections, and also underlie the bottom surfaces of the control sections, so that a very rigid construction is provided. Interposed between the splice bars and the control sections are one or more insulating members 37 of such shape that they will snugly engage at least all that portion of the outer surface of the control sections which would be engaged by the splice bars if the insulating members 37 were not provided, and interposed between the abutting ends of the control sections are the usual insulating end posts 35. The bolts 31 are also each insulated by suitable means, here shown as a sleeve 36 and insulating washers 36^a.

Referring again to Fig. 1, the speed control lever S which, as here shown, is capable of assuming three positions, designated p^1, p^2 and p^3, respectively, in the drawings, is provided with two contacts 30 and 41. Contact 30 is so arranged that this contact will be closed in any position of the lever except its p^1 or "off" position, and contact 41 is so arranged that this contact will be closed only when the lever occupies its p^3 position.

Associated with each control section 28 is a track relay designated by the reference character D with a suitable distinguishing exponent. Each track relay is connected in a track circuit which includes, in addition to the associated control section 28, the rail 1^a, contact 30 of lever S, and a suitable source of current here shown as a battery F. It will be apparent, therefore, that when contact 30 of lever S is open, or when this contact is closed and all of the sections 28 are unoccupied, all of the track relays D will be deenergized, but that, when contact 30 is closed, and a car wheel moves onto any one of the sections 28, the associated track relay D will become energized. It will also be apparent that the duration of the time interval during which a track relay remains energized when it has once become energized will depend upon the time required for the car to traverse a distance which is equal to the length of the associated control section, and hence upon the speed of the car.

The means for controlling relay C also comprises a plurality of timing relays T^a, T^b, T^c, etc., one of which is controlled by each track relay. These timing relays are similar relays, and as here shown, have slow-releasing characteristics. Each timing relay T is connected with a pair of line wires 38 and 39 over the back contact $40—40^a$ of the associated track relay D, as will be apparent from an inspection of the drawings, and the line wires 38 and 39, in turn, are constantly connected with a suitable source of electromotive force, here shown as a battery G. It will be seen, therefore, that when none of the track relays D are energized, as when contact 30 of lever S is open, or when this contact is closed and no car is traversing the stretch of track shown in the drawings, all of the timing relays T will be energized; but

that, when contact 30 of lever S is closed and a car is traversing the stretch of track shown in the drawings, each time a car wheel moves onto one of the control sections 28, and causes the associated track relay D to become energized, the timing relay T controlled by such track relay will become deenergized and will remain deenergized for a time interval which depends upon the speed of the car. If the speed of the car is sufficiently slow so that this time interval is longer than the release time of such timing relay T, this timing relay will close its back contact 29, but if the speed of the car is not sufficiently slow so that this time interval is longer than the release time of this timing relay, this timing relay will not close its back contact 29.

For reasons which will be made clear as the description proceeds, it is desirable to be able to at times vary the release times of the timing relays T to cause them to close their back contacts 29 at different car speeds, and for this purpose, we provide each timing relay with a shunt circuit which becomes closed when the associated track relay D becomes energized, provided lever S then occupies its p^3 position. Referring to relay T^a, for example, the shunt circuit for this relay includes front contact 40—40^b of track relay D^a, a resistance unit H^a, a line wire 42, contact 41 of lever S, and line wire 38. The shunt circuit for each of the other timing relays T is similar to that just described for the timing relay T^a.

It will be readily understood that if more than two release times are desired for each timing relay, these relays may be provided with additional shunt circuits, each similar to the shunt circuits shown, but each having a different resistance and so arranged that different ones of these circuits may be rendered effective by moving lever S to different positions. It will also be readily understood that the release times of the timing relays T when the shunt circuits shown are cut in may be regulated to any desired value within the limits of design of these relays by choosing the proper value of the resistance for the associated resistance unit H.

The slow-releasing relays T control relay C by virtue of a plurality of parallel pick-up circuits, each of which includes a suitable source of current, here shown as a battery E, and the front contact 29 of a different one of the timing relays T. It will be seen, therefore, that when all of the timing relays T are energized, relay C will be deenergized, but that when any one of the timing relays T becomes deenergized and remains deenergized for a sufficient interval of time to cause it to close its back contact 29, relay C will become energized.

Relay C is made sufficiently slow-releasing so that, when a car is traversing the stretch of track shown in the drawings at a speed which is just slow enough to cause the timing relays T to successively close their back contacts 29, this relay will bridge the interval of time which will elapse under these conditions between the opening of the back contact 29 of one timing relay due to a wheel of the car having departed from the associated section 28, and the closing of the back contact 29 of the timing relay T next in advance due to the same wheel of the car having moved onto the section 28 associated with this latter timing relay.

As shown in the drawings, all parts of the apparatus are in the positions which they normally occupy when no car is traversing the stretch of track shown in the drawings. That is to say, the timing relays T are all energized, and the track relays D are all deenergized. Speed control lever S occupies its p^1 or "off" position. Relay C is deenergized and lever L occupies its a position, causing the braking bars to be held in their non-braking positions.

In explaining the operation of the apparatus as a whole, we will first assume that a car is approaching the car retarder R from the left at a relatively high speed, and that it is desired to have the car leave the car retarder at the highest reduced speed for which the apparatus is designed. The operator will therefore first move the braking bars to their braking positions by moving lever L from its a to its b position, and he will then move speed control lever S from its p^1 to its p^2 position. As the car moves through the retarder, each time a wheel of the car moves onto one of the control sections 28, the associated track relay D will become energized and will deenergize the associated timing relay T, but as long as the speed of the car is above the speed corresponding to the p^2 position of lever S, none of the timing relays T will remain deenergized long enough to close its back contact 29. Relay C will therefore remain energized, and the car retarder will therefore continue to slow down the car. As soon, however, as the car has been slowed down by the car retarder to a speed which is equal to, or less than, the speed corresponding to the p^2 position of lever S, and a wheel of the car traverses one of the control sections 28, the associated timing relay T will close its back contact 29, and relay C will then become energized. When relay C becomes energized, the braking bars will be moved to their non-braking positions in the manner previously described, and it will be apparent, therefore, that no further retardation of the car will take place unless relay C again becomes deenergized and remains deenergized for a sufficient interval of time to cause it to open its front contact 24—24^a and close its back contact 24—24^b while the car is still within the limits of the car retarder. Due to the slow-releasing characteristics of relay C previously pointed out, this can only happen in the event that the car accelerates to a speed which is greater than the speed corresponding to the p^2 position of the lever. Assuming the car does this, then as soon thereafter as the timing relay T which last became deenergized for a time interval of sufficient duration to cause it to close its back contact 29 again becomes energized, relay C will become deenergized and will subsequently remain deenergized, because, under these conditions, none of the other timing relays will now become deenergized long enough to close its back contact 29. Relay C will therefore open its front contact 24—24^a and will close its back contact 24—24^b, thus restoring the braking bars to their braking positions in which they will again retard the speed of the car.

I will now assume that with the braking bars in their braking positions, the operator moves lever S to its p^3 position instead of its p^2 position, in order to slow down a car which is approaching the retarder at a relatively high speed, to the slowest speed for which the apparatus is designed. Under these conditions, the operation of the apparatus will be similar to that just described with the single exception that since contact 41 of lever S is now closed, when a track relay D becomes energized and deenergizes the associated timing relay T, it will at the same time complete the shunt circuit for such associated timing relay, thus increasing the length of time the relay must be deenergized before it will close

its back contact 29. It will be seen, therefore, that when lever S occupies its p^3 position, the timing relays will release their armatures at a lower car speed than when lever S occupies its p^2 position, with the result that the retarder will slow down the car to such lower car speed, as will be readily understood from the foregoing without further description.

Under some conditions, that is, where there is no great variation in the length of the wheel base of the trucks of the different cars handled from the average value which is about five and one-half feet, the same results as are obtained with the apparatus previously described may be obtained with a fewer number of parts by providing the rail 1 with "inactive" sections of the proper length between the control sections or groups of the control sections. One arrangement of this type suitable for cars having four wheel trucks is illustrated in Fig. 5. Referring to Fig. 5, as here shown, the control sections are arranged in two groups, each comprising two sections, the two sections of the one group being designated 28^h and 28^i, and the two sections of the other group being designated 28^k and 28^l. The remaining sections, designated 28^g, 28^j, and 28^m, are the "inactive" sections, that is to say, they form no part of the control apparatus for the retarder but serve merely as a part of the running rail for the car. It will be understood, of course, that in actual practice, the total number of groups of control sections which are provided will depend upon the length of the retarder and the length of the longest car to be retarded. The lengths of the control and inactive sections may be varied to suit the conditions, the only essential requirement being that at least one control section will at all times be engaged by one and only one car wheel. One lengh which has been found satisfactory for the control sections when the wheel base of the trucks is between five and six feet, is three feet, and one length which has been found satisfactory for the inactive sections under these conditions is five feet. The control sections are, of course, insulated from each other and from the inactive sections, a preferred construction being shown in Figs. 6 and 7. As here shown, the rail 1 is constructed in substantially the same manner as shown in Figs. 2 and 3 and previously described in connection with Fig. 1, with the exception that the one splice bar which is here designated 32^a, instead of being continuous in length is made in sections so arranged that the abutting ends of each two adjacent sections are located near the middle of a different one of the inactive sections. With this arrangement, in order to inspect or repair the insulation of any control section, it is necessary to remove only one section of the splice bar 32^a, thus facilitating maintenance. The inactive sections are shown insulated from the splice bars, but at these inactive sections a metal filler may be substituted for the insulating member if desired. It is unnecessary to insulate the bolts which pass through the inactive sections.

Each control section 28 has associated therewith apparatus which is similar in all respects to that associated with any one of the sections 28 shown in Fig. 1, and the remainder of the apparatus is likewise similar in all respects to that shown in Fig. 1. Furthermore, the operation of the apparatus is similar to the operation of the apparatus shown in Fig. 1, and it is thought that it will be readily understood from the foregoing and from an inspection of the drawings without further description.

It should be pointed out that for cars having trucks whose wheel base is longer than six feet, the apparatus may be constructed similar to that shown in Fig. 5 with the exception that each group of control sections will consist of three sections instead of only two sections.

Although we have herein shown and described only two forms of railway car retarders embodying our invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of our invention.

Having thus described our invention, what we claim is:

1. In combination, a stretch of railway track, a braking bar located in the trackway and movable toward and away from one of the rails of said stretch into a braking or a non-braking position, a plurality of relatively short insulated control sections located end to end in one of the rails of said stretch, a source of electromotive force, a plurality of track circuits each including one of said control sections, the opposite rail of said stretch and said source; and means including said track circuits for controlling said braking bar in accordance with the speed of a car traversing said stretch.

2. In combination, a stretch of railway track, a braking bar located in the trackway and movable toward and away from one of the rails of said stretch into a braking or a non-braking position, a plurality of relatively short insulated control sections formed in one of the rails of said stretch, a source of electromotive force, a plurality of track circuits each including one of said control sections, the opposite rail of said stretch, said source, and a track relay; and means controlled by said track relays for controlling said braking bar.

3. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of said stretch and movable into engagement with a part of a car traversing said stretch for retarding the speed of the car, a series of insulated control sections formed in one of the rails of said stretch, a source of electromotive force, a plurality of track circuits each including a track relay, said source, a different one of said control sections, and the opposite rail of said stretch, a plurality of timing relays one controlled by each of said track relays, and means controlled by said timing relays for controlling said braking bar.

4. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of said stretch and movable toward and away from such one rail into braking and non-braking positions, a first relay, means controlled by said first relay for controlling said braking bar, a series of relatively short insulated control sections formed in one rail of said stretch, a source of electromotive force, a plurality of track circuits each including a track relay, said source, a different one of said control sections, and the rail of said stretch opposite to the rail in which said control section is formed, a plurality of timing relays one controlled by each of said track relays, and means controlled by said timing relays for controlling said first relay.

5. In combination, a stretch of railway track, a braking bar located in the trackway adjacent

one of the rails of said stretch and movable into engagement with a part of a car traversing said stretch for retarding the speed of the car, a series of insulated control sections formed in one of the rails of said stretch, a source of electromotive force, a plurality of track circuits each including a track relay, said source, a different one of said control sections, and the rail of said stretch opposite to the rail in which said control section is formed, a plurality of timing relays one controlled by each of said track relays, a slow-releasing relay, means controlled by said slow-releasing relay for controlling said braking bar, and means controlled by said timing relay for controlling said slow-releasing relay.

6. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of said stretch and movable toward and away from such one rail into braking and non-braking positions, a plurality of short insulated control sections formed in one rail of said stretch, a plurality of track relays; a plurality of track circuits each including a different one of said control sections, the opposite rail, a different one of said track relays and a source of current; a plurality of slow-releasing timing relays one controlled by a back contact of each track relay, a manually operable speed control lever, a plurality of shunt circuits one for each of said timing relays and each controlled by said speed control lever and including a front contact of a different one of said track relays, and means controlled by said timing relays for controlling said braking bar.

7. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of said stretch and movable toward and away from such one rail into braking and non-braking positions, a plurality of short insulated control sections formed in one rail of said stretch, a plurality of track relays; a plurality of track circuits each including a different one of said control sections, the opposite rail, a different one of said track relays, and a source of current; a plurality of slow-releasing timing relays one controlled by a back contact of each track relay, a manually operable speed control lever, a plurality of shunt circuits one for each of said timing relays and each controlled by said speed control lever and including a front contact of a different one of said track relays, an auxiliary slow-releasing relay for controlling said braking bar, and means controlled by said timing relays for controlling said auxiliary relay.

8. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of said stretch and movable toward and away from such one rail into braking and non-braking positions, a plurality of short insulated control sections formed in one rail of said stretch, a plurality of track relays; a plurality of track circuits each including a different one of said rail sections, the opposite rail, a different one of said track relays, and a source of current; a plurality of slow-releasing timing relays one controlled by a back contact of each track relay, a manually operable speed control lever, a plurality of shunt circuits one for each of said timing relays and each controlled by said speed control lever and including a front contact of a different one of said track relays, an auxiliary slow-releasing relay, means for at times moving said braking bar to its braking or non-braking positions according as said auxiliary relay is energized or deenergized, and means controlled by said timing relays for controlling said auxiliary relay.

9. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of the stretch and movable into engagement with a part of a car traversing said stretch for retarding the speed of the car, a plurality of groups of relatively short insulated control sections formed in one rail of said stretch and separated by inactive sections, means for measuring whether the speed of a car is above or below a predetermined speed while any wheel of the car is traversing any one of said control sections, and means controlled by said last mentioned means for controlling said braking bar.

10. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of the stretch and movable into engagement with a part of a car traversing said stretch for retarding the speed of the car, a plurality of groups of relatively short insulated control sections formed in one rail of said stretch and separated by inactive sections, said sections being so arranged that at all times while a car is traversing said stretch at least one of said active sections will be engaged by one and only one wheel of the car, means for measuring whether the speed of a car is above or below a predetermined speed while any wheel of the car is traversing any one of said active sections, and means controlled by said last mentioned means for controlling said braking bar.

11. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of said stretch and movable into engagement with a part of a car traversing said stretch for retarding the speed of the car, one of the rails of said stretch being divided to form control and inactive sections the control sections being arranged in groups separated from each other by the inactive sections, the control sections further being insulated from each other and from the inactive sections, a plurality of track relays; a plurality of track circuits each including a different one of said control sections, the opposite rail, a different one of said track relays, and a source of current; a plurality of slow-releasing timing relays one controlled by a back contact of each of said track relays, a slow-releasing auxiliary relay controlled by said timing relays, and means controlled by said auxiliary relay for controlling said braking bar.

12. In combination, a stretch of railway track, a braking bar located in the trackway and movable toward and away from one of the rails of said stretch into a braking or a non-braking position, a plurality of insulated control sections located end to end in one of the rails of said stretch, said sections being of such length that two wheels of a car cannot occupy the same section at any one time, a source of electromotive force; a plurality of track circuits each including one of said control sections, the opposite rail of said stretch and said source; and means including said track circuits for controlling said braking bar in accordance with the speed of a car traversing said stretch.

13. In combination, a stretch of railway track, a braking bar located in the trackway and movable toward and away from one of the rails of said stretch into a braking or a non-braking position, a plurality of insulated control sections located end to end in one of the rails of said stretch, said sections being of such length that

two wheels of a car cannot occupy the same section at any one time, a source of electromotive force; a plurality of track circuits each including one of said control sections, the opposite rail of said stretch, said source, and a track relay; and means controlled by said track relays for controlling said braking bar.

14. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of said stretch and movable into engagement with a part of a car traversing said stretch for retarding the speed of the car, a plurality of insulated control sections located end to end in one of the rails of said stretch, said sections being of such length that two wheels of a car cannot occupy the same section at any one time, a source of electromotive force; a plurality of track circuits each including a track relay, said source, a different one of said control sections, and the opposite rail of said stretch; a plurality of timing relays one controlled by each of said track relays, and means controlled by said timing relays for controlling said braking bar.

15. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of said stretch and movable toward and away from such one rail into braking and non-braking positions, a first relay, means controlled by said first relay for controlling said braking bar, a plurality of insulated control sections located end to end in one of the rails of said stretch, said sections being of such length that two wheels of a car cannot occupy the same section at any one time, a source of electromotive force; a plurality of track circuits each including a track relay, said source, a different one of said control sections, and the rail of said stretch opposite to the rail in which said control section is formed; a plurality of timing relays one controlled by each of said track relays, and means controlled by said timing relays for controlling said first relay.

16. In combination, a stretch of railway track, a braking bar located in the trackway adjacent one of the rails of said stretch and movable into engagement with a part of a car traversing said stretch for retarding the speed of the car, a plurality of insulated control sections located end to end in one of the rails of said stretch, said sections being of such length that two wheels of a car cannot occupy the same section at any one time, a source of electromotive force; a plurality of track circuits each including a track relay, said source, a different one of said control sections, and the rail of said stretch opposite to the rail in which said control section is formed; a plurality of timing relays one controlled by each of said track relays, a slow-releasing relay, means controlled by said slow-releasing relay for controlling said braking bar, and means controlled by said timing relay for controlling said slow-releasing relay.

HERBERT L. BONE.
JOHN W. LIVINGSTON.