Oct. 27, 1936. C. S. BUSHNELL 2,058,770

AUTOMATIC TRAIN CONTROL SYSTEM

Filed Sept. 12, 1935 3 Sheets-Sheet 1

FIG. 1.

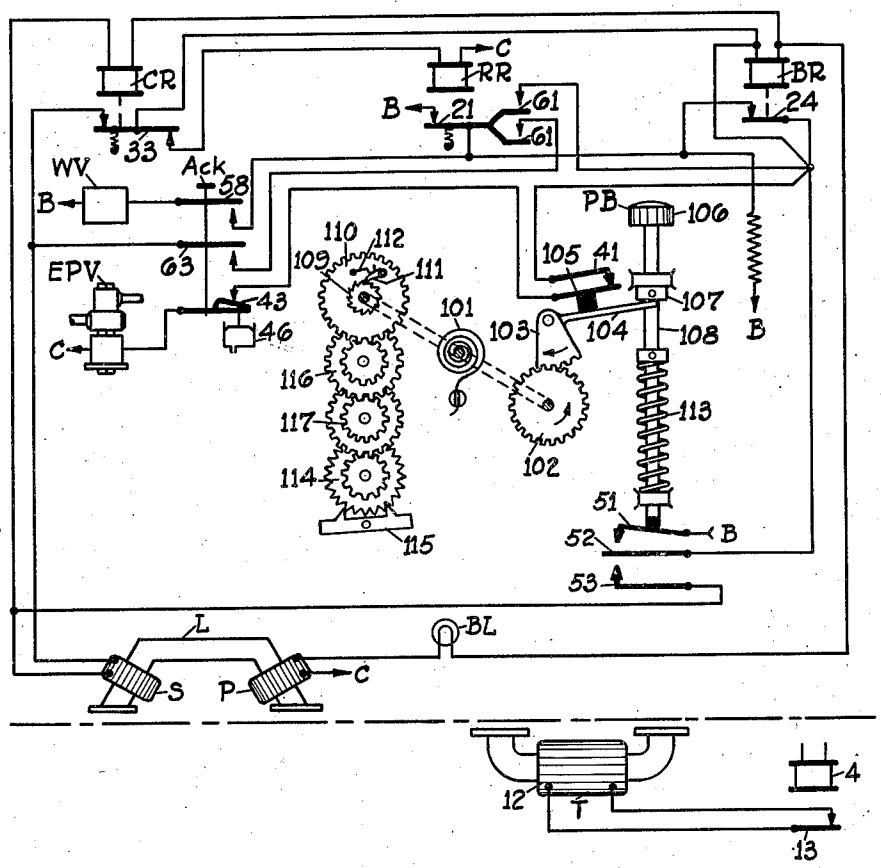
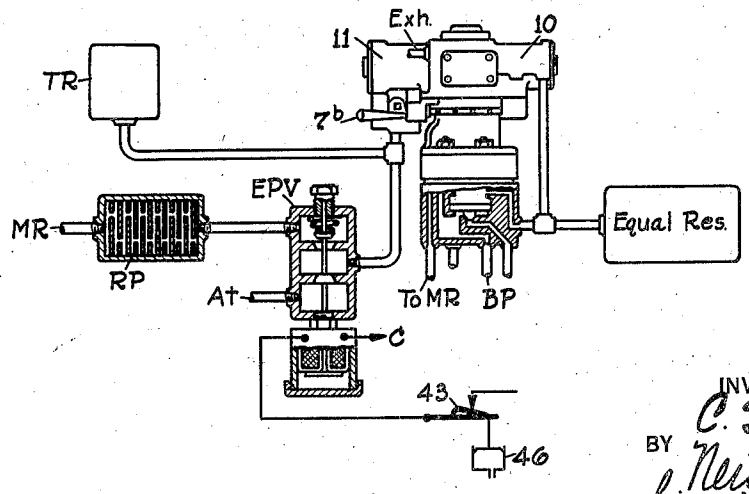


FIG. 2.



INVENTOR
C. S. Bushnell,
BY
Neil W. Preston,
his ATTORNEY

Oct. 27, 1936. C. S. BUSHNELL 2,058,770

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FIG. 3.

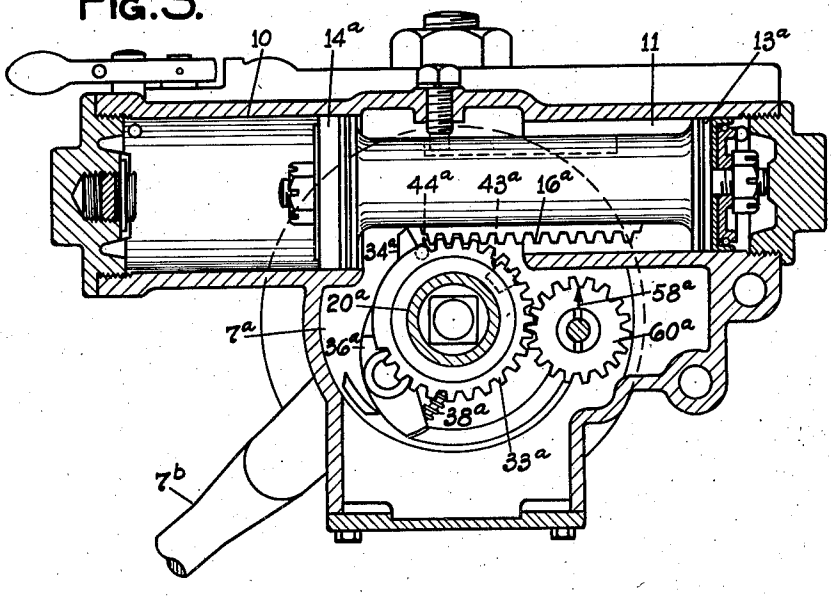
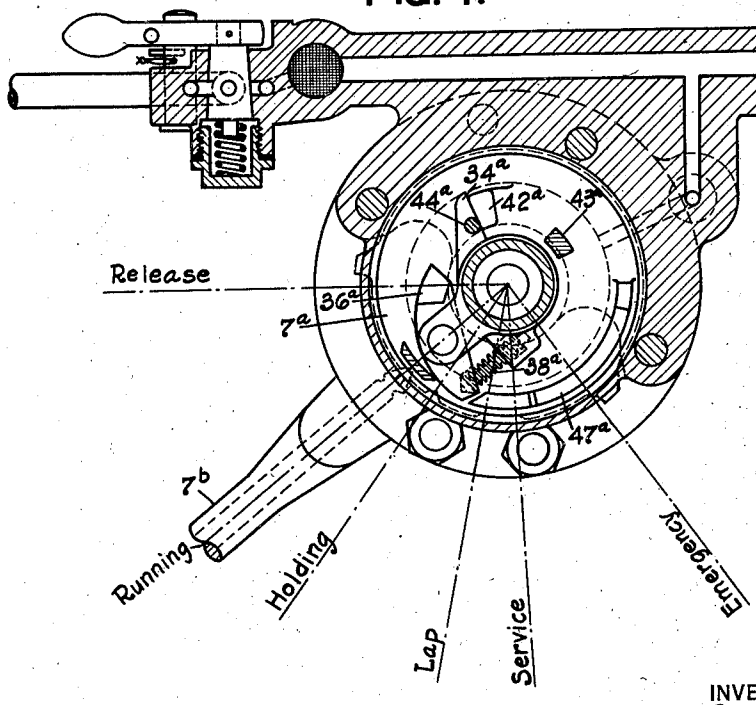


FIG. 4.



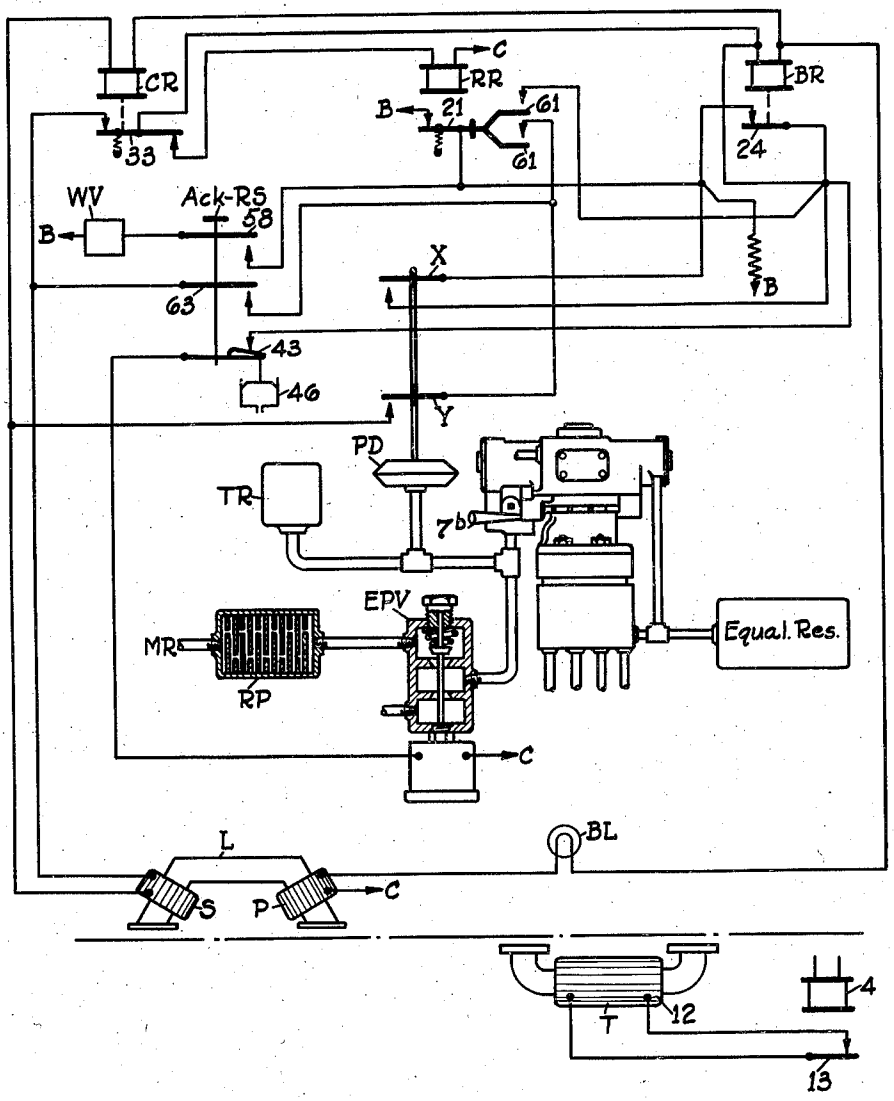
INVENTOR
C. S. Bushnell,
BY
his Neil W. Preston,
ATTORNEY

Oct. 27, 1936. C. S. BUSHNELL 2,058,770

AUTOMATIC TRAIN CONTROL SYSTEM

Filed Sept. 12, 1935 3 Sheets-Sheet 3

FIG. 5.



INVENTOR
C. S. Bushnell,
BY
Neil W. Preston,
his ATTORNEY

Patented Oct. 27, 1936 2,058,770

UNITED STATES PATENT OFFICE

2,058,770

AUTOMATIC TRAIN CONTROL SYSTEM

Charles S. Bushnell, Rochester, N. Y., assignor to General Railway Signal Company, Rochester, N. Y.

Application September 12, 1935, Serial No. 40,329

15 Claims. (Cl. 303—18)

This invention relates to a train control system of the type in which the brakes are applied by automatic means for operating the rotary valve of the usual engineer's brake valve which simultaneously with such operation of the valve disconnects the handle thereof, so that the engineer may not oppose the automatic operation nor effect release of the brakes, as by operation of the rotary valve to the release position, and more particularly to means for delaying the time of relatching of the handle after an automatic brake application has taken place.

It has been the practice in train control systems employing a brake valve actuator, such as above mentioned, to provide means for affording release of the brakes involving the relatching of the handle, by requiring the engineer to alight to the ground after the train has been brought to a stop, and then operate a reset push button accessible only from the ground. Although this is a way of assuring that the train has actually been brought to a stop before the brake valve handle can be relatched and the brakes released, the requirement of the engineer to alight to the ground has in some instances involved hazards which it is desired to avoid. A system of the type just mentioned where the reset button is only accessible from the ground has been shown in my prior Patent No. 1,686,434, granted October 2, 1928, and the brake valve actuator, which not only affords automatic means for operating the rotary valve of the engineer's brake valve to a brake applying position but also unlatches the brake valve handle so that the brakes cannot be released by the engineer, is shown in my prior Patent No. 1,628,454, granted May 10, 1927.

In order to avoid the hazard of requiring the engineer to alight to the ground to permit relatching of the handle and release of the brakes, it is proposed in accordance with the present invention to provide means in the cab which if operated starts a timing device which must consume a predetermined time before it functions to unlatch the handle to permit release of the brakes. In one form of the invention, this timing device comprises a clock-work mechanism which completes a circuit after the lapse of a predetermined time, after which time the engineer's brake valve handle may be relatched, and if the engineer is then alive and otherwise capable of handling his train, he may move the engineer's brake valve to the release position to release the brakes.

As a modified form of the invention, it is proposed to use pneumatic means for delaying the time of relatching of the engineer's brake valve handle.

As a second modified arrangement it is also proposed, as indicated by a modified form of the invention, to employ an acknowledging means whereby the engineer may manifest his vigilance upon the approach to a caution or a danger signal, such as for instance, illustrated in my prior Patent No. 1,686,434 above mentioned, and to employ this same acknowledging device to start suitable timing apparatus, which after the lapse of a predetermined time will result in relatching of the engineer's brake valve handle.

In describing the invention in detail, reference will be made to the accompanying drawings in which:—

Fig. 1 shows conventionally the car-carried and a portion of the wayside electrical apparatus of an intermittent inductive train control system employing a cab-carried clock-work time retarded reset device.

Fig. 2 illustrates the pneumatic timing apparatus for delaying the relatching of the brake valve handle to be used with the car-carried apparatus such as shown in Fig. 1 with the clock-work mechanism omitted.

Figs. 3 and 4 show several cross-sectional views of the brake valve actuator for operating the engineer's brake valve and disconnecting the brake valve handle; and

Fig. 5 shows the car-carried apparatus shown in Fig. 1 modified by the omission of the reset push button and employing the acknowledging contactor to initiate pneumatic timing apparatus, such as shown in Fig. 2 supplemented by pressure operated contacts, which will permit relatching of the engineer's brake valve handle after a lapse of a predetermined time.

Fig. 1.—Referring to Fig. 1 of the drawings, the circuit diagram shown therein is identical to that shown in Fig. 2 of my prior Patent No. 1,686,434, above referred to, except that the reset device PB has been moved from a point accessible only from the ground into the cab, and the protecting contact **41** of the reset push button PB is slow closing as accomplished by the clock-work mechanism illustrated.

This reset device PB comprises normally open contacts **51**—**52** and **52**—**53** and a normally closed contact **41**. The normally closed contact **41** tends to remain closed by the spiral spring **101** acting on gear **102**, which gear through the medium of sector **103** returns the arm **104** so that the insulated knob **105** closes the contacts **41**, assuming this arm **104** to have previously been moved to a

lower position by depressing the button 106. It is apparent that depression of the button 106 causes the head 107 on the rod 108 to strike the arm 104, thereby opening the contact 41 and winding the spring 101, and in so doing causes the ratchet wheel 109 to take a new position on the gear 110 as permitted by the dog 111 biased by the spring 112. Also, this depression of the push button 106 closes contacts 51—52 and 52—53, in the order given. If the push button 106 is now released, although it will be immediately returned by reason of the coil spring 113, the arm 104 will be very slowly returned to its normal position, this by reason of the fact that the energy of the main spring 101 must first be dissipated through the medium of the escapement wheel 114 and the escapement pallet 115, which are driven by the gear 110 through the medium of speed increasing gears 116 and 117.

Since the remaining portion of Fig. 1 of the drawings is identical to that shown in my prior Patent No. 1,686,434, these devices and circuits will not be specifically described, except that a brief description of the circuits and the operation of the invention with the time retarded reset will be given. For convenience, like reference characters have been assigned to common parts of Fig. 1 of this application, as appear in Fig. 2 of said prior Patent No. 1,686,434.

As is more fully described in said prior Patent No. 1,686,434, an automatic brake application may be avoided by the engineer if he acknowledges his vigilance upon entering a caution or a danger block by the depression of the acknowledging push button Ack. Also, as more fully pointed out in said prior patent, this acknowledging push button Ack cannot be maliciously tied into its active position, for if this is done, an automatic brake application will ensue after a short period of delay, this by reason of the opening of the contact 43 of the acknowledging contactor Ack, this delay being measured by any suitable timing means such as the dash pot 46 illustrated.

It may be briefly stated that the apparatus shown in Fig. 1 comprises three stick relays CR, RR, and BR which are all normally stuck up and of which the initial control relay CR is connected in series with the secondary winding S of a car-carried receiver L. Putting it briefly, the circuits are such that an inductive kick produced in the secondary coil S of the receiver L when passing over an active trackway inductor T causes the current flowing in the relay CR to pass through zero to cause deenergization of this stick relay CR. The circuits are such that dropping of the relay CR breaks the stick circuit for the relay RR, and dropping of relay RR breaks the stick circuit for the relay BR, and deenergization of the relay BR causes deenergization of the electro-pneumatic valve EPV, which in turn causes an automatic brake application through the medium of the brake valve actuator shown in Figs. 3 and 4 of the drawings.

It may be mentioned at this point that the primary coil P of the receiver L is connected in series with the relay BR through a circuit including front contact 21 of relay RR, front contact 24 of relay BR, winding of relay BR, ballast lamp BL, and primary winding P in series, and that the potential drop across the winding of relay BR is used as a potentiometer potential for energizing the relay CR and the secondary winding S in series. This construction is used to check accidental breakage or undeenergization of the primary circuit P. This circuit includes also the stick contact 33 of the control relay CR. The stick circuit for the relay RR (controlled by relay CR) may be traced from a terminal B through front contact 21 of relay RR, through front contact 24 of relay BR, through front contact 33 of relay CR, through winding of relay RR, to the other terminal C of the same battery. The device WV is a whistle valve, which is sounded from the time the acknowledging device Ack is depressed until the relay BR has been picked up and has closed the shunting contact 21. It may be pointed out here that upon depression of the acknowledging device Ack the relay BR may be maintained up even though relays CR and RR are deenergized. This is accomplished through a stick circuit including the contact 58 of the acknowledging device, the stick contact 24 of the relay BR, the winding of the relay BR and the primary coil P of the receiver L in series, but that the device EPV can be energized in this manner only for a short period of time, this because depression of device Ack opens its contact 43 after a short period of delay to effect deenergization of the brake applying device EPV. It may also be pointed out that this depression of the acknowledging device Ack, providing it is done before the relay BR has been deenergized closes a pick-up circuit for the relay CR which may be traced from the left terminal of the relay BR through contact 24 of the relay BR, through contact 61 of the relay RR, through contact 63 of the device Ack, through secondary coil S and control relay CR in series, to the other terminal of the relay BR. Also, depression of the device Ack results in picking up of the relay RR as soon as the relay CR has been energized, this pick-up circuit extending from B, through whistle valve WV through contact 58 of device Ack, through contact 24 of relay BR, through contact 33 of relay CR, through the winding of relay RR to the other terminal C of the same battery.

Operation Fig. 1

Let us now assume that a train equipped with the apparatus as shown in Fig. 1 of the drawings moves into a caution block while the engineer is not alert and fails to operate the acknowledging device Ack just prior to the passing of the car-carried receiver L over the trackway inductor T at a time when the contact 13 of the line relay 4 is open, because there is a train in the second block in advance of the point in question. This passage of the receiver L over the inductor T causes a cycle of current to be induced in the secondary winding S, the first wave of which current is in opposition to the current normally flowing in the circuit including it and relay CR in series. This temporary reduction of the current to zero in the control relay CR causes it to open its stick contact 33, thereby leaving the relay CR permanently deenergized. Also, opening of the contact 33 of relay CR breaks the stick circuit for the relay RR including the stick contact 21, so that the relay RR is permanently deenergized, and opening of contact 21 of relay RR deenergizes relay BR, which by opening of contact 24 effects deenergization of the electro-pneumatic valve EPV, which directly controls the brake valve actuator shown in Figs. 3 and 4, causing an automatic brake application. At this point it may be mentioned that the track inductor T is ineffective to drop the relay CR when its winding 12 is on closed circuit. This action is due to the fact that a shorted coil does not permit

a rapid change of flux therethrough by reason of the bucking action thereof.

Let us further assume that the engineer immediately depresses the push button 106 in order to release his brakes as quickly as possible. It will be observed that in so doing, although he can immediately restore the relays CR, RR, and BR by operating the push button 106, that the restoration of the relay CR, RR, and BR will not effect immediate reenergization of the device EPV. This is true because the contact 41 of the time retarded reset device PB will not reclose until a predetermined period of time has elapsed, say thirty or more seconds, to assure that the train has been fully brought to a stop. If now, after the lapse of this predetermined time, the engineer is alive and physically capable of controlling his train he may release the brakes by operating the engineer's brake valve to the service position to latch up the handle of the brake valve actuator shown in Figs. 3 and 4, and then operate it to the release position to release the brakes.

It is thus seen that the apparatus shown in Fig. 1 of the drawings requires a manual act after an automatic brake application, followed by a period of waiting, followed by a further manual act residing in the movement of the engineer's brake valve to a position to relatch the handle, and then to a position to place the engineer's rotary valve in the release position, and this requirement of two manual actions spaced by a period of waiting assures not only that the train has been brought to a stop but also that the engineer is physically able to control his train.

Modified form Fig. 2.—The form of the invention as illustrated in Fig. 2 preferably employs the same apparatus and control circuits as shown in Fig. 1 of the drawings for controlling the device EPV, except with the timing gears 116 and 117, the escapement wheel 114 and the escapement pallet 115 omitted. Obviously, the emission of this clock-work mechanism allows the contact 41 of the reset push button PB to close immediately upon release of the push button 106. In accordance with the modified form of the invention illustrated in Fig. 2, the delay in the relatching of the engineer's brake valve handle is accomplished after the valve EPV has been reenergized. This delay is accomplished by the addition of the restricted port RP through which main reservoir pressure may flow through the valve EPV to the small cylinder of the brake valve actuator (see Figs. 3 and 4), and the timing reservoir TR. The restricted port RP and the timing reservoir TR are so designed that the time required for the timing reservoir TR to be charged to a pressure value to operate the pistons of the brake valve actuator to their normal position is sufficient to bring the train to a stop with the brakes applied. The restricted port RP comprises a cylindrical chamber filled with tight fitting perforated discs, these discs being spaced apart and so stacked that the perforations of adjacent discs do not line up. This structure affords friction to the passage of air but does not readily clog up.

Operation Fig. 2

The apparatus shown in Fig. 2, in view of the description just given, is obviously the same as the operation of the apparatus shown in Fig. 1, except that in Fig. 2, the device EPV is actually energized before the period of delay takes place; whereas, in Fig. 1 the device EPV is not energized until after the lapse of this period or delay. The ultimate result, however, is substantially the same in both instances, in that the engineer's brake valve handle cannot be latched up until after a lapse of time sufficient to bring the train to a stop with the brakes applied.

Since all of the other apparatus shown in Fig. 2 is of a conventional nature and has been fully described in my prior Patent No. 1,628,454 to which reference may be made, this apparatus need not be further described.

Brake valve actuator.—The brake valve actuator heretofore referred to and shown in side elevation of Fig. 2 of the drawings has been shown more in detail by horizontal sections illustrated in Figs. 3 and 4 of the drawings. This brake valve actuator is the same, as that shown in my Patent No. 1,628,454, above mentioned, to which reference may be made for a more detailed description. For convenience the same reference characters as used in my prior patent have been used, except that the exponent *a* has been added.

Generally speaking this brake valve actuator comprises a differential piston arrangement including pistons 13ª and 14ª normally urged in opposite directions by main reservoir pressure. The piston 13ª is directly connected to main reservoir at all times whereas the piston 14ª only at times has main reservoir pressure applied thereto through the medium of the electro-pneumatic valve EPV. Since the piston 14ª is larger than the piston 13ª the pistons will assume their right-hand position when pressure is applied to both of them and will assume the left-hand position when pressure is only applied to the piston 13ª. This differential piston device has a rack 16ª associated therewith which engages the pinion 33ª. The engineer's brake valve handle plate 7ª has two upwardly projection lugs numbered 42ª and 47ª respectively, the latter of which is in the form of a circular cam. This handle plate 7ª has an engineer's brake valve handle 7ᵇ directly connected thereto.

The usual rotary valve of the engineer's brake valve is provided with an upwardly extending sleeve 20ª to which is pivotally secured a latch member 36ª, which member is biased to its normal position by a spring 38ª. The actuator pinion 33ª is provided with a downwardly extending or depending pin 44ª and lug 43ª. The pin 44ª extends downward to a point where it cannot engage the lug 34ª but can engage the upper end of the latch member 36ª. The lug 43ª extends down from the pinion 33ª so that it can strike the lug 34ª but cannot strike the lug 42ª. From this construction it is apparent that if the pinion 33ª is operated in a counter-clockwise direction, as it will be when the main reservoir pressure is venting away from the piston 14ª, that the pin 44ª projecting downwardly from this pinion 33ª will strike the latch member 36ª at an angle to cause the opposite end of the latch member to disengage the curved cam portion 47ª. At about the same time during this rotation of the pinion 33ª it causes the lug 43ª to engage the projecting lug 34ª, thereby moving the rotary valve in a counter-clockwise direction to the service brake applying position, the handle 7ᵇ being left in its normal running position.

It may be pointed out that the pinion 60ª driven by the pinion 33ª is merely employed to drive the indicating pointer 58ª located so as to be visible to the engineer to inform him when the engineer's brake valve actuator is in a position to permit relatching of the handle.

Modification Fig. 5.—The form of the invention

illustrated in Fig. 5 is very similar to that shown in Fig. 1, and is the same as Fig. 1 except that the reset push button PB is entirely omitted and the pneumatically operated contacts X and Y and the circuit portions in which they are included have been added. The pneumatic apparatus illustrated in Fig. 5 is identical to that shown in Fig. 2 except that the sylphon or fluid pressure responsive device PD for operating contacts X and Y has been added. For this reason it will not be necessary to describe the devices shown in Fig. 5, except insofar as these devices co-act to produce a new result.

The purpose of the apparatus shown in Fig. 5 is to permit the same manually operable device, designated Ack—RS to be used to perform the acknowledged function of which the engineer may take advantage and avoid a brake application if he acknowledges his vigilance while passing over an active trackway device T, and to perform the time delayed reset function of which the engineer may take advantage after an automatic brake application has taken place.

Operation of Fig. 5

Since the circuit arrangement of Fig. 5 is identical to that of Fig. 1 insofar as the brake control and acknowledging functions are concerned, it is deemed unnecessary to discuss this portion of the modification shown in Fig. 5. In order to observe how the engineer may release the brakes after a period of delay determined by the timing reservoir TR and the restricted port RP, let us assume that an automatic brake application has taken place because the engineer has passed over an active inductor T without manifesting his vigilance. He might, of course, have manifested his vigilance by operating the acknowledging push button Ack—RS. This application of the brakes takes place because the device EPV has been deenergized through the medium of successive deenergizations of relays CR, RR, and BR.

Deenergization of the pneumatic valve EPV, of course, causes the venting of the pressure from the large piston 14ª thereby causing the actuator pinion 33ª to be operated in a counter-clockwise direction, resulting in the depending pin 44ª striking the latch member 36ª and unlatching the handle 7ᵇ, and in at the same time causing the depending lug 43ª to strike the projecting lug 34ª, and resulting in the engineer's rotary valve being operated to the service position. This operation of the engineer's brake valve causes an application of the brakes in the usual way. With the electro-pneumatic valve EPV deenergized, as just pointed out, pressure is released from the timing reservoir TR very quickly so that the contacts X and Y operated by the sylphon PD are almost immediately closed. As soon as these contacts X and Y have closed the engineer may restore the devices CR, RR, BR, and EPV. This restoration of these devices particularly valve EPV will not result in an immediate release of the brakes, this because a certain period of time is necesary (sufficient to bring a train moving at high speed to a stop with the brakes applied) to recharge the timing reservoir TR through the restricted port RP.

Let us now observe how the electro-pneumatic valve EPV may be restored to initiate the charging of the timing reservoir TR after a brake application has taken place and the contacts X and Y of the pneumatic device PD have been closed because the pressure back of the piston 14ª has fallen substantially to atmospheric pressure. This may be accomplished by depressing the combined acknowledging and reset device Ack—RS. Depression of the device Ack—RS closes the following circuit for reenergizing the relay BR:—starting at the terminal B, whistle valve WV, contact 58, contact X, winding of relay BR, ballast lamp BL, primary coil P to the other terminal C of the same battery. Closure of this circuit results in energization of the relay BR and the closure of its contact 24. With the contact 24 of relay BR closed current may then flow from the left-hand terminal of the relay BR (this relay BR in combination with primary coil P serving as a potentiometer) through contact 61 of relay RR, contact Y of pneumatic device PD, through winding of relay CR to the right-hand terminal of the relay BR. It should be noted that the seconary coil S of the receiver L is now shorted through contacts 63 and Y in series. The closure of this pick-up circuit results in energization of the relay CR to close its stick contact 33, thereby reestablishing the normal stick circuit for relay CR. With relays CR and BR energized the relay RR is energized through the following circuit: starting at the terminal B, whistle valve WV, contact 58 of device Ack—RS, front contact 24 of relay BR, front contact 33 of relay CR, winding of relay RR and to the other terminal C of the same battery. Upon energization of this circuit the contact 21 of relay RR will close, thereby shunting the whistle valve WV and informing the engineer that he may release the push button Ack—RS. The electro-pneumatic valve EPV is, of course, energized as soon as the acknowledging device Ack—RS is returned to its normal position resulting in the closure of the protecting contact 43.

With the electro-pneumatic device EPV restored by the joint action of the device Ack—RS and the contacts X and Y of the pneumatic device PD, main reservoir pressure may flow through the restricted port RP into the timing reservoir TR. After the desired period of delay, the time required to charge the timing reservoir TR to a pressure sufficient to return the brake valve actuator to its normal position, the engineer may operate his brake valve handle toward the right to effect relatching of the handle and may then move it to the left to release the brakes.

The applicant has thus illustrated three modified forms of his invention, illustrating various ways in which the engineer's brake valve may be relatched after a period of delay to assure that the train has actually been brought to a stop so a to eliminate the need of having a reset device accessible only from the ground and the elimination of the hazards accompanying the same.

Having thus shown and decribed several embodiments of the present invention it is desired to be understood that the present invention is not limited to the precise structure as shown for delaying the time of relatching the engineer's brake valve handle, but that the structure as illustrated has been chosen to illustrate at least several arrangements for accomplishing this result, and that certain changes, modifications, and additions may be made to adapt the invention to the particular problem encountered in practicing the same, all without departing from the spirit or scope of the invention, or the idea of means underlying the same, except as demanded by the scope of the following claims.

What I claim as new is:

1. In combination; an automatic train control system including an engineer's brake valve and

handle, and a brake valve actuator which under danger traffic conditions operates said valve to a brake applying position and unlatches said handle; and of brake releasing means effective only after the lapse of a predetermined time comprising, timing means for restoring said brake valve actuator to its normal position, and manually operable means for initiating said timing means into operation.

2. In combination; an automatic train control system including an engineer's brake valve and handle, and a brake valve actuator which under danger traffic conditions operates said valve to a brake applying position and unlatches said handle; and of brake releasing means effective only after the lapse of a predetermined time comprising, timing means for restoring said brake valve actuator to its normal position, manually operable means for initiating said timing means into operation, and means whereby if the engineer moves his brake valve handle to the service position after the lapse of such predetermined time following operation of said manually operable means the brake valve handle is relatched and the engineer may move the engineer's brake valve to the release position to release the brakes.

3. In combination, an engineer's brake valve, a brake valve actuator associated with said brake valve which if actuated to its abnormal position operates said brake valve to a brake applying position and unlatches the handle from the rotary valve of said engineer's brake valve, timing means which if initiated will restore said brake valve actuator to its inactive position after the lapse of a fixed time, and manually operable means for initiating said timing means.

4. In combination, an engineer's brake valve, a brake valve actuator associated with said brake valve which if actuated to its abnormal position operates said brake valve to a brake applying position and unlatches the handle from the rotary valve of said engineer's brake valve, timing means which if initiated will restore said brake valve actuator to its inactive position after the lapse of a fixed time, manually operable means for initiating said timing means, and means effective if said engineer's brake valve handle is moved to the brake applying position after the lapse of such fixed time it will again latch up said handle and allow the brakes to be released.

5. In combination, an engineer's brake valve, a brake valve actuator associated with said brake valve which if actuated to its abnormal position operates said brake valve to a brake applying position and unlatches the handle from the rotary valve of said engineer's brake valve, a clock-work escapement mechanism having a contact associated therewith and which if initiated will electrically restore said brake valve actuator to its inactive position after the lapse of a fixed time, manually operable means for initiating said timing means, and means effective if said engineer's brake valve handle is moved to the brake applying position after the lapse of such fixed time it will again latch up said handle and allow the brakes to be released.

6. In combination, an engineer's brake valve, a brake valve actuator associated with said brake valve which if actuated to its abnormal position operates said brake valve to a brake applying position and unlatches the handle from the rotary valve of said engineer's brake valve, a stick relay for controlling said brake valve actuator, a reset device including a timing device which if manually actuated directly closes a pick-up circuit for said stick relay and which a predetermined time thereafter effects restoration to normal of said brake valve actuator, whereby said engineer's brake valve may only be restored after the lapse of a predetermined time following manual operation of said reset device.

7. In combination, an engineer's brake valve, a brake valve actuator associated with said brake valve which if actuated to its abnormal position operates said brake valve to a brake applying position and unlatches the handle from the rotary valve of said engineer's brake valve, a stick relay for controlling said brake valve actuator, a reset device including a pneumatic timing device which if manually actuated directly closes a pick-up circuit for said stick relay and which a predetermined time thereafter effects restoration to normal of said brake valve actuator, whereby said engineer's brake valve may only be restored after the lapse of a predetermined time following manual operation of said reset device.

8. In combination, an engineer's brake valve, a brake valve actuator associated with said brake valve which if actuated to its abnormal position operates said brake valve to a brake applying position and unlatches the handle from the rotary valve of said engineer's brake valve, a stick relay for controlling said brake valve actuator, a reset device including a clockwork timing device which if manually actuated directly closes a pick-up circuit for said stick relay and which a predetermined time thereafter effects restoration to normal of said brake valve actuator, whereby said engineer's brake valve may only be restored after the lapse of a predetermined time following manual operation of said reset device.

9. In combination an engineer's brake valve on a train and including a handle, a brake valve actuator which if actuated operates said engineer's brake valve to a brake applying position and unlatches said handle from said valve, a stick relay for when energized maintaining said actuator in its normal inactive condition, means partly on the train and partly along the track for deenergizing said stick relay under adverse traffic conditions in advance of said train, and a manually controllable means which if operated upon entrance of said train into adverse traffic territory will prevent effective deenergization of said relay and which if operated after effective deenergization of said relay will effect restoration of said relay after the lapse of a predetermined period of time sufficient to bring said train to a stop with the brakes applied.

10. In combination an engineer's brake valve on a train and including a handle, a brake valve actuator which if actuated operates said engineer's brake valve to a brake applying position and unlatches said handle from said valve, a stick relay for when energized maintaining said actuator in its normal inactive condition, means partly on the train and partly along the track for deenergizing said stick relay under adverse traffic conditions in advance of said train, and a manually controllable means including pneumatic timing means which if operated upon entrance of said train into adverse traffic territory will prevent effective deenergization of said relay and which if operated after effective deenergization of said relay will effect restoration of said relay after the lapse of a predetermined period of time sufficient to bring said train to a stop with the brakes applied.

11. Automatic brake applying apparatus comprising, an engineer's brake valve, a brake valve

actuator which if actuated effects operation of the rotary valve of said engineer's brake valve to a brake applying position and effects unlatching of the handle of said engineer's brake valve, said actuator including an actuating cylinder from which pressure is vented to effect operation of said actuator, a source of fluid pressure, means including a two-way valve for venting fluid pressure from said cylinder at a high rate and for supplying the fluid pressure into said cylinder at a restricted rate, and means for controlling said valve.

12. Automatic brake applying apparatus comprising, an engineer's brake valve, a brake valve actuator which if actuated effects operation of the rotary valve of said engineer's brake valve to a brake applying position and effects unlatching of the handle of said engineer's brake valve, said actuator including an actuating cylinder from which pressure is vented to effect operation of said actuator, a source of fluid pressure, means including a two-way valve for venting fluid pressure from said cylinder at a high rate and for supplying fluid pressure into said cylinder at a restricted rate, automatic means for controlling said valve to vent fluid pressure from said cylinder, and manual means for controlling said valve to supply fluid pressure to said cylinder.

13. In combination, an automatic brake control for railway vehicles including a normally charged brake pipe, automatic brake applying means which if actuated causes venting of said brake pipe and an automatic application of the brakes of such vehicle; and of brake releasing means effective to permit release of said brakes only after the lapse of a predetermined time comprising, timing means for restoring said automatic brake applying means to its normal condition, manually operable means for initiating said timing means into operation, and other manually operable means effective to recharge said brake pipe only if operated after the lapse of said predetermined time following operation of said first mentioned manually operable means.

14. In combination; an automatic brake control system for railway vehicles including a normally charged brake pipe, a normally energized electro-responsive brake control device which if deenergized vents fluid pressure from said brake pipe and causes an automatic brake application, a normally energized stick relay deenergized when the vehicle enters a danger zone, a time delay reset device for restoring said stick relay only after at least a predetermined period of delay following deenergization of said brake control device and including normally closed and normally open contacts, an energizing circuit for said brake control device including said normally closed contacts, a pick-up circuit for said stick relay including said normally open contacts, manually operable means for closing said normally open contacts and opening said normally closed contacts, timing means for opening said normally open contacts and for reclosing said normally closed contacts a predetermined time following manual operation of said manually operable means, and other manually operable means effective to recharge said brake pipe only if operated after reenergization of said brake control device.

15. In combination; an automatic brake control system for railway vehicles including a normally charged brake pipe, a normally energized electro-responsive brake control device which if deenergized vents fluid pressure from said brake pipe and causes an automatic brake application, a normally energized stick relay deenergized when the vehicle enters a danger zone, a time delay reset device for restoring said stick relay only after at least a predetermined period of delay following deenergization of said brake control device and including normally closed and normally open contacts, an energizing circuit for said brake control device including said normally closed contacts, a pick-up circuit for said stick relay including said normally open contacts, manually operable means for closing said normally open contacts and opening said normally closed contacts, clock-work mechanism initiated by operation of said manually operable means for opening said normally open contacts and for reclosing said normally closed contacts a predetermined time following manual operation of said manually operable means, and other manually operable means effective to recharge said brake pipe only if operated after reenergization of said brake control device.

CHARLES S. BUSHNELL.