J. W. BARNES, Jr.

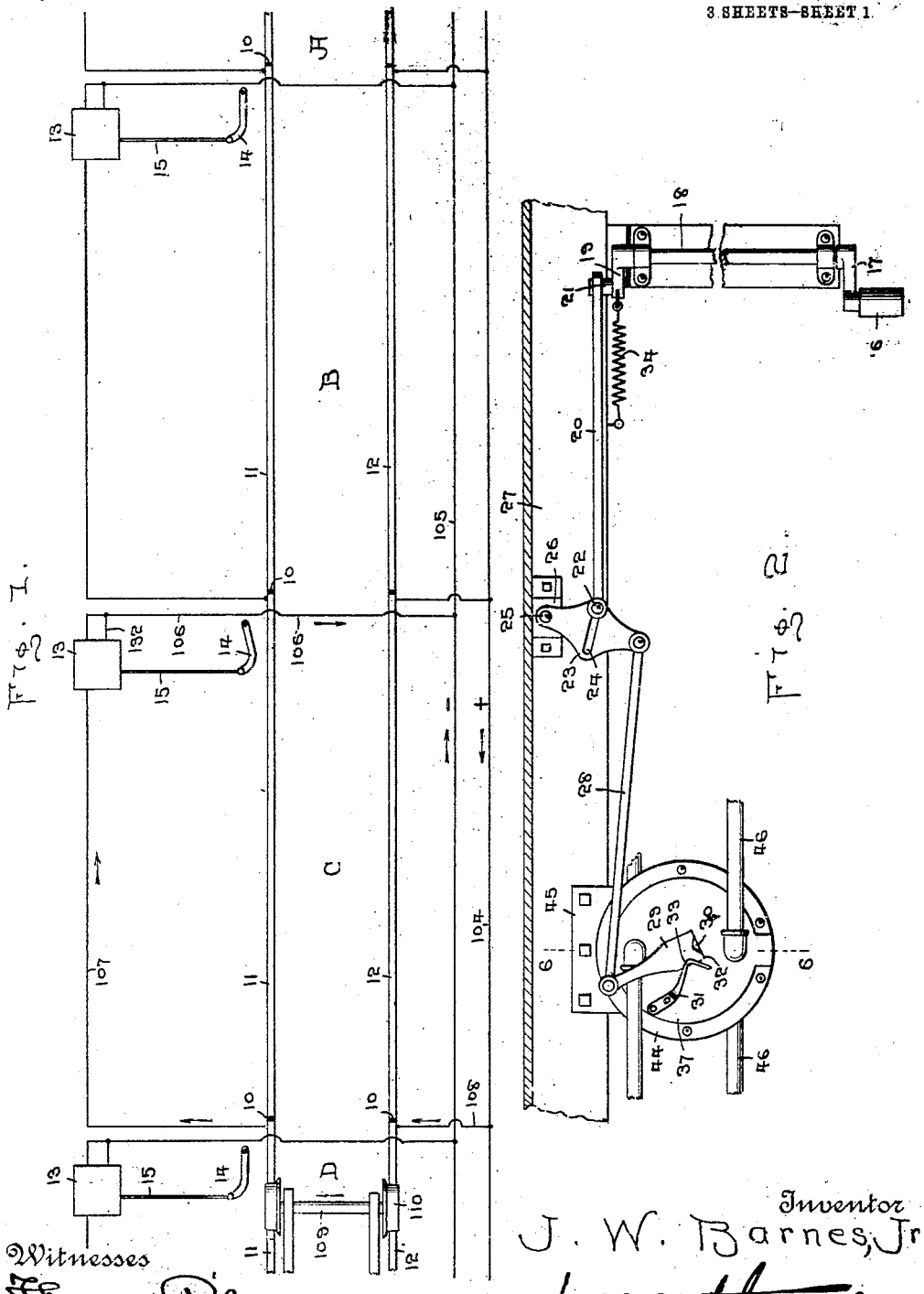
LOCOMOTIVE STOPPING APPARATUS.

APPLICATION FILED MAR. 20, 1913.

1,124,583.

Patented Jan. 12, 1915.

3 SHEETS—SHEET 1.



Witnesses

Thos. W. Riley

M. Newcomb

Inventor

J. W. Barnes, Jr

By W. J. Fitz Gerald & Co

Attorneys

J. W. BARNES, Jr.

LOCOMOTIVE STOPPING APPARATUS.

APPLICATION FILED MAR. 20, 1913.

1,124,583.

Patented Jan. 12, 1915.

3 SHEETS—SHEET 2.

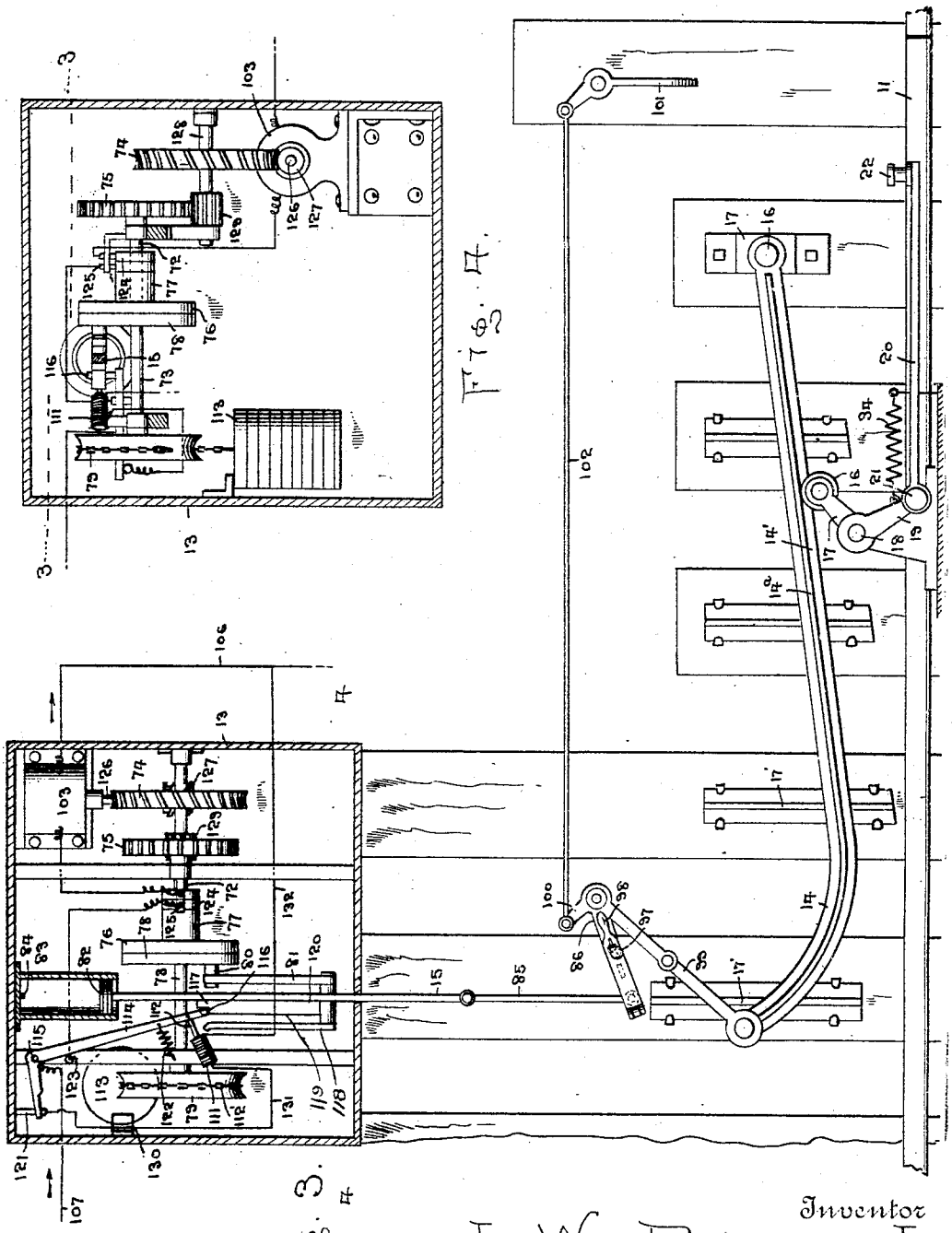


Fig. 4.

Witnesses

Thos. W. Riley

M. Newcomb

Inventor

J. W. Barnes, Jr

By W. J. Fitz Gerald & Co

Attorneys

J. W. BARNES, Jr.

LOCOMOTIVE STOPPING APPARATUS.

APPLICATION FILED MAR. 20, 1913.

1,124,583. Patented Jan. 12, 1915.

3 SHEETS—SHEET 3.

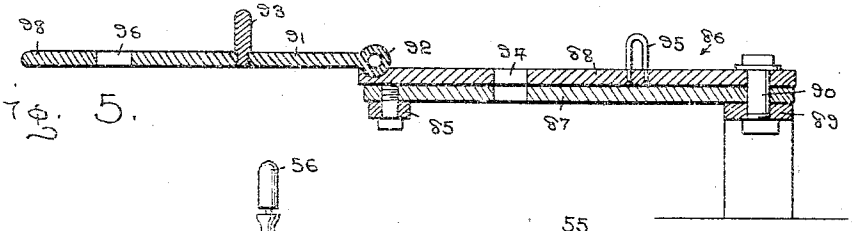


Fig. 5.

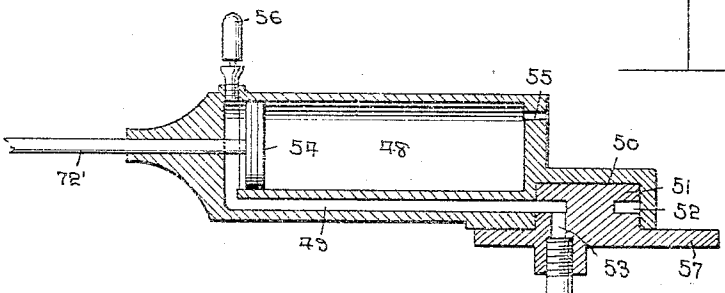


Fig. 6.

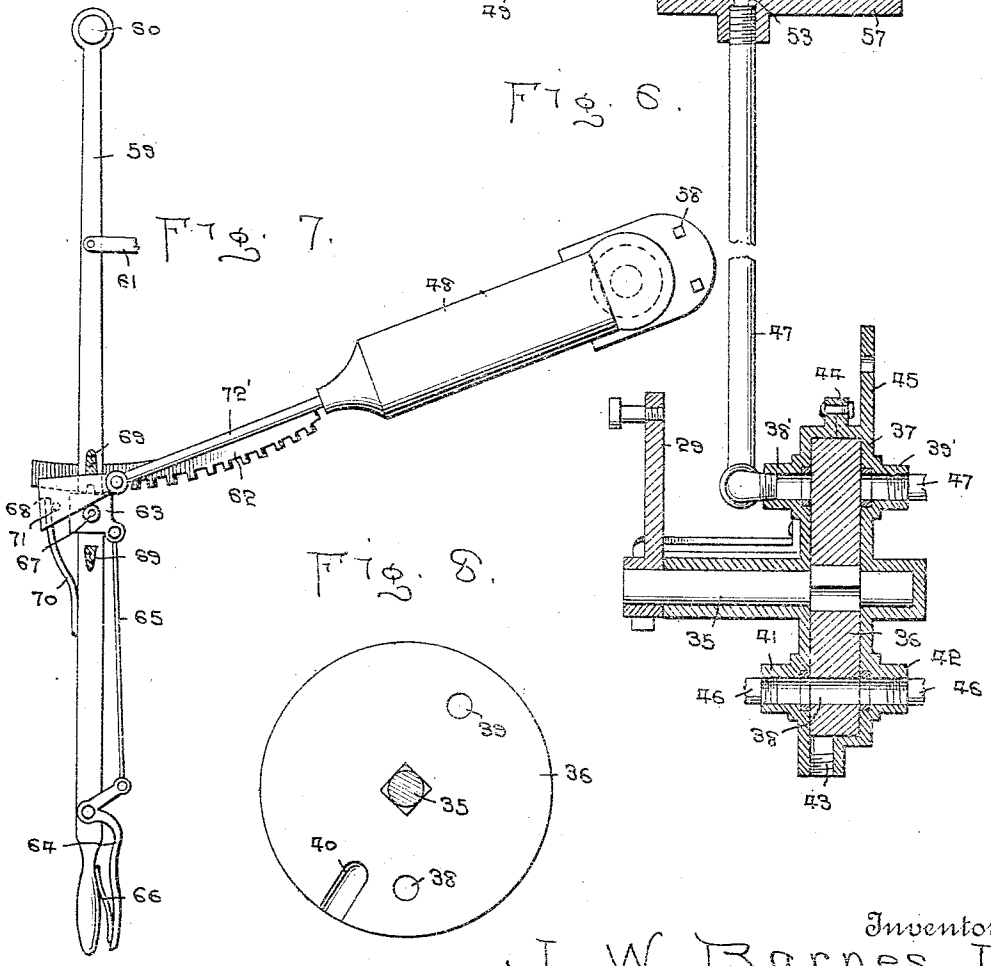


Fig. 7.

Fig. 8.

Witnesses

Thomas Reed

M. Newcomb

Inventor

J. W. Barnes, Jr

By W. J. Fitz Gerald & Co

Attorneys

UNITED STATES PATENT OFFICE.

JUSTUS W. BARNES, JR., OF BECKET, MASSACHUSETTS.

LOCOMOTIVE-STOPPING APPARATUS.

1,124,583. Specification of Letters Patent. Patented Jan. 12, 1915.

Application filed March 20, 1913. Serial No. 755,679.

To all whom it may concern:

Be it known that I, JUSTUS W. BARNES, Jr., a citizen of the United States, residing at Becket, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Locomotive-Stopping Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to locomotive stopping apparatus, and it more particularly relates to a combination of electric conductors and connections with mechanical structure, whereby a train of cars or a locomotive may be automatically and instantaneously stopped.

The prime object of the invention is to prevent rear end collisions.

Another object of the invention is to divide a railroad into sections or blocks which are electrically insulated from each other, and to provide each block with an electrically operated mechanism, and to provide each locomotive with valve-actuating and brake-actuating mechanism, for instantly applying the air-brakes of the engine and train, and simultaneously closing the throttle of the locomotive.

A further object of the invention is to equip a railroad with apparatus of this character whereby the electrically operated mechanism, or electro-mechanical actuator, of one insulated section of railroad is actuated by a train in an adjacent section in advance, which closes the circuit in the advance section, so as to set in operation the electro-mechanical actuator in the first said section, so that if a train approaches the first said train from the rear, and tends to advance within the length of one of said sections from the forward train, the brake-actuating mechanism and throttle actuating mechanism of the rear train will be actuated automatically, so that the rear train will be stopped, while the forward train increases the distance between the two trains.

Another object of the invention is to provide a locomotive stopping apparatus of this character which may be operated by hand, in case of emergency, so as to prevent a train from running into a wash-out, landslide, wreck, etc.

Another object of the invention is to provide apparatus of this character which may be used in connection with the ordinary or any preferred system of signaling, telephoning, or telegraphing, etc., so as to eliminate unnecessary expense of installation, and, another object of the invention is to provide apparatus of this character which is compact, simple and economical of construction and maintenance, positive and thoroughly reliable in operation, and withal thoroughly efficient.

Other objects and advantages may be recited hereinafter and in the claims.

In the accompanying drawings, which supplement this specification, Figure 1 is a somewhat diagrammatical plan view illustrating several adjacent sections of railroad having my improved locomotive stopping apparatus applied thereto. Fig. 2 is a fragmental detail view, in elevation, of an arrester or cut-off valve and its operating mechanism. Fig. 3 is a plan view illustrating a fragment of a railroad having my improved locomotive arrester applied in operative position, and a fragmental portion of the train and its brake-actuating and throttle-actuating mechanism in its operative position with relation to the cam-rail. This figure also shows the electro-mechanical operating mechanism, the housing therefor being shown in horizontal section on the line 3—3 of Fig. 4. Fig. 4 is a vertical section through the housing, taken on the line 4—4 of Fig. 3. Fig. 5 is an enlarged vertical sectional view through the combined bell-crank and hand-lever illustrated in Fig. 3. Fig. 6 is an enlarged vertical sectional view illustrating the cut-off valve and its connection with the compressed air cylinder and piston which combine with certain mechanism illustrated in Figs. 2 and 3 for automatically, instantly and simultaneously actuating the air-brakes and throttle. Fig. 7 is a plan view of the cylinder illustrated in Fig. 6, in connection with the throttle-operating lever, and, Fig. 8 is a side elevation view of the cut-off disk.

Referring to the drawings, in which simi-

lar reference characters correspond to the several parts throughout the several views, the railroad track is divided into sections A, B, C, D, etc., and these sections may be of any desired length, but preferably several miles, and not in the proportion illustrated, in which the length of the sections is greatly diminished, for want of space and for the purpose of comprehensive illustration. These sections are insulated from each other at 10, so that each of the rail-sections 11 and 12 constitutes an electric conductor throughout its length.

Each section is provided with an operating station which consists of an electro-mechanical actuator within the casing 13, a cam-bar 14 and its connecting element 15. The cam-bar 14 is pivoted at 16 to a stationary block or bench 17, adjacent to the rail section 11, on the right hand side of the railroad; it being understood that all of the trains travel from right to left, in Figs. 1 and 3, as in all double track railways, only one track, however, being illustrated in the present disclosure. The cam-rail 14 may be of any desired shape but is preferably in the shape of an inverted T, in cross section, for the purpose of rigidity and thorough efficiency, and upon the horizontal flanges 14′ is located the upstanding flange 14ª against which the roller 16 rolls as the locomotive passes along the track. This roller 16 is journaled on an arm 17, mounted on the vertical shaft 18, at the upper end of which is mounted an arm 19, disposed substantially at right angles to the arm 17. A link 20 is pivotally connected to the arm 19, by means of a crank-pin 21, one end of the link 20 being provided with a laterally extending stud 22 which is slidably connected with a transmission lever 23; said lever having a horizontal slot 24 through which the stud 22 extends. The lever 23 is pivotally mounted at 25 on a suitable bracket 26, secured on a beam 27. This beam is only illustrated as a means for supporting the cut-off valve and its operating mechanism, but it should be understood that I may mount these mechanisms in any suitable way, either upon the locomotive or upon the tender.

To the lower end of the lever 23 is pivotally connected a connecting rod or link 28, having one end pivotally connected to a shifter-arm 29, said shifter-arm being provided with notches 30 which are adapted to engage with a spring element or detent 31, whereby the arm 29 may be alternately held in two different positions, that is, in normal position and in train-stopping position.

As the train moves along the railway, from right to left, the arm 17 is pressed by the cam-rail until it is substantially parallel with the track, thereby swinging the arm 19 forward, drawing the link 20, and thereby swinging the transmission lever 23. It will be seen that the distance which the lower end of the lever 23 travels is approximately twice the distance which the medial or slotted portion travels, and hence, the distance which the rod 28 is pulled by the link 20 is approximately twice the distance which said link travels. Now, when the corner or point 32 has passed over the apex 33 of the detent 31, the spring action and wedge action of said detent forces the element 29 to move rapidly forward until the detent rests in the other notch 30. During the foregoing movement, the stud 22 slides in the slot 24, from the front to the rear thereof; but as soon as the roller 16 has moved out of engagement with the rail 14, the shaft 18 and arms 17 and 19 are returned to their normal positions, by means of a retractile spring 34. The forward swing of the shifter-arm 29 rotates the axle or trunnion 35, and this axle may be integrally formed with or fitted to the rotary disk or cut-off valve member 36. This valve member constitutes an essential element of the cut-off valve, of which the casing 37 constitutes the other essential element. This casing is provided with bearings in which the axle 35 is rotatably mounted, while the disk 36 is snugly fitted between the parallel walls of the casing and adapted to be rotated therein by means of the arm 29 and shaft 35. The disk 36 is provided with ports 38, 39 and 40, the first two of which extends entirely through the disk, the last one extending only partly through the disk and through the periphery thereof. The casing 37 is provided with pipe connections 38′, 39′, 41 and 42, being also provided with a release opening or outlet 43. The casing is also provided with apertured flanges 44, through which bolts or other suitable means may be extended for securing the separable sections of the casing together.

One of the casing sections is provided with an apertured flange 45, by means of which it may be secured to the element 27, or to any other desired element, as described. The air-pipe 46, which is adapted to connect with a pump (not shown) and with the air-brakes (not shown), is intersected by the valve casing 37, having its adjacent ends secured to the internally screw-threaded bosses or pipe connections 41 and 42, so that communication is normally established through the aperture or port 38. A pipe 47 is adapted to communicate with a reservoir (not shown), into which air is compressed through the pipe 46. The pipe 47 is also intersected by the valve casing 37, and is adapted to communicate with the aperture or port 39 when the disk is actuated, as previously described, so as to establish communication of the adjacent ends of the pipe 47, through said port 39, and allow the com-

pressed air to pass through the pipe 47 into the throttle-actuating cylinder 48. This cylinder is of special construction, being provided with a port 49 which extends approximately throughout its length and communicates with the interior of the cylinder at its forward end. The rear end of the cylinder is provided with a cylindrical bearing and air-chamber combined, indicated at 50, and in this chamber 50 is seated a trunnion 51 which is provided with a peripheral groove or port 52. A port 53 communicates with the port 52 while the latter communicates with the port 49, and the communication of the ports 49 and 52 is unbroken and unaffected by the rotation of the cylinder 48 upon the trunnion 50. The port 53 communicates with the pipe 47, and so, when compressed air passes through the port 39, pipe 47 and ports 53, 52 and 49, and into the cylinder 48, the piston 54 is actuated and forced back within the cylinder, while the air escapes through the vent 55. A whistle 56 may be provided on the cylinder 48, so as to notify the engineer and conductor that the engine is being stopped by this locomotive stopping apparatus, and not by wreck or accident. The trunnion 51 is provided with an apertured flange or base 57 through which bolts or other fastening means 58 may be inserted for securing it to any suitable support (not shown) within the engineer's cab.

The throttle-actuating lever 59 may be of any preferred or usual construction, being pivotally mounted at 60, connected to the throttle (not shown) by means of a link 61. The usual toothed segment 62 is employed for adjustment of the lever 59, a sliding detent 63 being connected to the handle 64 by means of the link 65. A spring 66 co-acts with the handle and link for holding the detent in engagement with the teeth of the segment 62. The detent 63 is provided with a stud or roller 67 against which a wedge element 68 is adapted to be moved, for disengaging the detent 63 from the teeth of the segment. The wedge 68 is backed and supported by a keeper element 69 which is fixedly secured on the lever 59. The keeper element is partly removed in Fig. 7, for the sake of clearness, but the two sectioned portions thereof are adapted to be connected by a bridge element (not shown), which may extend over the elements 63, 67 and 68, so as to hold the latter element in proper working relation with the roller 67. A spring 70 is secured on the lever 59, and bears against a stud 71, which extends down from the wedge element 68. The wedge element 68 is connected with the piston 54 by means of the piston rod 72', so that when the piston is actuated, as described, the wedge 68 is drawn between the roller 67 and one of the sectioned elements 69, so as to push the detent 63 out of engagement with the teeth of the segment. The sliding movement of the element 63 is arrested by the other sectioned element 69, so that the piston rod 72' now exerts a positive and forceful pull on the lever 59, so as to move the link 61 longitudinally and thereby close the throttle of the engine.

It will be seen that the foregoing operation is effected by the rotation of the disk 36, and the consequent establishment of an air current through the pipe 47 and the several intercommunicating ports. Now, it will also be seen that the same movement of the disk 36 which opens the port 39 closes the port 38 and opens the port 40; or, in other words, the communication of the air-pump and air-brakes is cut off while the air may escape from said air-brakes through the port 40, so that said air-brakes are quickly and gradually operated; the escape of air not being so rapid as to draw the brakes instantly, which would result in frightening and probably injuring some of the passengers.

The cam-rail 14 is normally out of operative position, its rectilinear portion being substantially parallel with the railroad track, as shown at the left of Fig. 1, so that the roller 16 does not come into contact therewith; but when a train starts to enter one of the track sections before another train, in advance thereof, has passed out of the preceding section, the previously described operation will result, the cam-rail 14 having been swung into the position shown in Fig. 3 by the electro-mechanical actuator, which is described in detail as follows: Within the casing 13 is mounted a rotatable shaft 72 and a second rotatable shaft 73, these shafts being axially alined. The shaft 72 carries a spur gear 75 and a disk 76 which are rotatable with the shaft 72 and with an electro-magnet 77 by which the disk is to be magnetized. The shaft 73 carries a disk 78 and a sheave wheel 79. The disks 76 and 78, together with the magnet 77, constitute a magnetic friction clutch, the adjacent faces of said disks being smooth and in contact with each other, and adapted to rotate alternately with each other and independently of each other. The friction disk 78 is provided with a crank-pin or stud 80 to which is pivotally connected one end of a connecting rod 81, having its other end pivotally connected to the plunger rod or element 15. One end of this plunger rod carries a piston 82, adapted to slide within a cylinder 83, said cylinder having therein a vent 84. The other end of the plunger rod 15 is connected by a link 85 to a horizontal rocker or bell-crank 86.

The bell-crank is of special construction,

as illustrated in Figs. 3 and 5, being formed in three movable sections. The lower section 87 is pivotally connected with the link 85, while this lower section and the middle section 88 are pivotally mounted upon the same support 89 and upon the same pivot 90. The upper section 91 is hinged to the middle section at 92, and is adapted to be swung outward, as in Fig. 5, and inward, as in Fig. 3. When in this latter position, the lower and middle sections are held in parallel relation by means of a stud 93 which extends through registering apertures, indicated at 94, while the staple 95 extends through an aperture 96, and a padlock 97 is engaged with the staple 95; so that these upper, lower and middle elements are locked securely together, in an obvious manner.

When in open position, as illustrated in Fig. 5, the handle 98 may be grasped for swinging the middle and upper sections of the bell-crank instantly on the lower section, so that the cam-rail, which is connected to the middle section by means of a link 99, may be swung into or out of operative position, without affecting the mechanism within the casing 13. The bell-crank is also provided with an arm 100 which is connected to a signal 101, through a link 102. This signal is so connected as to be in signaling position when the cam-rail is in its operative position, so that the engineer may begin to stop the engine before it is stopped by the stopping apparatus, providing he sees the signal; but in case of negligence, or obstruction, such as fog, rain or snow, the stopping apparatus will effectually stop the train, in the manner described.

Now, in order that the cam-rail 14 may be thrown into operative position by means of a train in the forward or advance railroad section or block, the mechanism within the casing 13 includes a motor indicated at 103, which is electrically connected with one of the rails in the forward railroad section, while the other rail of the forward section is electrically connected with the positive conductor or line wire 104. The negative or return line wire 105 is connected with the motor through a conductor wire 106, a relatively long conductor wire 107 being employed for connecting with one of said forward sections, while a relatively short conductor 108 connects said positive wire with the opposite rail of said forward section. Now, assuming that a locomotive has just passed from the section C into section D, and that the circuit between the rails 11 and 12 is closed by the axle 109 and wheels 110; it will be seen that the circuit will pass, in the direction of the arrows, from the conductor 104 through the conductor 108, rail section 12, wheels 100, axle 109, rail 11, conductor 107 and conductor 106, to the negative line wire 105. However, in completing this circuit the current must also pass through the motor 103, or alternately through the coil or solenoid 111 (see Figs. 3 and 4).

A chain 112′ has one end secured to the sheave wheel 79, its other end being secured to a weight 113, whereby the disk 78, connecting rod 81 and plunger-rod 15 are held in their normal position, for holding the cam-rail and its adjuncts in their inoperative position. A lever 114 is pivotally mounted at 115 within the casing 13, and this lever is made of conducting material, and comprises a combination electric switch and mechanical detent, one arm of said lever being provided with a stud 116 which engages with a notched lug 117, secured on the plunger-rod 15. The plunger-rod also carries a guide-arm 118, which is spaced apart from the element 15 and from the cam surface 119 of the lug 117, so as to provide a slot 120 which slides over the stud 116 and constitutes a guide and actuating means for the latter.

In the position shown in Fig. 3, the short arm of the lever 114 is in contact with a binding post or contact 121, to which one of the terminals 131 of the solenoid 111 is connected, the other solenoid terminal 132 being electrically connected to the conductor wire 106, while the conductor wire 107 is electrically connected to the pivot 115, of the lever 114; and therefore, so long as the wheels 110 remain on the section D (see Fig. 1), the circuit is established through the conducting elements 107, 115, 114, 121, 131, 111, 132 and 106, while no current is flowing through the motor 103, nor through the magnet 77, and so, the motor is at rest and the plunger-rod 15 and its adjuncts are held outward by means of stud 116, as described; said stud being held in engagement with the lug 117 by means of the solenoid 111 and rod or plunger 112; said plunger being movably connected to the lever 114 and being adapted to slide axially through the coil 111, said coil being properly wound for repelling the plunger, and thereby holding the lever against the action of the spring 122, in engagement with the lug 117. However, as soon as the wheels 110 leave section D, the electric connection between the rails of that section is broken, so that the current ceases to flow through the conductors 107 and 108, opposite to section C, and through the connections and conductors within the casing 13 of said section C, and now, the solenoid becomes inoperative, so that the spring 122 now disengages the stud 116 and lug 117, so that the weight 113 rotates the wheel 79 and disk 78, and coacts with the element 15 and its adjuncts for sliding the cam-rail on its rests 17′, into its inoperative position, while

the piston 82 and cylinder 83 constitute an air cushion for preventing the weight 113 from too suddenly returning said element or plunger rod 15.

When the next train enters the section D, the circuit will be completed through the wheels and axles thereof, so that an electric current will now pass through magnet 77 and draw the disks 76 and 78 tightly into frictional contact, sufficient play being allowed in the journal bearings for this slight relative movement of the disks; said magnet being provided with contact rings 124 and with brushes 125, so that the current passes through the magnet, rings, brushes and conductor wires into and through the motor 103 so as to actuate the motor, and thereby rotate the shaft or axle 126. A worm 127 is carried by said axle, and meshes with a worm-wheel 74, so as to rotate the latter and thereby rotate the shaft 128 on which it is seated. A pinion 129 is also fixed on the shaft 128 and meshes with the spur gear 75. As the disk 24 is now in frictional contact with the disk 78 the latter is thereby caused to rotate with the disk 76, so as to force the plunger element 1 outward, simultaneously raising the weight 113 until the latter has been arrested by the stop-lug 130. While in this position, the current passes through the solenoid 111 and the conductors 131 and 132 which are connected therewith, so as to retain the several elements in the position shown in Fig. 3, so long as the current continues to flow through said solenoid, as previously described.

It will be seen that I have provided an apparatus of this character which is fully capable of attaining the foregoing objects in a thoroughly practical and efficient manner.

I do not limit my invention to the exact details of construction, combination and arrangement of parts as herewith illustrated and described, but my invention may only be limited by a reasonable interpretation of the claims.

I claim:

1. In combination, a railroad track divided into insulated sections and having its rails insulated from each other, a normally open electric circuit including the rails of each section, a member movably seated adjacent the track, electro-mechanical means for moving said member into operative position, electro-magnetic means in said circuit for locking said member in operative position, mechanical means for returning said member to inoperative position, and electro-magnetic means in said circuit for connecting said electro-mechanical means with said mechanical means.

2. In combination, a railroad track divided into insulated sections and having its rails insulated from each other, a normally open electric circuit including the rails of each section, a member movably seated adjacent the rails of each section, electro-mechanical means for moving said member into operative position, electro-magnetic means in said circuit for locking said member in operative position, mechanical means for returning said member into inoperative position, and means operatively connected with said member for alternately closing the circuit to said electro-magnetic means and said electro-mechanical means.

3. In combination, a railroad, a locomotive adapted to travel on the railroad and having a stopping mechanism extending upwardly therefrom, a cam rail movably mounted adjacent the railroad and adapted to contact with said stopping mechanism as the locomotive moves along the track for stopping the locomotive, electro-mechanical means for moving said cam rail into operative position, mechanical means for moving said cam rail out of operative position, and separable electrical controlling means between said electro-mechanical means and said mechanical means.

4. In combination, a railroad divided into insulated sections and having its opposite track-rails insulated from each other, a pair of electric conductors extending longitudinally of the railroad, an electro-mechanical actuator adjacent to each said section, a member operatively connected with each electro-mechanical actuator adapted to be moved thereby adjacent to the railroad for contacting with or otherwise affecting a locomotive or train as it travels on the railroad past said member, said electro-mechanical actuator consisting of a plunger-rod which forms a part of the connection with said member, a connecting rod for moving the plunger-rod longitudinally, a metal disk pivotally connected to the connecting rod, a second metal disk in frictional contact with the first said disk and in axial alinement therewith, a magnet for increasing the friction of said disks, a motor, a gear connected with the motor and co-acting therewith for rotating the second said disk and thereby rotating the first said disk, a lever for engagement with said plunger-rod and holding it in its extended position, a spring for effecting disengagement of the lever with the plunger-rod, a coil and plunger for opposing the action of the spring and retaining the engagement of the lever with the plunger-rod, and means on the plunger-rod for moving said lever against the action of said spring, said lever being of conducting material and constituting a switch element whereby the circuit through said coil is broken while the circuit through said motor is closed, said lever being electrically connected with one of said track-rails, and said motor being electrically con-

nected with one of said electric conductors, said coil also being connected with the last said electric conductor, the other said electric conductor being connected with the opposite track-rail, whereby the circuit may be closed by the wheels and the axle which connects them upon the track-rails.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JUSTUS W. BARNES, JR.

Witnesses:

WILLIAM J. CROSS,

ALFRED J. CROSHINE.