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D. M. DALEY

AUTOMATIC TRAIN STOPPING APPARATUS

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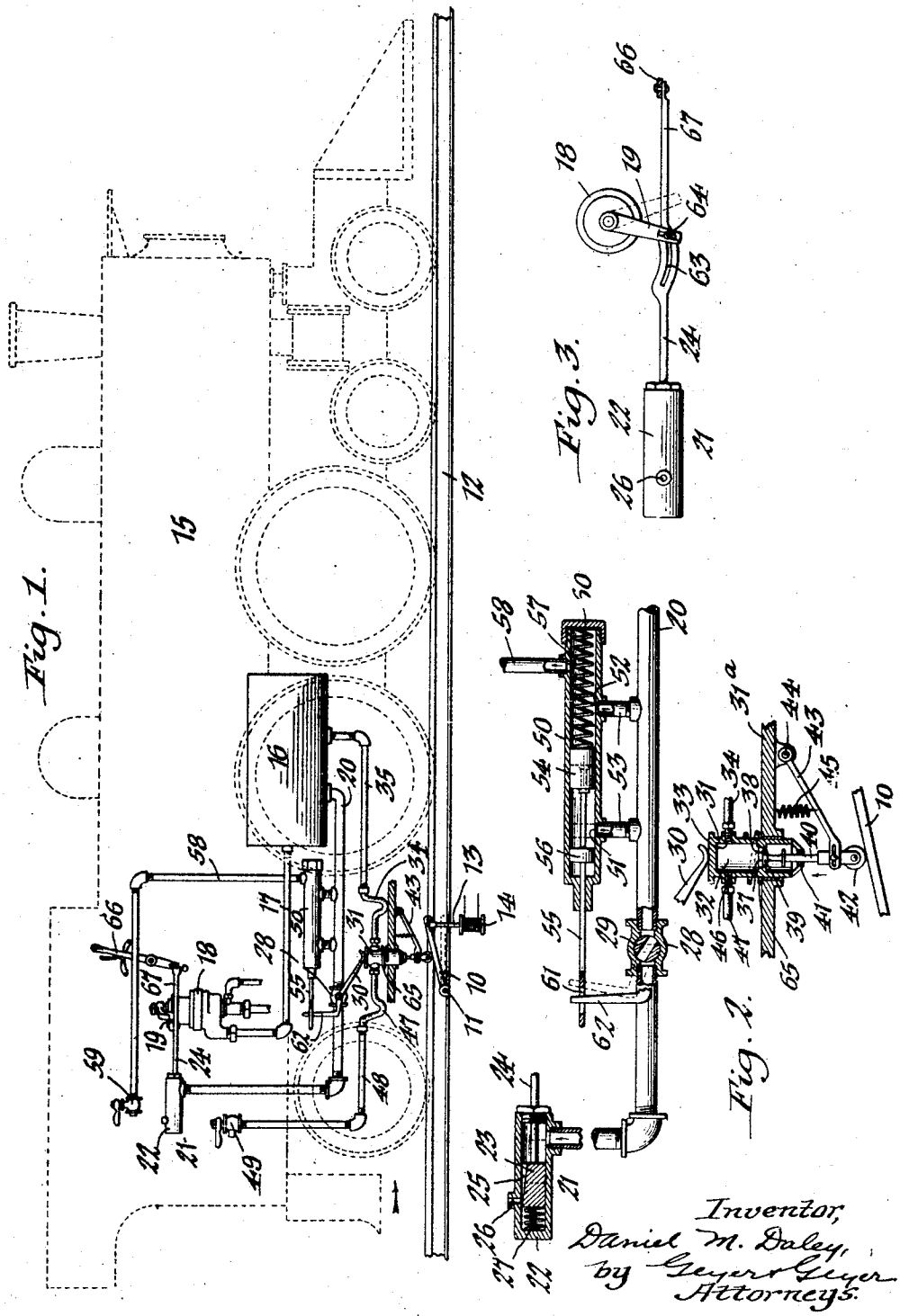


Fig. 1.

Fig. 3.

Fig. 2.

Inventor,
Daniel M. Daley,
by Geyer & Geyer
Attorneys.

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DANIEL M. DALEY, OF LACKAWANNA, NEW YORK, ASSIGNOR OF ONE-HALF TO JOHN H. SHEA, OF LACKAWANNA, NEW YORK.

AUTOMATIC TRAIN-STOPPING APPARATUS.

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This invention relates generally to improvements in train stopping apparatus but more particularly to an apparatus for use in block signal systems and of the type for automatically applying the brakes of the train should the engineer fail to heed a danger signal or run past a signal at danger.

One of its objects is to provide a novel mechanism of this character which will automatically actuate the engineer's brake valve to apply the brakes whenever a danger signal is set against the train.

Another object of the invention is to so construct the brake operating mechanism, that while it will function to automatically applying the brakes should the engineer fail to observe or see a danger or warning signal, it will not in any way interefere with the independent actual control of the train by the engineer.

A still further object is to provide a pneumatically operated train stopping apparatus which is simple and durable in construction, and reliable and efficient in operation.

Other features of the invention reside in the particular construction and arrangement of parts hereinafter described and particularly pointed out in the appended claims.

In the accompanying drawings:—

Figure 1 is a side elevation of a locomotive showing my invention in connection therewith. Figure 2 is an enlarged fragmentary sectional elevation of the operating mechanism for actuating the engineer's brake valve. Figure 3 is an enlarged top plan view showing the connection between the engineer's brake valve lever and the means for actuating it.

Similar characters of reference indicate corresponding parts throughout the several views.

In its general organization, this apparatus consists of an adjustable trip device or ramp disposed along the track at a suitable distance in front of a given block signal and arranged to be projected into the path of a tappet or similar device on a locomotive, and pneumatically controlled means carried by the locomotive and governed by said tappet for effecting the application of the brakes.

The adjustable trip device or ramp shown in the drawings, by way of example, preferably consists of a vertically-swinging arm 10 pivoted at 11 alongside the track 12. In its normal inoperative position, this arm assumes a substantially horizontal position shown by dotted lines in Fig. 1, and may be moved to an inclined operative position by the bar 13 of a solenoid 14 electrically connected with the usual track circuit so that when the signal is moved to "danger" position, an electric circuit is closed which energizes the solenoid and moves the ramp arm 10 to its operative position. Inasmuch as the mechanism for closing this electric circuit is common in this type of signal systems and forms no part of the present invention, it has not been deemed necessary to illustrate it in the drawings.

Mounted in the usual manner on the locomotive 15 is the main air reservoir 16 of the air brake system and connected by a pipe 17 therewith is the engineer's valve 18 having the customary hand lever 19 for controlling it. The mechanism for automatically actuating this valve-lever to effect a service application of the brakes, should the engineer fail to heed the danger signal, is preferably constructed as follows:—

Leading from the main reservoir is a pipe or conduit 20 which is provided at its end with a graduated valve 21 consisting of a body or casing 22 closed at its ends and containing a slide valve or plunger 23 having a guide rod 24 pivotally connected at its outer or free end to the hand lever 19 of the engineer's valve. In its face this slide valve has a longitudinal tapered port 25 decreasing in size from its front end to its rear end and arranged to communicate with a vent or outlet port 26 in the valve body. A spring 27 interposed between the rear end of the valve and the opposing end wall of the valve-body 22 serves to normally maintain said valve in the closed position shown by dotted lines in Fig. 2, in which position the engineer's valve is likewise closed. Interposed in the pipe 20 between the main reservoir and the graduated valve 21 is a controlling valve 28 for regulating the passage of air from the reservoir to said graduated valve. This controlling valve contains a ported-plug 29 having an actuating lever 30 which projects into the path of and normally contacts with the upper closed end of a vertically movable member 31 suitably guided on a stationary part 31ª of the locomotive. Said member 31 is preferably in

the form of a cylinder open at its bottom and containing an air compartment 32 in its upper end provided with an air inlet 33 connected by a flexible hose 34 and pipe 35 with the main reservoir 16. The bottom wall 36 of this compartment contains an opening 37 having an upwardly-facing valve-seat 38 with which a suitable valve 39 normally engages, the same being held against its seat by the air pressure in said compartment, such pressure being about 80 or 90 pounds to the square inch. Abutting against the underside of the valve 39 is a plunger or tappet rod 40 guided in a bridge-piece 41 depending from the cylinder 31 and terminating at its lower end in a roller 42 adapted to ride over the trip arm 10. A suspension arm 43 pivoted at 44 and connected at its free end to the tappet rod serves to hold the latter up against the valve 39, a spring 45 acting to normally sustain said tappet rod in a position to encounter the trip arm should it be set in its operative position. When the tappet rod encounters the inclined trip arm, as seen in Figs. 1 and 2, the former is raised and the valve 39, being held down by the air pressure in the cylinder-compartment 32, is prevented from opening, thus causing the cylinder 31 to be elevated bodily together with said tappet rod, which movement results in the lever 30 being swung upwardly to open the controlling valve 28, whereupon the air from the reservoir flows into the graduated valve 21 and moves its slide 23 in a direction to turn the engineer's valve-lever 19 to "service" position and effect the application of the brakes. As soon as the tappet rod passes clear of the inclined trip arm, the former together with the cylinder 31 returns to its initial lowered position by gravity, the spring 45 sustaining these parts in such position. Inasmuch as the valve lever 30 simply bears on the upper side of the cylinder, it does not move downwardly therewith, but remains in its open position to permit the continued application of the brakes until such time as the engineer takes the control of the air brake into his own hands. When the trip arm is in its horizontal or inoperative position, shown by dotted lines in Fig. 1, the tappet rod roller 42 clears said arm and the cylinder remains in its lowered position.

In case it is desired to leave the train in full control of the engineer, the cylinder 31 is provided with an outlet port 46 having a flexible hose 47 and pipe 48 leading therefrom, said pipe being provided at its outlet end with a cock 49 opening into the atmosphere. When the latter is opened, which need be only momentarily while passing over the ramp 10 the air is exhausted from the cylinder-compartment 32 so that when the tappet rod encounters the inclined trip arm, the valve 39 is free to move upwardly independently of its cylinder with the result that the controlling valve 28 and graduated valve 21 are unaffected, these parts remaining in their normally closed positions.

Means are provided for automatically effecting the return of the controlling valve 28 to its normally closed position after the brakes have been applied and the engineer has observed the warning given thereby. For this purpose, an equalizing chamber or cylinder 50 is provided having inlet ports 51, 52 near its ends connected by pipes 53 with the pipe 20 at a point between the reservoir 16 and the controlling valve 28. Operating in said cylinder 50 between its inlet ports is a balanced piston 54 having a rod 55 extending through one end thereof. Fixed on this rod for movement with its piston is a slide valve 56 which is adapted to open and close the inlet port 51 for effecting either a balancing of the pressure within the cylinder on opposite sides of the piston or shutting off the admission of air from the pipe 20 into the left hand side of the cylinder. That portion of the cylinder at the right of the piston is provided with an outlet port 57 to which a pipe 58 is connected having a cock 59 at its outlet end opening into the atmosphere. A spring 60 interposed between the piston and the right hand end of the cylinder serves to limit its movement toward that end of the cylinder. The extended end of the piston-rod 55 is provided with a longitudinal slot 61 into which the upper end of a releasing arm 62 of the valve-lever 30 projects, as shown in Fig. 2, said slot being of the proper length to permit the free movement of the releasing arm therein as the valve-plug 29 is turned from its closed position to its fully opened position in the act of automatically applying the brakes. In effecting the automatic turning of this valve-plug to its closed position, the engineer opens the cock 59, which exhausts the air from the right hand side of the cylinder 50 and causes the piston to be moved from the full line position to the dotted line position shown in Fig. 2, with the slide-valve 56 arranged over and closing the port 51. In moving to this position, the rear end of the slot 61 in the piston rod engages the releasing arm 62 of the valve-lever 30 and shifts it to the closed position shown by dotted lines in Fig. 2, the spring 60 being designed to permit such movement and to limit the forward movement of the piston 54 in its cylinder. When the valve has been reset to its normal closed position, the engineer again closes the cock 59 after which the piston and slide valve return to their initial balanced position in the cylinder.

In order that the engineer may operate the brake lever 19 independently of the automatic mechanism, the adjoining end of the

valve-rod 24 has an arcuate slot 63 with which a pin 64 carried by said lever is adapted to engage.

Briefly stated, the operation of this apparatus is as follows:

Assume that the signal arm of a semaphore is set against an approaching train and the trip device 10 to be in its inclined position, shown in Fig. 1. When the tappet rod 40 encounters the trip device it rides up the same and raises the cylinder 31 which movement opens the controlling valve 28 and permits the air under pressure from the main reservoir to flow into the graduated valve 21 and move the engineer's brake valve lever 19 from the dotted line position to the full line position shown in Fig. 3, thereby applying the brakes and at the same time warning the engineer of danger ahead so that he may act accordingly and thereafter take control of the train into his own hands. To reset the controlling valve 28 in its closed position, the engineer opens the cock 59 which automatically causes the balanced piston 54 to move forwardly in its cylinder 50 against the resistance of the light spring 60 and shift the releasing arm 62 of the valve-lever 30 in the proper direction to close the valve-plug 29. As soon as this operation is effected, the engineer closes the cock 59 to allow the parts affected to return to their initial position.

A coil spring 65 is preferably applied to the cylinder 31 for cushioning the downward movement thereof after its tappet rod 40 passes over the trip device 10.

In addition to applying the brakes, the apparatus may also function to throw the throttle lever 66 to its "off" position and shut off the steam. For this purpose, the graduated valve-rod 24, which is connected with the hand lever 19 of the engineer's brake valve, is provided with an extension 67 connected to the lower arm of the throttle lever. Thus, whenever the brake lever is automatically moved to brake applying position, the throttle lever is simultaneously moved to a position to shut off the steam, the holding pawl of the throttle lever being so arranged as to readily ride over the teeth of the quadrant for this purpose.

I claim as my invention:—

1. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of pneumatically-operated means for actuating the brake valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve-actuating means, a trip device, and pneumatically-governed means on the locomotive arranged to be tripped by said device for actuating said controlling valve.

2. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of pneumatically-operated means for actuating the brake valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve-actuating means, a trip device, a pneumatically-governed member mounted on the locomotive for moving said controlling valve from a normally closed position to its open position, means under the control of the engineer for rendering the pneumatically-governed member operative or inoperative, and a tappet engaging said pneumatically-governed member and arranged to be elevated by said trip device.

3. In an automatic train stopping apparatus, the combination with a locomomotive having an air brake system including a main air reservoir and a brake valve, of pneumatically-operated means for actuating the brake valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve-actuating means, a trip device, an actuating member for said controlling valve guided for vertical movement on the locomotive and having an air compartment therein communicating with said reservoir, an upwardly-opening valve in the bottom of said compartment normally held closed by the air pressure therein, and a vertically-movable tappet engaging said compartment-valve and arranged to be actuated by said trip device for shifting said actuating member in a direction to open the controlling valve.

4. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of pneumatically-operated means for actuating the brake-valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve-actuating means, a trip device, a pneumatically-governed member in communication with the reservoir and mounted on the locomotive for moving said controlling valve from a normally closed position to its open position, a tappet engaging said pneumatically-governed member and arranged to be elevated by said trip device, and means for yieldingly sustaining said pneumatically-governed member and said tappet in their normal lowered position.

5. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of pneumatically-operated means for actuating the brake valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve actuating means, a trip device, an actuating member

for said controlling valve guided for vertical movement on the locomotive and having an air compartment therein communicating with said reservoir, an upwardly-opening valve in the bottom of said compartment normally held closed by the air pressure therein, a vertically-movable tappet guided on the valve-actuating member and bearing at its upper end against said compartment-valve, said tappet being arranged to be actuated by said trip device for shifting said actuating member in a direction to open the controlling valve, and a yieldable suspension member connected to said tappet for holding the same and said actuating member in their normal lowered position.

6. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of pneumatically-operated means for actuating the brake valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve actuating means and having a lever for opening and closing the same, a trip device disposed adjacent to the train-track, a tappet carried by the locomotive and arranged to be tripped upwardly by said trip device, and a member interposed between said valve-lever and said tappet and constructed for movement with or to be held stationary relative to said tappet.

7. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of pneumatically-operated means for actuating the brake valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve-actuating means and having a lever for opening and closing the same, a trip device disposed adjacent to the train-track, a tappet carried by the locomotive and arranged to be tripped upwardly by said trip device, and a member interposed between said valve-lever and said trip device and constructed for movement with or be held stationary relative to said tappet, said member being in the form of a cylinder having an air compartment communicating with said reservoir, an upwardly-opening valve seated in the bottom of said compartment and normally held closed by the air pressure therein, said valve lever bearing on the closed upper end of said cylinder and said tappet bearing at its upper end against said valve, and means for exhausting the air from said compartment.

8. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of a pipe connected at one end with said reservoir, a casing connected to the other end of said pipe and having a plunger therein operatively connected to the brake valve for moving the same to a position to apply the brakes, a controlling valve applied to said pipe between the reservoir and said plunger-casing, a trip device, and pneumatically-governed means on the locomotive communicating with the reservoir and arranged to be tripped by said device for actuating said controlling valve.

9. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of a pipe connected at one end with said reservoir, a casing connected to the other end of said pipe and having a plunger therein operatively connected to the brake valve for moving the same to a position to apply the brakes, said plunger containing a vent port arranged to communicate with the atmosphere at a predetermined point in the stroke of said plunger, a controlling valve applied to said pipe between the reservoir and said plunger-casing, a trip device, and means on the locomotive arranged to be tripped by said device for moving the controlling valve to its open position.

10. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of pneumatically-operated means for actuating the brake-valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve-actuating means, a trip device, pneumatically-governed means on the locomotive arranged to be tripped by said device for moving said controlling valve to its open position, and pneumatically-operated means connected with the controlling valve and governed by the operator for restoring said valve to its normally closed position.

11. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of pneumatically-operated means for actuating the brake valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve-actuating means, a two-armed lever for actuating said valve, a trip device, means on the locomotive arranged to be tripped by said device and engaging one arm of said valve-lever for moving the valve to its open position, and pneumatically-operated means governed by the operator and connected with the other arm of said valve-lever for moving the valve to its closed position.

12. In an automatic train stopping apparatus, the combination with a locomotive having an air brake system including a main air reservoir and a brake valve, of pneu-

matically-operated means for actuating the brake valve communicating with said reservoir, a controlling valve interposed between the reservoir and said brake valve-actuating means, a trip device, means on the locomotive arranged to be tripped by said device for moving said controlling valve to its open position, and means governed by the operator for restoring said valve to its normally closed position, said last-named means including a cylinder communicating at its opposite ends with said reservoir, a normally balanced piston operating in the cylinder and operatively connected to said controlling valve, a slide valve movable with said piston for shutting off the admission of air into one end of said cylinder, and means for exhausting the air from the other end of said cylinder.

DANIEL M. DALEY.