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2,456,286

LOW BRAKE PRESSURE SIGNAL DEVICE

Filed Oct. 20, 1945

3 Sheets-Sheet 1

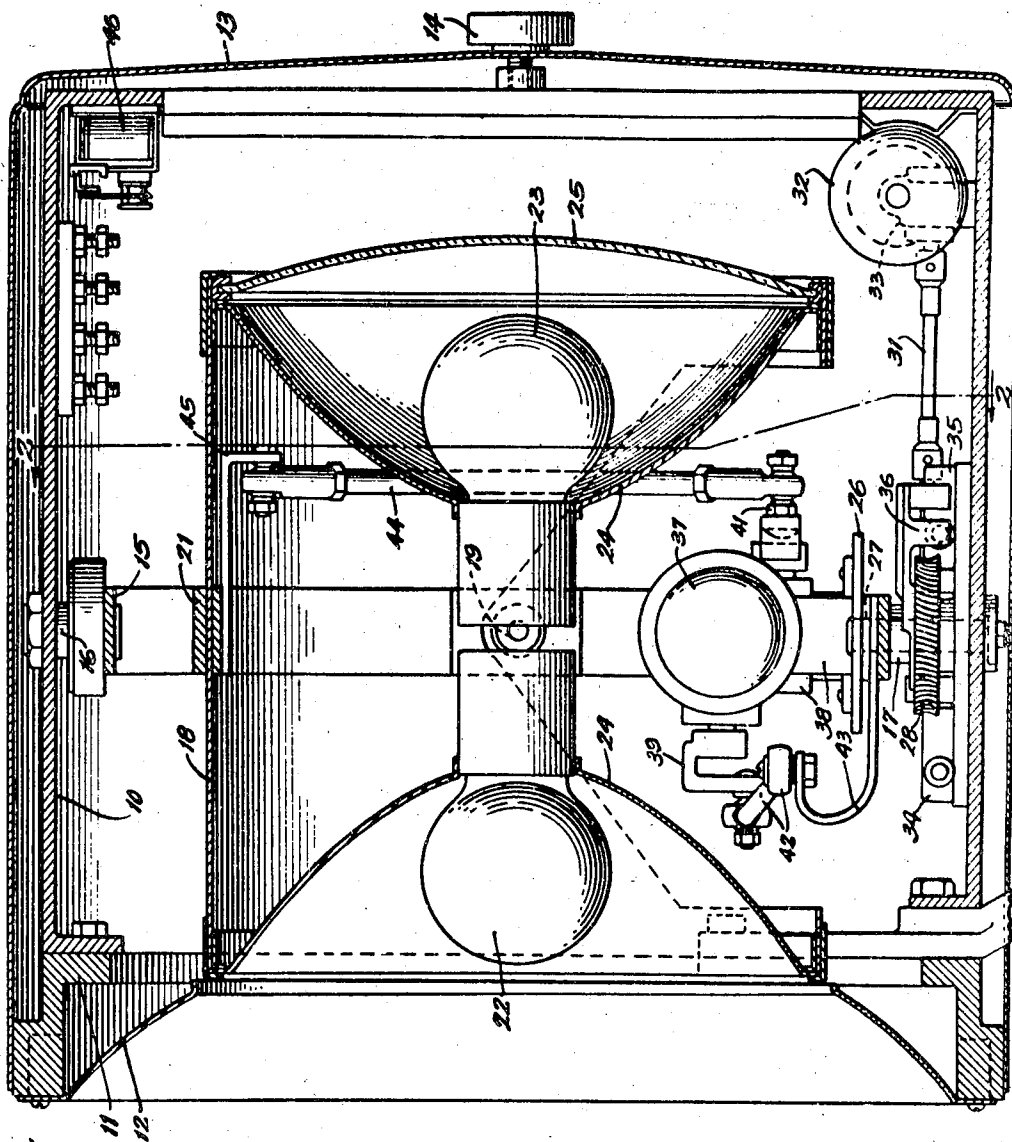


Fig. 1

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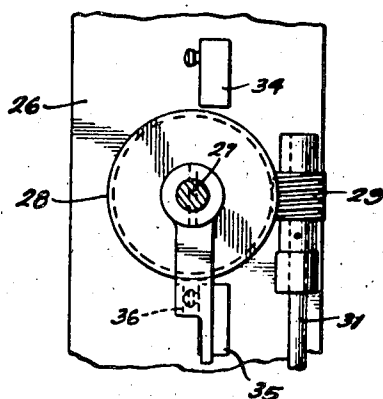
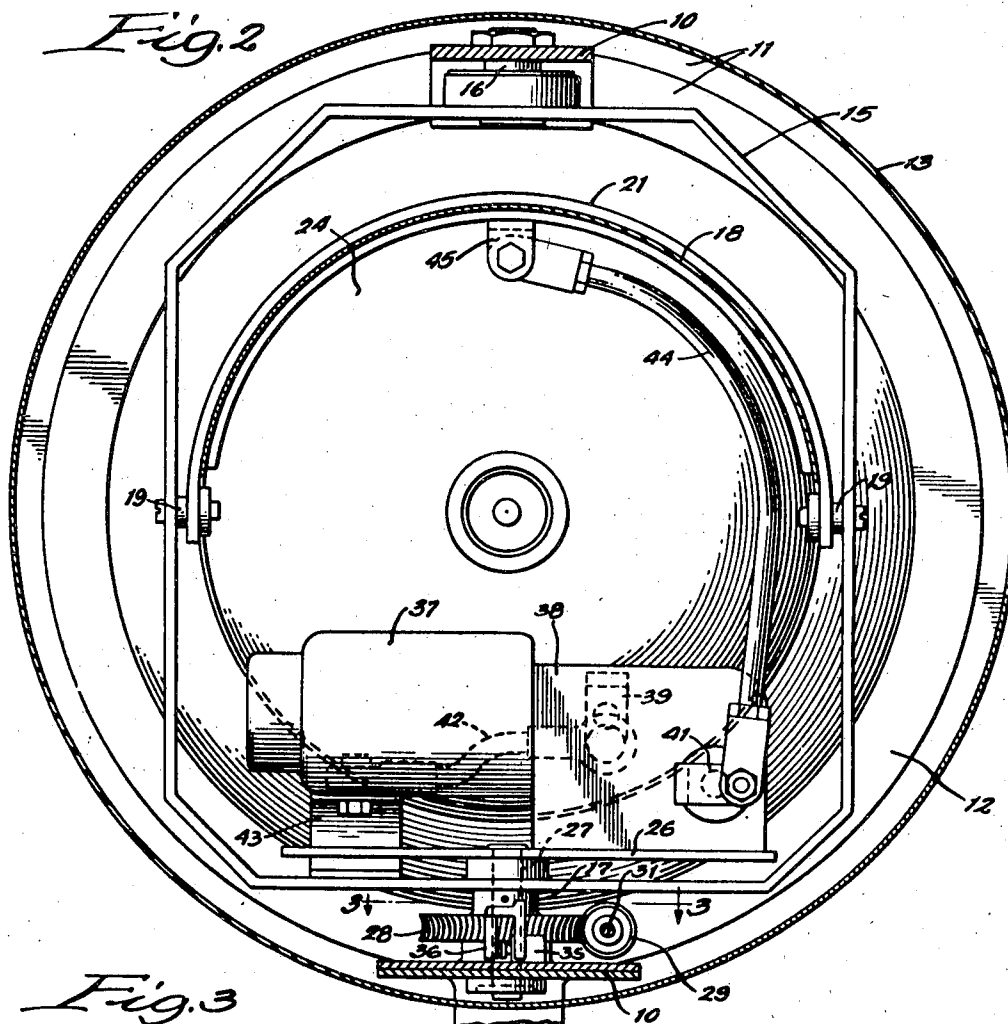
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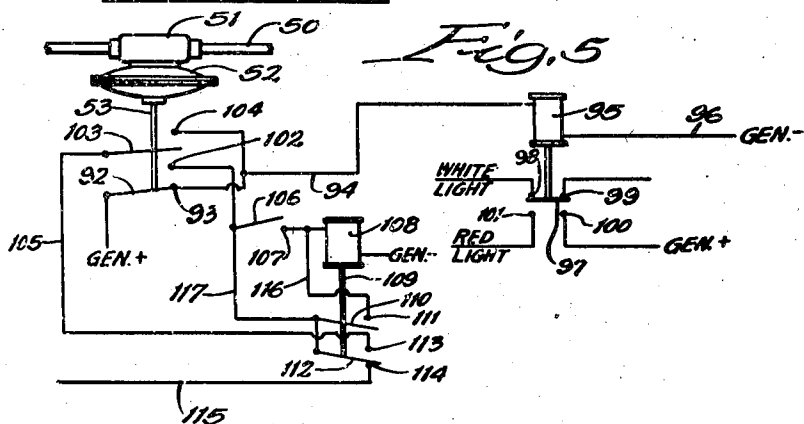
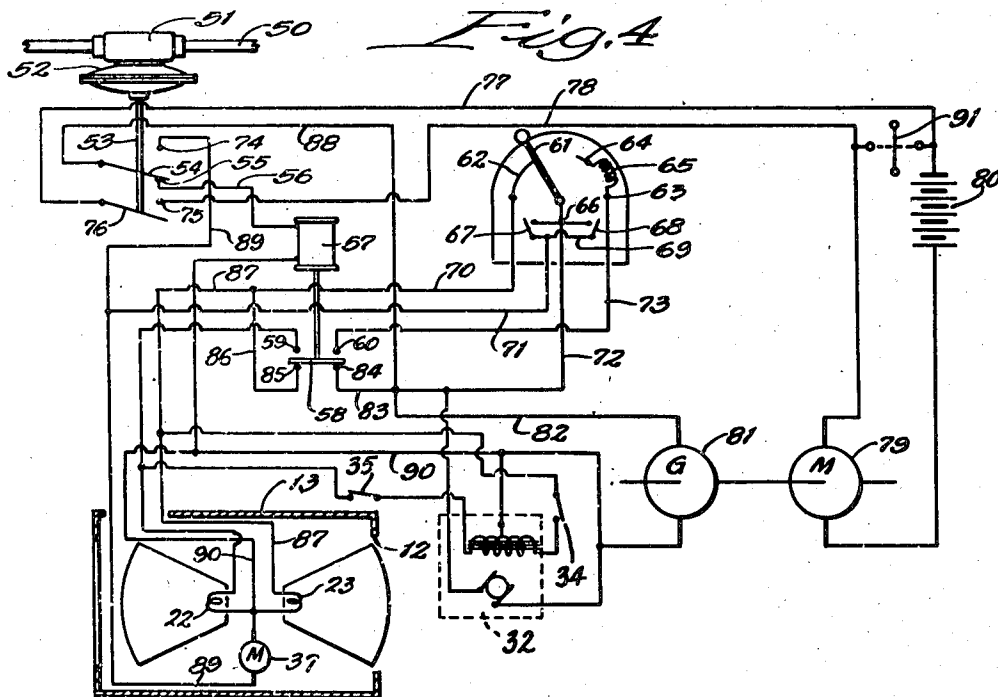
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LOW BRAKE PRESSURE SIGNAL DEVICE

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,456,286

LOW BRAKE PRESSURE SIGNAL DEVICE

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Application October 20, 1945, Serial No. 623,587

6 Claims. (Cl. 177-311)

1 This invention relates to signal devices. The invention is particularly useful in connection with signal lights on railway cars and other vehicles employing pressure lines for operating brakes and the like.

Numerous accidents have occurred on railways where the pressure in the brake line dropped to a low point at which brakes could not be effectively applied, and particularly when, after a derailment, the pressure line was broken and signal lights were not available for warning an approaching train.

An object of the present invention is to provide signal means whereby upon the dropping of the pressure in a brake line, from any cause, a warning light will immediately be set in operation at either or both ends of a railway train. A further object is to provide, in combination with a signal, apparatus providing a warning light and a favorable light, together with means for rotating one or the other into view, means responsive to a drop in pressure in the brake line below a predetermined point for actuating said signal device to bring the warning light into view. Yet another object is to provide means whereby, after the warning light has been in service and the cars have been brought onto a switch line, the warning light can be turned off while at the same time conditioning the apparatus so that upon the building up of pressure again, the signal device will become automatically effective for a new warning operation. Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated in preferred embodiments, by the accompanying drawings, in which—

Figure 1 is an axial section through a signal device which may be employed with the present invention, parts of the structure being shown in elevation; Fig. 2, a transverse section on the line of 2-2 of Fig. 1; Fig. 3, a partial section on the line 3-3 of Fig. 2; Fig. 4, a wiring diagram; and Fig. 5, a wiring diagram for a modified form of the invention.

The present invention may be employed in combination with any suitable signalling device. For the purpose of illustration, I have set forth the signalling structure shown in Figs. 1 to 3 inclusive and with which the present invention may be effectively carried out. The structure shown in Figs. 1 to 3 inclusive and its operation are set out more fully and described in greater detail in my co-pending application Serial No. 570,946, now Patent No. 2,417,934, for Signal de-

2 vices. For the purpose of the present invention, it is sufficient to describe the structure shown in Figs. 1 to 3 inclusive as follows:

The control device, as illustrated, comprises a main frame 10 which is generally U-shaped and which is connected at one end to a ring 11 supporting an annular reflector 12 formed with a central opening through which a beam of light may be projected. The main frame is preferably covered by a housing 13 fitting against the ring 11, as shown, and secured by a screw 14 to the rearward end of the main frame. The frame and cover are adapted to be fixedly mounted in a railway car, such as a locomotive. It will be understood that the reflector 12 may be covered by a suitable glazed cover or lens, as desired.

A subframe 15, in the form of a strap bent around and with its ends connected together, is pivotally mounted in the main frame on opposed pivots 16 and 17 which define an axis transverse to the length of the main frame. Within the subframe 15, a lamp support 18 is mounted on pivots 19 lying on an axis transverse to the axis of the pivots 16 and 17. The lamp support, as shown, may be in the form of a cylindrical sheet metal member cut away at one side and having a reinforcing strap 21 thereon to which the pivots 19 are connected.

A pair of electric lamps 22 and 23 are supported in the support 18 facing toward the opposite ends thereof and lying within reflectors 24. The lamp 23 is adapted to project a beam having a distinctive color, such as red, and for this purpose a tinted transparent cover 25 may be secured over its reflector 24.

The position of the main frame with respect to the support is controlled through a mechanism which is carried by a plate 26 secured to a shaft 27 which is coaxial with the pivot 17. A worm gear 28 is connected to the shaft 27 and meshes with a worm 29 on a shaft 31 which is driven by a motor 32 through a suitable gear box indicated at 33. The motor 32 is of the reversible direct current type to drive the gear 28 in either direction. The amount of motion of the gear 28 is limited by limit switches 34 and 35 which are normally closed and which are opened by engagement of an arm 36 therewith. The arm 36 is connected to the gear 28 and coacts with the switches to permit movement of the plate 26 through substantially 180°.

The plate 26 carries a motor 37 which drives a gear box 38 from which two cranks 39 and 41 are operated. The crank 39 is connected through

a link 42 to a bracket 43 secured to subframe 15 so that as the crank 39 turns, the subframe will be oscillated about the pivots 16 and 17. The crank 41 is similarly connected through a link 44 to a bracket extension 45 on the support 18 so that as the crank 41 turns, the support will be oscillated about the pivots 19. By properly adjusting the throws of the cranks 39 and 41, any desired motion of the support can be produced, such as the figure eight movement normally employed in signal devices of this character.

In combination with the foregoing signalling apparatus, I provide, as shown more clearly in Fig. 4, apparatus, which is responsive to a drop in pressure in a brake fluid pipe below a predetermined point, for actuating the signal device. The brake fluid pipe, as shown in Fig. 4, is indicated by the numeral 50. Communicating with the pressure fluid pipe through the fitting 51 is an actuator cylinder 52 equipped with a diaphragm (not shown) to which is connected a plunger 53. Normally, the diaphragm is urged upwardly within the chamber 52 by means of a spring, but the pressure within the air fluid pipe or brake fluid pipe 50 is normally high enough to maintain the plunger 53 in its lower position, as illustrated in Fig. 4. The plunger 53, in the high pressure position shown, brings contact arm 54 into contact with the point 55. Point 55 is connected through lead line 56 to the solenoid 57 which draws the contact arm 58 upwardly to connect the contact points 59 and 60 when switch 91 is closed and the air pressure in line 50 is normal. Under those circumstances, the apparatus is set for manual operation, and the operation of the signal mechanism is controlled through the movement of the wiper arm 61.

The wiper arm 61 is adapted to contact either the segment 62 or the segment 63. Preferably, an additional segment 64 is provided connected through a resistance 65 to the segment 63 to dim the light 22 when desired.

Switches 67 and 68 connect motor 37 to the generator to cause a "figure 8" or other desired reciprocating motion of the lights 22 and 23. The switches are in parallel; switch 67 may be an ordinary off-on switch for producing continuous operation of motor 37, while switch 68 may be a normally-open push-button switch for "inching" motor 37 along to produce any desired stationary orientation of the light 22 or 23, whichever may be showing. Line 70 leading from segment 62, line 71 leading from the lead 69, line 72 leading from the wiper arm 61, and line 73 leading from the segments 63 all make connection with the operating lines in the signal device to operate the lights 22 and 23 therein and the motor 32 which rotates the lights to bring either 22 or 23 into view through the opening or reflector 12, as described more fully in my co-pending application Serial No. 570,946 now Patent No. 2,417,934. Line 73 is rendered effective in this operation by the closure of points 59 and 60 by reason of the operation of solenoid 57 in response to manual closing of switch 91.

I will not describe structure which, when the pressure drops below a predetermined point, will lock out the manual control switch structure described and which will automatically operate the signal mechanism to bring the warning light into view. As shown more clearly in Fig. 4, there is a contact point 74 directly above the arm 54 and a contact point 75 directly above the contact arm 76, carried by plunger 53. Should the pressure within the cylinder 52 drop below a predetermined

point, say 20 pounds, the diaphragm moves upwardly under the influence of the spring, breaking the contact between arm 54 and point 55 and bringing arm 54 into contact with point 74, and likewise arm 76 into contact with point 75. By these connections, a current is caused to flow through lines 77 and 78 to start the motor 79 which is operated by a battery 80 if it has not previously been running. A 64-volt battery has been found satisfactory for this purpose. The motor 79 drives generator 81 and a current flows through lead 82 and through lead 83. In the meantime, since the contact between arm 54 and 55 was broken, solenoid 57 is not active and the bridge 58 connects points 84 and 85. The current then flows through leads 86 and 87 to the warning light 23 and to motor 32. Motor 32 brings the red light 23 into alignment with the open end of the casing 33, if the light is not already in that position. The current flows back through lead line 88 to the generator 81. It will be understood that motor 32, shown schematically in Fig. 4, is actually located within the housing of the light, as shown in Fig. 1.

In the operation of the structure shown in Fig. 4, it will be noted that as long as the plunger 53 is in down position, the solenoid 57 functions and connects the points 59 and 60 of the line 73 when manual control switch is closed. Under this arrangement, the operation of the motor 32 and the lights 22 and 23 is by means of the manually-controlled switch arm 91. It will also be understood that motor 37 may be employed throughout all of the operations to move the lights 22 and 23 in the courses already described. However, since the invention is applicable to lights which do not move, as well as to such moving lights, a description of the motor operation for actuating lights 22 and 23 in figure eight movements will not be set out.

When the pressure in brake fluid pipe 50 drops below a predetermined point, say 20 pounds, the plunger 53 moves upwardly, breaking contact 55 and making contacts between arm 54 and point 74 and between arm 76 and point 75. The breaking of the contact at 55 causes the solenoid 57 to become inactive whether or not switch is closed and the bridge 58 drops and connects points 84 and 85. Lines 77 and 78 are energized by the above-mentioned contacts, and battery 80 causes a current to flow through motor 79 to set it into operation for driving the generator 81. The operation now is automatic and is not under the control of the wiper arm or switch lever 61.

The current flows from the generator now to the motor 32 and to the red light 23, the motor 32 being so adjusted as always to bring light 23 into view through the aperture in the end of the casing. There is thus displayed only the warning light 23, and the white light or favorable light 22 remains obscured. Should the pressure within line 50 build up at any point, the plunger 53 swings downwardly, breaking contacts with the points 74 and 76 and making a contact between arm 54 and point 55. The solenoid 57 draws the connector bridge 58 upwardly to connect points 59 and 60, if manual switch 91 is closed. If switch 91 is open, as shown in Fig. 4, solenoid 57 remains de-energized until switch 91 is closed by a manual operation. It will be understood that the principal function of switch 91 is to permit display of either the white or the red light, at the operator's election, at times when the air pressure in line 50 is normal.

In the modified structure shown in Fig. 5, I pro-

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vide an arrangement whereby a manual switch may be closed to turn off the warning light and at the same time condition the apparatus for return to normal operation as soon as the plunger 53 is lowered; that is, after the pressure builds up above a predetermined point. In this construction, the arm 92 leading from the generator normally connects with point 93 and the lead line 94. Solenoid 95, which is connected to the generator 96, is actuated to lift the bridge 97 and connect points 98 and 99. The connection with points 98 and 99 brings the white light into the circuit and thus renders it visible. Should the plunger 53 be raised, as when the pressure in line 50 drops below a predetermined point, the connection between arm 92 and point 93 is broken and the solenoid 95 is no longer effective in holding up the bridge 97. The member 97 thus drops and connects points 100 and 101 which brings the red or warning light into view.

Under the above circumstances, it is quite likely that the train will be brought onto a switch line and no further need of the warning light will be necessary. It is here desired to manually turn off the red light while at the same time providing means for conditioning the apparatus so that, upon the building up of pressure, the device will again function automatically to indicate the drop in pressure, should this occur. When the plunger 53 moves upwardly, it connects contact arm 92 with the contact point 102, and contact arm 103 with point 104. No current flows through arm 103 and point 104 because lead 105 communicating therewith has no connection at its other end. Also, no current flows through the lead 92 and 102 because this line is broken by switch 106. Should switch 106 be pressed downwardly to meet the contact point 107, current then flows through the solenoid 108, and the plunger 109 is raised to bring the arm 110 against contact arm 111 and the arm 112 against contact arm 113. The raising of arm 112 breaks the contact with point 114 which is connected through lead 115 with the motor.

In the operation resulting from the closing of switch 106, current flows from the generator through contact arm 92, point 102, switch 106, to solenoid 108 connected to the generator. Plunger 109 is raised and current flows through leads 110 and 111 and through contact arm 112, point 113, and back through line 105, arm 103, contact point 104, and lead line 94 to the solenoid 95. The solenoid raises the switch 97, thus turning off the warning light and turning on the white light. When the pressure in cylinder 52 builds up, the plunger 53 will fall and the arm 103 will break its connection with point 104 and the arm 92 will break its connection with point 102 but makes its normal connection with point 93. Thus, the apparatus is now in starting condition. The white light is on and the apparatus is conditioned for bringing the red light into view the moment that the pressure in the line 50 drops below the predetermined point and the plunger 53 again rises.

In the operation of the structure shown in Fig. 4, it will be noted that the manual switch which connects lines 77 and 78 may be turned to place the battery 80 in circuit so that the current will pass through the switch, battery 80, and the motor 79 to drive generator 81. In the night time, usually such manual switch may be employed to keep the generator constantly in operation. In the daytime, however, it is often desirable to turn off the motor and generator by

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the use of this manual switch. Even, however, when the switch is turned off, the raising of the plunger 53 will close the circuit and thus automatically produce a current from battery 80 to the motor 79.

While in the foregoing specification I have set forth a structure in considerable detail, it will be understood that such details may be varied widely by those skilled in the art without departing from the spirit of my invention.

I claim:

1. In combination with a brake line maintained under high fluid pressure on railway cars and the like, a signal device provided with a warning light and a favorable light, means for rotatably mounting said lights to move one into view while obscuring the other, and means responsive to a drop in pressure in said brake line below a predetermined point for actuating said last-mentioned means to bring said warning light into view.

2. In combination with a fluid pressure line carried by a vehicle, pressure-responsive mechanism associated therewith, signal apparatus providing warning and favorable lights, means for rotating the lights to bring one of the two into view, and means actuated by said pressure-responsive mechanism, when the pressure in said line changes in a selected direction to a predetermined degree, for operating said signal apparatus to bring said warning light into view.

3. In combination with a fluid pressure line carried by a vehicle, pressure-responsive mechanism associated therewith, signal apparatus providing warning and favorable lights, means for rotating the lights to bring one of the two into view, means actuated by said pressure-responsive mechanism, when the pressure in said line changes in a selected direction to a predetermined degree, for operating said signal apparatus to bring said warning light into view, means for turning off said warning light, and switch means actuated by a plunger in said pressure line upon the building up of pressure therein to reset the circuit for the operation of said lights again when the pressure in the line changes in said selected direction to a predetermined degree.

4. In combination with a high pressure air brake line on railway cars and the like, a signal device provided with a warning light and a favorable light, means adapted to be actuated to bring one of the two of said lights into view, means responsive to a drop in pressure in said brake line below a predetermined point for actuating said last-mentioned means to bring said warning light into view, a diaphragm-equipped plunger in said pressure line and actuated by the building up of pressure again in said line above a predetermined degree, and switch means actuated by said plunger for resetting the circuit of said light-moving means to render the same responsive to a second drop in pressure.

5. In combination with a high pressure air brake line on railway cars and the like, a signal device provided with a warning light and a favorable light, means adapted to be actuated to bring one of the two of said lights into view, means responsive to a drop in pressure in said brake line below a predetermined point for actuating said last-mentioned means to bring said warning light into view, manual means for turning off said warning light, switch means in the circuit of said light-moving means, and a plunger actuated by the building up of pressure in said pressure line for moving said switch means to

reset said circuit for rendering the same responsive again to a drop in pressure.

6. In combination with a fluid pressure line, pressure-responsive mechanism communicating therewith, signal apparatus providing warning and favorable lights, means for moving said lights to bring one of the two into view, and means actuated by said pressure-responsive mechanism when the pressure in said line falls below a predetermined point, for operating said light-moving means to bring said warning light into view.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Certificate of Correction

Patent No. 2,456,286.

December 14, 1948.

JEREMIAH D. KENNELLY

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 3, line 66, for the word "not" before "describe" read *now*; column 4, lines 29 and 47, for "switch" read *switch 91*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of April, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.