

Feb. 20, 1934.

H. L. BONE

1,947,638

RAILWAY BRAKING APPARATUS

Filed Oct. 25, 1932

2 Sheets-Sheet 1

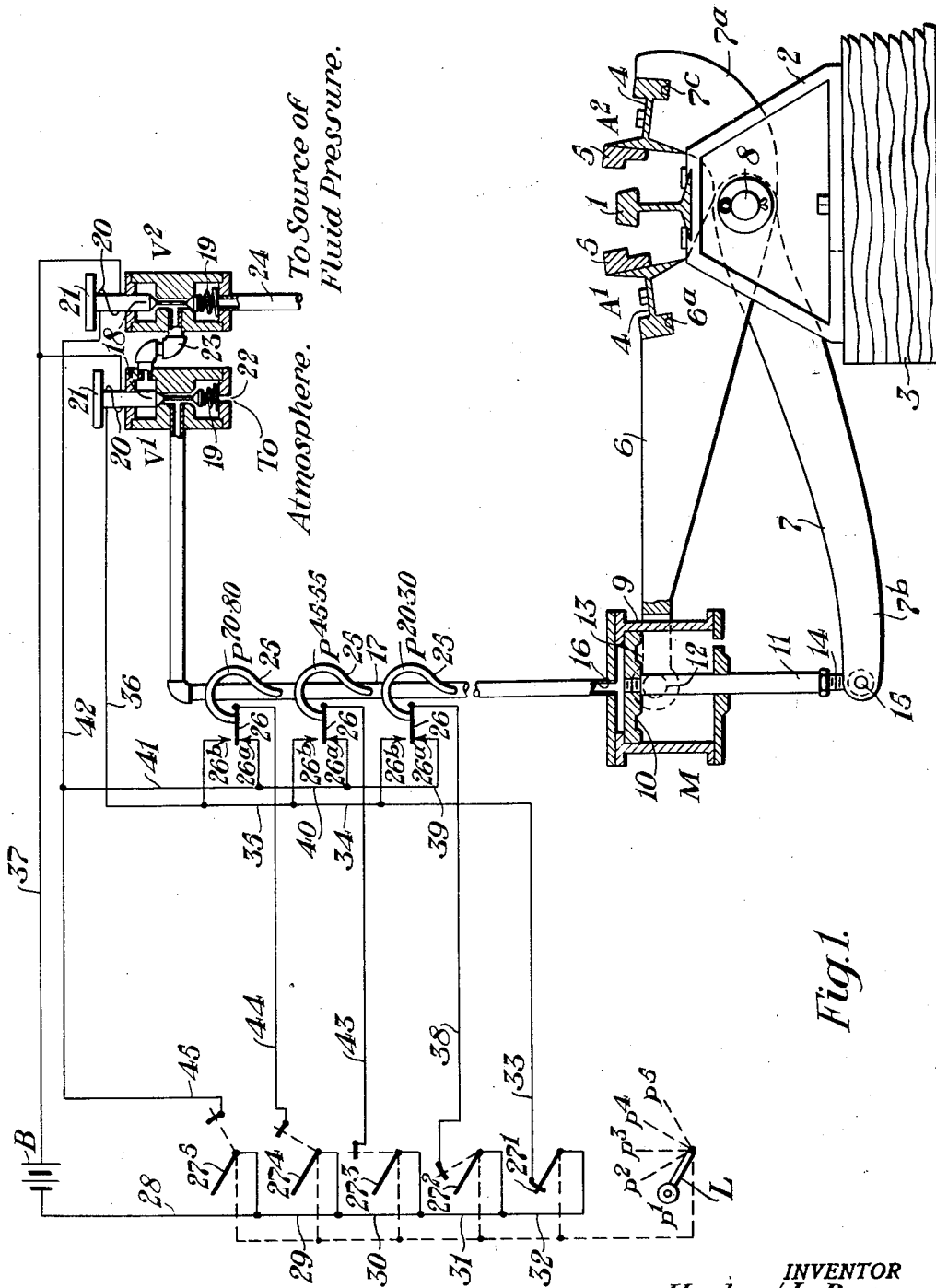


Fig. 1.

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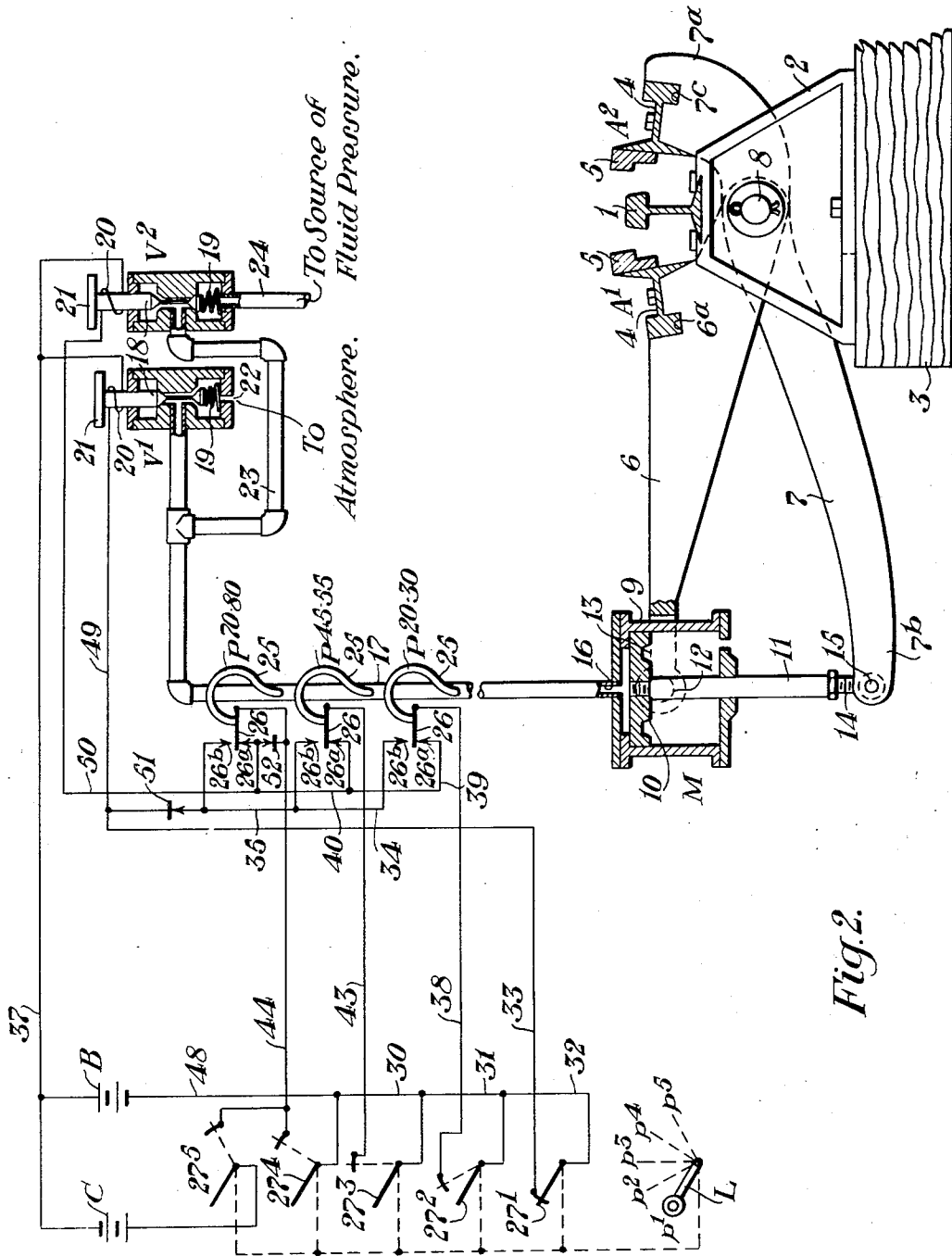


Fig. 2.

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UNITED STATES PATENT OFFICE

1,947,638

RAILWAY BRAKING APPARATUS

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Application October 25, 1932. Serial No. 639,433

11 Claims. (Cl. 303—20)

My invention relates to railway braking apparatus, and particularly to braking apparatus of the type comprising wheel engaging braking bars located beside a track rail, and movable
5 toward and away from the rail into braking and non-braking positions. More particularly, my invention relates to apparatus of the type described in which the braking bars are arranged to be moved to their braking positions by a fluid pressure operated motor, and to be restored to their non-braking positions by suitable biasing means, such as gravity.

I will describe two forms of apparatus embodying my invention, and will then point out the
15 novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a view, partly diagrammatic and partly cross-sectioned, illustrating one form of apparatus embodying my invention. Fig. 2 is a similar view showing a
20 modified form of the apparatus illustrated in Fig. 1 and also embodying my invention.

Similar reference characters refer to similar parts in both views.

Referring to the drawings, the reference character 1 designates one track rail of a stretch of railway track, which track rail, as here shown, is secured to a rail support 2 mounted on an adjacent pair of the usual crossties 3, only one crosstie being visible in the drawings. Associated with
30 the rail 1 is a car retarder comprising two braking bars A^1 and A^2 located on opposite sides of rail 1. Each of these braking bars comprises, as usual, a brake beam 4 and a brake shoe 5.

The braking bars A^1 and A^2 are arranged to be moved toward and away from the rail 1 through the medium of a lever 6 which is pivotally mounted at one end on a pivot pin 8 carried by the rail support 2, and a lever 7 which is pivotally mounted intermediate its ends on the pivot pin 8. The
40 lever 6 is inclined upwardly and extends away from the rail 1 and is provided in its upper surface with a groove 6^a which receives the braking bar A^1 . The one end 7^a of the lever 7 is likewise inclined upwardly and extends away from the rail 1 at the opposite side of the rail from the lever 6, and the other end 7^b of the lever 7 is inclined downwardly and extends away from the rail 1 below the lever 6. The end 7^a of the lever 7 is provided in its upper surface with a groove
50 7^c , similar to the groove 6^a in the lever 6, which groove receives the braking bar A^2 . The parts are so arranged and so proportioned that if the outer or free ends of the levers 6 and 7 are moved apart, the braking bars will be moved toward the rails into their effective or braking positions.

When the braking bars occupy their braking positions, the brake shoes will engage the opposite side faces of a car wheel traversing rail 1, and will retard the speed of the car. The center of gravity of the lever 6 and braking bar A^1 is considerably to the left of the pivot pin 8 so that this lever will normally tend to rotate in a counter-clockwise direction about the pivot pin. Similarly, the center of gravity of the lever 7 and braking bar A^2 is to the right of the pivot pin 8 so that this lever will normally tend to rotate in a clockwise direction about the pivot pin. It will be apparent, therefore, that when no force is applied to the free ends of the levers 6 and 7 to move them apart, the free ends of these levers will move toward each other, thereby moving the braking bars to their ineffective or non-braking positions in which they are illustrated in the drawings.

The levers 6 and 7 are arranged to be moved apart by means of a fluid pressure motor M comprising a cylinder 9 containing a reciprocable piston 10 which is attached to the inner end of a piston rod 11. The cylinder 9 is pivotally connected with the free end of the lever 6 by means of trunnions 12 formed on the side of the cylinder and extending through bifurcations 13 formed on the lever 6, while the piston rod 11 is connected at its free end with the free end 7^b of the lever 7 by means of an adjustable eyebolt 14 and a pivot pin 15. Fluid pressure may be admitted to the cylinder 9 between the upper end of the cylinder and the piston 10 through an opening 16 which is threaded to receive a pipe 17. When fluid pressure is admitted to the cylinder 9 through the pipe 17 and opening 16, the piston 10 will be forced downwardly and the cylinder 9 upwardly, thereby separating the levers 6 and 7, and hence moving the braking bars toward their effective or braking positions. It will be obvious that when the braking bars are moved to their braking positions, they will exert a braking force which is proportional to the pressure of the fluid supplied to the cylinder 9.

The motor M is controlled by two magnet valves V^1 and V^2 , each comprising a valve stem 18 biased to an upper position by means of a spring 19, and provided with a winding 20 and an armature 21. When valve V^1 is energized, valve stem 18 of this valve moves downwardly against the bias exerted by the associated spring 19, and pipe 17 is then connected with atmosphere through a port 22. When valve V^1 is de-energized, however, pipe 17 is disconnected from atmosphere and is connected with a pipe 23 lead-

ing to the valve V². When valve V² is energized, valve stem 18 of this valve moves downwardly, and connects the pipe 23 with a pipe 24 which is constantly supplied with fluid pressure, usually
 5 air, from a suitable source not shown in the drawings, but when valve V² is deenergized, as shown in the drawings, pipe 23 is disconnected from the pipe 24. It will be apparent, therefore,
 10 that when valve V¹ is energized, the region of cylinder 9 of motor M between the piston 10 and the upper end of the cylinder is connected with atmosphere, so that the braking bars of the car retarder will then be held in their ineffective or non-braking positions by gravity. When, how-
 15 ever, valve V¹ is deenergized and valve V² is energized, fluid pressure will be supplied to the upper end of cylinder 9 of motor M, thus causing the braking bars to move to their effective or braking positions.

The valves V are controlled in part by a plurality of pressure responsive devices P²⁰⁻³⁰, P⁴⁵⁻⁵⁵, and P⁷⁰⁻⁸⁰, each comprising a Bourdon tube 25 connected to the pipe 17, and hence subjected to the pressure of the fluid in the region of
 25 cylinder 9 between piston 10 and the upper end of the cylinder. Each Bourdon tube 25 controls two contacts 26—26^a and 26—26^b. The pressure responsive devices P²⁰⁻³⁰, P⁴⁵⁻⁵⁵, and P⁷⁰⁻⁸⁰ are so constructed and so adjusted that they will
 30 operate successively as the pressure in the region of cylinder 9 between the piston 10 and the upper end of the cylinder increases. For example, for all pressures below twenty pounds per square
 35 inch, the contact 26—26^a of each of these devices is closed. If the pressure exceeds twenty pounds per square inch, however, contact
 40 26—26^a of device P²⁰⁻³⁰ opens, and if the pressure exceeds thirty pounds per square inch, contact 26—26^b of device P²⁰⁻³⁰ closes. In similar
 45 manner, the pressure responsive devices P⁴⁵⁻⁵⁵ and P⁷⁰⁻⁸⁰ are adjusted to open their contacts 26—26^a at forty-five and seventy pounds per square inch, respectively, and to close their
 50 contacts 26—26^b at fifty-five and eighty pounds per square inch, respectively. Of course, these specific pressures are not essential but are only
 55 mentioned for purposes of explanation.

The valves V are also controlled by means of a manually operable lever L which, as here
 60 shown, is capable of assuming five positions, indicated by dotted lines in the drawings and designated by the reference characters p¹—p⁵, inclusive. The lever L controls a plurality of con-
 65 tacts, each designated by the reference character 27 with a distinguishing exponent corresponding to the position of the lever in which the corresponding contact is closed. For example, con-
 70 tact 27¹ is closed in the p¹ position of the lever, contact 27² in the p² position of the lever, etc.

Lever L will usually be located at a point re-
 75 mote from the braking apparatus, as in the control cabin of a classification yard car retarder system, and will be connected with the braking apparatus by means of line wires extending from the control cabin to the braking apparatus. As
 80 shown in the drawings, lever L occupies its p¹ or "off" position, which is a position which it normally occupies when no cars are to be re-
 85 tarder, and all of the contacts of lever L, with the exception of contact 27¹, are therefore open. Valve V² is therefore deenergized, but valve V¹ is
 90 energized over a circuit which passes from a suitable source of current, here shown as a battery B, through wires 28, 29, 30, 31 and 32, contact
 95 27¹ of lever L, line wire 33, wires 34, 35 and 36,

winding 20 of valve V¹, and line wire 37 back to battery B. Since valve V² is deenergized, pipe 24 is disconnected from pipe 23, and the supply of fluid pressure to cylinder 9 is therefore cut
 100 off, and since valve V¹ is energized, cylinder 9 is connected with atmosphere. The braking bars are therefore held in their ineffective or non-braking positions by gravity. The contact 26—26^a
 105 of each of the pressure responsive devices P is closed, and the contact 26—26^b of each of these devices is open.

In explaining the operation of the apparatus as a whole, I will first assume that the operator wishes to make a comparatively light brake application. To do this, he moves lever L from its
 110 p¹ to its p² position, thereby opening contact 27¹ of lever L and closing contact 27². The opening of the contact 27¹ interrupts the circuit which was previously closed for valve V¹ at this contact, and
 115 valve V¹ therefore now becomes deenergized, and disconnects pipe 17 from port 22 and connects this pipe with the pipe 23. The closing of contact 27² completes a circuit for a valve V², and
 120 current flows from battery B through wires 28, 29, 30 and 31, contact 27² of lever L, line wire 38, contact 26—26^a of pressure responsive device P²⁰⁻³⁰, wires 39, 40, 41 and 42, winding 20 of valve
 125 V², and line wire 37 back to battery B. Valve V² therefore becomes energized and connects pipe 24 with pipe 23, so that fluid at full line pressure
 130 is now supplied to the upper end of cylinder 9, thus causing the braking bars to move to their effective or braking positions. As soon as the fluid in the upper end of cylinder 9 reaches
 135 twenty pounds per square inch, contact 26—26^a of pressure responsive device P²⁰⁻³⁰ will open and will interrupt the circuit just traced for valve V². Valve V² will then become deenergized and will
 140 cut off the supply of fluid to the upper end of the cylinder until the pressure in the motor again decreases below twenty pounds per square inch, at which time valve V² will again become ener-
 145 gized and will again admit fluid to the cylinder. If the fluid in the motor now increases to a pressure of thirty pounds per square inch for any
 150 reason, contact 26—26^b of pressure responsive device P²⁰⁻³⁰ will become closed and will complete a circuit for valve V¹ which passes from battery
 155 B through wires 28, 29, 30 and 31, contact 27² of lever L, line wire 38, contact 26—26^b of pressure responsive device P²⁰⁻³⁰, wires 34, 35 and 36, winding 20 of valve V¹, and line wire 37 back to battery
 160 B. Valve V¹ will therefore become energized, and will vent fluid pressure from cylinder 9 until the pressure again decreases to thirty pounds per
 165 square inch and permits contact 26—26^b to open. It will be seen, therefore, that when lever L occupies its p² position, the braking bars will be held in their braking positions by a pressure of
 170 between twenty and thirty pounds per square inch.

If the operator desires to make a more powerful brake application, he moves lever L to its p³ position in which contact 27³ is closed. Under these
 175 conditions, valve V¹ will be deenergized, and valve V² will become energized over a circuit which passes from battery B through wires 28, 29 and
 180 30, contact 27³ of lever L, line wire 43, contact 26—26^a of pressure responsive device P⁴⁵⁻⁵⁵, wires 40, 41 and 42, winding 20 of valve V², and line
 185 wire 37 back to battery B. Fluid pressure will therefore now be admitted to the upper end of cylinder 9 until the pressure of the fluid in the
 190 cylinder increases to forty-five pounds per square inch, at which time contact 26—26^a of pressure
 195

responsive device P⁴⁵⁻⁵⁵ will open and will deenergize valve V². If the pressure in the upper end of cylinder 9 now increases to fifty-five pounds per square inch, contact 26—26^b of pressure responsive device P⁴⁵⁻⁵⁵ will become closed and will complete another circuit for valve V¹, this latter circuit passing from battery B, through wires 28, 29 and 30, contact 27³ of lever L, line wire 43, contact 26—26^b of pressure responsive device P⁴⁵⁻⁵⁵, wires 35 and 36, winding 20 of valve V¹, and line wire 37 back to battery B. Valve V¹ will therefore become energized and will exhaust fluid from the upper end of cylinder 9 until the pressure decreases to that at which contact 26—26^b of pressure responsive device P⁴⁵⁻⁵⁵ opens. It will be apparent, therefore, that when lever L occupies its p³ position, the braking bars will be held in their braking positions by a pressure of between forty-five and fifty-five pounds per square inch.

If the operator moves lever L to its p⁴ position, valve V² will then become energized over a circuit which passes from battery B through wires 28 and 29, contact 27⁴ of lever L, line wire 44, contact 26—26^a of pressure responsive device P⁷⁰⁻⁸⁰, wires 41 and 42, winding 20 of valve V² and line wire 37 back to battery B. Under these conditions, fluid will be supplied to the upper end of cylinder 9 until the pressure in the cylinder reaches seventy pounds per square inch, which is the pressure at which contact 26—26^a of pressure responsive device P⁷⁰⁻⁸⁰ opens. If the pressure in cylinder 9 now increases to eighty pounds per square inch, contact 26—26^b of pressure responsive device P⁷⁰⁻⁸⁰ will become closed, and will complete still another circuit for valve V¹. This latter circuit for valve V¹ may be traced from battery B through wires 28 and 29, contact 27⁴ of lever L, line wire 44, contact 26—26^b of pressure responsive device P⁷⁰⁻⁸⁰, wire 36, winding 20 of valve V¹, and line wire 37 back to battery B. Valve V¹ will therefore become energized until the pressure in the upper end of cylinder 9 again decreases to eighty pounds per square inch. It will be seen, therefore, that when lever L is moved to its p⁴ position, cylinder 9 is supplied with fluid at a pressure of between seventy and eighty pounds per square inch, so that the braking bars exert a corresponding braking force.

If the operator desires to cause the braking bars to exert their maximum braking force, he moves lever L to its p⁵ position. Under these conditions, valve V² becomes energized and subsequently remains energized over a circuit which passes from battery B through wire 28, contact 27⁵ of lever L, line wire 45, wire 42, winding 20 of valve V², and line wire 37 back to battery B. It will be apparent, therefore, that, under these conditions, the braking bars will be held in their braking positions by fluid at full line pressure.

It should be observed that if the operator moves the lever L from a position corresponding to a higher braking force to a position corresponding to a lower braking force, the apparatus immediately and automatically reduces the braking pressure to a value corresponding to the new position of the lever in a manner which will be apparent from the drawings without tracing the sequence of operation in detail.

When lever L occupies any one of its p², p³, p⁴, or p⁵ positions, so that the braking bars occupy their braking positions, and the operator wishes to restore the braking bars to their non-braking positions in which they are illustrated in the drawings, he will restore lever L to its p¹ or "off"

position. When he does this, all circuits previously traced for valve V² will be interrupted, and the circuit previously described for valve V¹ including contact 27¹ of lever L will become closed. Valve V² will therefore become deenergized and valve V¹ will become energized. As a result, the supply of fluid pressure to the upper end of cylinder 9 will be cut off and the fluid which was previously supplied to this end of the cylinder will be vented to atmosphere. The braking bars will therefore move under the influence of gravity, to their ineffective or non-braking positions. When the braking bars reach their non-braking positions, all parts are restored to the positions in which they are shown in the drawings.

One advantage of the apparatus shown in Fig. 1 is that the short-circuiting of the contacts of one of the pressure responsive devices, as by a condensation of moisture on the contacts due to unfavorable weather conditions, will not, under any conditions, cause a direct flow of fluid from the source to atmosphere, as has heretofore been possible. For, if one of the pressure responsive devices becomes short-circuited, the valves V¹ and V² will become simultaneously energized in a manner which will be readily understood from an inspection of the drawings, but due to the fact that it is necessary for valve V¹ to be deenergized when valve V² is energized before fluid can be supplied to the motor from the source, valve V¹ will act, under these conditions, to prevent the flow of fluid from the source past this valve. It will be seen, therefore, that with the apparatus shown in Fig. 1 there can be no waste of fluid due to improper operation of the valves under any conditions.

Referring now to Fig. 2, as here shown, the pipe 23, instead of being connected with the pipe 17 through the valve V¹, as shown in Fig. 1, is connected directly with the pipe 17, so that fluid pressure from the pipe 24 will be supplied to cylinder 9 whenever valve V² is energized regardless of whether valve V¹ is then energized or deenergized, this being the usual arrangement of valves commonly employed for controlling the supply of fluid to, and exhaust of fluid from, a fluid pressure motor of the type shown. Furthermore, as shown in Fig. 2, the circuits for controlling the valves V¹ and V² have been modified somewhat, and rectifiers have been included in some of these circuits in order to decrease the number of line wires between the control point and the braking apparatus, and to prevent improper operation of the valves in the event that the contacts of one of the pressure responsive devices become short-circuited, as by condensation of moisture on the contacts, when lever L occupies its p¹ or "off" position.

The operation of the apparatus shown in Fig. 2 is as follows: When lever L occupies its p¹ or "off" position, valve V² is deenergized so that the supply of fluid pressure to motor M is cut off, and valve V¹ is energized over a circuit which passes from battery B through wires 48, 30, 31 and 32, contact 27¹ of lever L, line wire 33, wire 49, winding 20 of valve V¹, and line wire 37 back to battery B. Since valve V¹ is energized, cylinder 9 of motor M is connected with atmosphere through port 22, and the braking bars are therefore held in their non-braking positions by gravity. Furthermore, since cylinder 9 is vented to atmosphere, the contacts 26—26^a of the pressure responsive devices P are all closed, and the contacts 26—26^b are all open.

If now lever L is moved to its p¹ position, valve

V¹ will become deenergized, and valve V² will become energized over a circuit which passes from battery B through wires 48, 30 and 31, contact 27² of lever L, line wire 38, contact 26—26^a of pressure responsive device P²⁰⁻³⁰, wires 39, 40 and 50, winding 20 of valve V², and line wire 37 back to battery B. The deenergization of valve V¹ will cut off the supply of fluid pressure to cylinder 9 of motor M, while the energization of valve V² will connect the cylinder with the pipe 24, so that fluid pressure will then be supplied to the cylinder, thus moving the braking bars of the car retarder to their braking positions. When the pressure of the fluid in cylinder 9 increases to twenty pounds per square inch, contact 26—26^a of pressure responsive device P²⁰⁻³⁰ will open and will deenergize valve V², and if the pressure in the cylinder increases to thirty pounds per square inch, contact 26—26^b of pressure responsive device P²⁰⁻³⁰ will become closed and will complete a circuit for valve V¹, which circuit may be traced from battery B through wires 48, 30 and 31, contact 27² of lever L, line wire 38, contact 26—26^b of pressure responsive device P²⁰⁻³⁰, wires 34 and 35, an asymmetric unit 51 in its low resistance direction, wire 49, winding 20 of valve V¹, and wire 37 back to battery B. Valve V¹ will therefore become energized, and will vent fluid from cylinder 9 to atmosphere until the pressure of the fluid in the cylinder decreases sufficiently to cause contact 26—26^b of pressure responsive device P²⁰⁻³⁰ to open and deenergize valve V¹. It will be seen, therefore, that with the apparatus shown in Fig. 2, when lever L is moved to its p³ position, the braking bars will be held in their braking positions by a pressure of between twenty and thirty pounds per square inch, in the same manner as with the apparatus shown in Fig. 1.

If lever L is moved to its p³ position, valve V² will become energized over a circuit which passes from battery B through wires 48 and 30, contact 27³ of lever L, line wire 43, contact 26—26^a of pressure responsive device P⁴⁵⁻⁵⁵, wires 40 and 50, winding 20 of valve V², and line wire 37 back to battery B. Valve V² will now remain energized until the pressure of the fluid in cylinder 9 increases to forty-five pounds per square inch, at which time contact 26—26^a of pressure responsive device P⁴⁵⁻⁵⁵ will open and will deenergize valve V². If the pressure of the fluid in cylinder 9 increases to fifty-five pounds per square inch under these conditions, valve V¹ will become energized over a circuit which passes from battery B through wires 48 and 30, contact 27³ of lever L, line wire 43, contact 26—26^b of pressure responsive device P⁴⁵⁻⁵⁵, wire 35, asymmetric unit 51 in its low resistance direction, wire 49, winding 20 of valve V¹, and line wire 37 back to battery B. It will be seen, therefore, that when lever L occupies its p³ position the braking bars will be held in their braking positions by a pressure of between forty-five and fifty-five pounds per square inch.

If lever L is moved to its p⁴ position, valve V² will become energized and will remain energized until the pressure of the fluid in the motor increases to seventy pounds per square inch, the current for the valve under these conditions passing from battery B through wire 48, contact 27⁴ of lever L, line wire 44, contact 26—26^a of pressure responsive device P⁷⁰⁻⁸⁰, wire 50, winding 20 of valve V² and line wire 37 back to battery B. If the pressure of the fluid in the motor now increases to eighty pounds per square inch, valve V¹ will become energized over a circuit which passes from battery B through wire

48, contact 27⁴ of lever L, line wire 44, contact 26—26^b of pressure responsive device P⁷⁰⁻⁸⁰, asymmetric unit 51 in its low resistance direction, wire 49, winding 20 of valve V¹, and wire 37 back to battery B. It follows that when lever L occupies its p⁴ position, the braking bars will be held in their braking positions by a pressure of between seventy and eighty pounds per square inch.

If lever L is moved to its p⁵ position, valve V² will become energized and will subsequently remain energized by virtue of a circuit which passes from a battery C through line wire 37, winding 20 of valve V², an asymmetric unit 52 in its low resistance direction, line wire 44, and contact 27⁵ of lever L back to battery C. Under these conditions, therefore, the braking bars will be held in their braking positions by fluid at full line pressure.

In order to restore the apparatus from its closed or effective position to its open or ineffective position, the operator moves lever L to its p¹ or "off" position, in which position it is illustrated in the drawings. All circuits for valve V² are then interrupted, and the circuit previously traced for valve V¹ then becomes closed at contact 27¹ of lever L. Valve V² therefore becomes deenergized and cuts off the supply of fluid pressure to motor M, while valve V¹ becomes energized and vents the fluid which was previously supplied to the motor to atmosphere. The braking bars therefore then return to their braking positions under the influence of gravity. When the braking bars reach their braking positions, the parts are all restored to the positions in which they are illustrated in the drawings.

It should be pointed out that, with the apparatus constructed as shown in Fig. 2, if the asymmetric unit 51 were omitted and the contacts of one of the pressure responsive devices became short-circuited, as by a drop of water, when lever L occupies its p¹ or "off" position, the valves V¹ and V² would then both become energized, and there would then be a continuous exhaust of fluid pressure from the source to atmosphere. The asymmetric unit 51, however, prevents this from happening because it prevents the flow of current from the line wire 33 to the pressure responsive devices, and hence to the valve V², under these conditions. The asymmetric unit 52 is provided to permit selective control of the valves V¹ and V² over a single pair of line wires, by reversing the polarity of the current supplied to the line wires.

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

Having thus described my invention, what I claim is:

1. Railway braking apparatus comprising a braking bar located in the trackway beside a track rail, a fluid pressure motor for moving said braking bar toward the track rail into a braking position in which it will engage a part of a car to retard the speed of the car, a first contact which becomes opened when the pressure of the fluid in said motor increases to a predetermined value, means effective when said first contact is closed for normally supplying fluid pressure to said motor, a second contact which becomes closed when the pressure of the fluid in said motor increases to a pressure which is

somewhat higher than the pressure at which said first contact opens, means effective when said second contact is closed for exhausting fluid from said motor, and means effective under certain conditions if both of said contacts became simultaneously closed due to a short circuit for preventing fluid from being supplied to said motor or exhausted to atmosphere.

2. Railway braking apparatus comprising a braking bar located in the trackway beside a track rail, a fluid pressure motor for moving said braking bar toward the track rail into a braking position in which it will engage a part of a car to retard the speed of the car, a first contact which becomes opened when the pressure of the fluid in said motor increases to a predetermined pressure and a second contact which becomes closed when the pressure of the fluid in said motor increases to a pressure which is somewhat higher than the pressure at which said first contact opens, a manually operable lever having an "off" and an "on" position, means effective when said lever occupies its "off" position for normally connecting said motor with atmosphere, means effective when said lever occupies its "on" position and said first contact is closed for normally connecting said motor with a source of fluid pressure, means effective when said lever occupies its "on" position and said second contact is closed for normally connecting said motor with atmosphere, and means effective if said two contacts become short-circuited when said lever occupies its "off" position for preventing fluid pressure from being supplied to said motor or exhausted to atmosphere.

3. Railway braking apparatus comprising a braking bar movable toward and away from a track rail into braking and non-braking positions, and biased to a non-braking position, a fluid pressure motor for moving said braking bar to its braking position, a pressure responsive device subjected to the pressure of the fluid in said motor and provided with a first contact which becomes opened when the pressure of the fluid in said motor increases to a predetermined pressure and with a second contact which becomes closed when the pressure of the fluid in said motor increases to a pressure which is somewhat higher than the pressure at which said first contact opens, a source of fluid pressure, means controlled in part by said first contact for connecting said motor with said source of fluid pressure, means controlled in part by said second contact for connecting said motor with atmosphere, and means at times effective in the event that said two contacts become simultaneously closed due to a short circuit for preventing said source from becoming connected with atmosphere.

4. Railway braking apparatus comprising a braking bar movable toward and away from a track rail into braking and non-braking positions, and biased to a non-braking position, a fluid pressure motor for moving said braking bar to its braking position, a pressure responsive device subjected to the pressure of the fluid in said motor and provided with a first contact which becomes opened when the pressure of the fluid in said motor increases to a predetermined pressure and with a second contact which becomes closed when the pressure of the fluid in said motor increases to a pressure which is somewhat higher than the pressure at which said first contact opens, manually controlled means effective when said first contact is closed for

normally connecting said fluid pressure motor with said source of fluid pressure and when said second contact is closed for normally connecting said fluid pressure motor with atmosphere, and means effective under certain conditions in the event that both of said contacts become simultaneously closed due to a short circuit for preventing said source from becoming connected with atmosphere.

5. Railway braking apparatus comprising a braking bar movable toward and away from a track rail into braking and non-braking positions and biased to its non-braking position, a fluid pressure motor for moving said braking bar to its braking position, a first and a second magnet valve, a source of fluid pressure, means including said two magnet valves and effective when and only when said first valve is energized and said second valve is deenergized for connecting said motor with said source of fluid pressure, means including said second valve and effective only when said second valve is energized for connecting said motor with atmosphere, a pressure responsive device provided with a first contact which becomes opened when the pressure of the fluid in said motor increases to a predetermined value and with a second contact which becomes closed when the pressure of the fluid in said motor increases to a value which is somewhat higher than the value at which said first contact becomes opened, a circuit for said first valve including said first contact, and a circuit for said second valve including said second contact.

6. Railway braking apparatus comprising a braking bar movable toward and away from a track rail into braking and non-braking positions and biased to its non-braking position, a fluid pressure motor for moving said braking bar to its braking position, a first and a second magnet valve, a source of fluid pressure, means including said two magnet valves and effective when and only when said first valve is energized and said second valve is deenergized for connecting said motor with said source of fluid pressure, means including said second valve and effective only when said second valve is energized for connecting said motor with atmosphere, a pressure responsive device provided with a first contact which becomes opened when the pressure of the fluid in said motor increases to a predetermined value and with a second contact which becomes closed when the pressure of the fluid in said motor increases to a value which is somewhat higher than the value at which said first contact becomes opened, a manually controlled lever, a circuit for said first valve controlled by said lever and including said first contact and a circuit for said second valve controlled by said lever and including said second contact.

7. Railway braking apparatus comprising a braking bar movable toward and away from a track rail into braking and non-braking positions and biased to its non-braking position, a fluid pressure motor for moving said braking bar to its braking position, a first and a second magnet valve, a source of fluid pressure, means including said two magnet valves and effective when and only when said first valve is energized and said second valve is deenergized for connecting said motor with said source of fluid pressure, means including said second valve and effective only when said second valve is energized for connecting said motor with atmosphere, a series of pressure responsive devices, a first series of contacts

one controlled by each of said pressure responsive devices in such manner that said contacts will become successively opened as the pressure in said motor increases, a second series of contacts one controlled by each of said pressure responsive devices and each arranged to become closed when the pressure of the fluid in said motor increases to a pressure which is somewhat higher than the pressure at which the contact of the first series which is controlled by the same pressure responsive device opens, a plurality of circuits for said first valve each controlled by a different contact of said first series of contacts, and a plurality of circuits for said second valve each controlled by a different contact of said second series.

8. Railway braking apparatus comprising a braking bar movable toward and away from a track rail into braking and non-braking positions and biased to its non-braking position, a fluid pressure motor for moving said braking bar to its braking position, a first and a second magnet valve, a source of fluid pressure, means including said two magnet valves and effective when and only when said first valve is energized and said second valve is deenergized for connecting said motor with said source of fluid pressure, means including said second valve and effective only when said second valve is energized for connecting said motor with atmosphere, a first series of pressure responsive contacts arranged to become successively opened as the pressure in said motor increases, a second series of pressure responsive contacts one for each contact of the first series and each arranged to become closed at a pressure which is somewhat higher than the pressure at which the corresponding contact of the first series opens, a manually operable lever provided with a plurality of contacts which are selectively operated in response to movement of said lever to different positions, a plurality of circuits for said first valve each including a different contact of said lever and a different contact of said first series of contacts, and a plurality of circuits for said second valve each including a different contact of said lever and a different contact of said second series of contacts.

9. Railway braking apparatus comprising a braking bar located in the trackway beside a track rail, a fluid pressure motor for moving said braking bar toward the track rail into a braking position in which it will engage a part of a car to retard the speed of the car, a first magnet valve effective when energized for connecting said motor with a source of fluid pressure, a second magnet valve effective when energized for connecting said motor with atmosphere, a lever having an "off" and an "on" position and provided with a first contact which is closed when said lever occupies its "off" position and with a second contact which is closed when said lever occupies its "on" position, a device responsive to the pressure of the fluid in said motor and provided with a normally closed contact which becomes opened when the pressure of the fluid in said motor increases to a predetermined value and with a normally open contact which becomes closed when the pressure of the fluid in said motor increases to a pressure which is somewhat higher than the pressure at which said first contact opens, an asymmetric unit, a first circuit for said second valve including said first contact of said lever; a second circuit for said second valve including said second contact of said lever, said normally open contact, and said asymmetric unit, and a first circuit for said

first valve including said second contact of said lever and said normally closed contact.

10. Railway braking apparatus comprising a braking bar located in the trackway beside a track rail, a fluid pressure motor for moving said braking bar toward the track rail into a braking position in which it will engage a part of a car to retard the speed of the car, a first magnet valve effective when energized for connecting said motor with a source of fluid pressure, a second magnet valve effective when energized for connecting said motor with atmosphere, a lever having two positions and provided with a first contact which is closed in the one position and a second contact which is closed in the other position, a device responsive to the pressure of the fluid in said motor and provided with a normally closed contact which becomes opened when the pressure of the fluid in said motor increases to a predetermined value and with a normally open contact which becomes closed when the pressure of the fluid in said motor increases to a pressure which is somewhat higher than the pressure at which said first contact opens, two asymmetric units, two sources of electromotive force, a first circuit for said first valve including one of said sources of electromotive force, said normally closed contact, and said one contact of said lever; a first circuit for said second valve including said one source of electromotive force, said normally open contact, one of said asymmetric units, and said one contact of said lever; and a second circuit for said first valve including the remaining source of electromotive force, the remaining asymmetric unit, and said second contact of said lever, said two asymmetric units and said two sources being disposed in opposite directions in the respective circuits in which they are included.

11. Railway braking apparatus comprising a braking bar located in the trackway beside a track rail, a fluid pressure motor for moving said braking bar toward the track rail into a braking position in which it will engage a part of a car to retard the speed of the car, a first magnet valve effective when energized for connecting said motor with a source of fluid pressure, a second magnet valve effective when energized for connecting said motor with atmosphere, two line wires, means for reversibly supplying current to said line wires, a device responsive to the pressure of the fluid in said motor and provided with a normally closed contact which becomes opened when the pressure of the fluid in said motor increases to a predetermined pressure and with a normally open contact which becomes closed when the pressure of the fluid in said motor increases to a pressure which is somewhat higher than the pressure at which said first contact opens, two asymmetric units, means including one of said asymmetric units for connecting said first magnet valve with said line wires when said line wires are supplied with current of one polarity, means including said normally open contact and the remaining asymmetric unit for connecting said second magnet valve with said line wires when said line wires are supplied with current of the other polarity, and means including said normally closed contact for connecting said first magnet valve with said line wires when said line wires are supplied with current of said other polarity, said two asymmetric units being disposed in opposite directions with respect to said line wires.