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RAILWAY BRAKING APPARATUS

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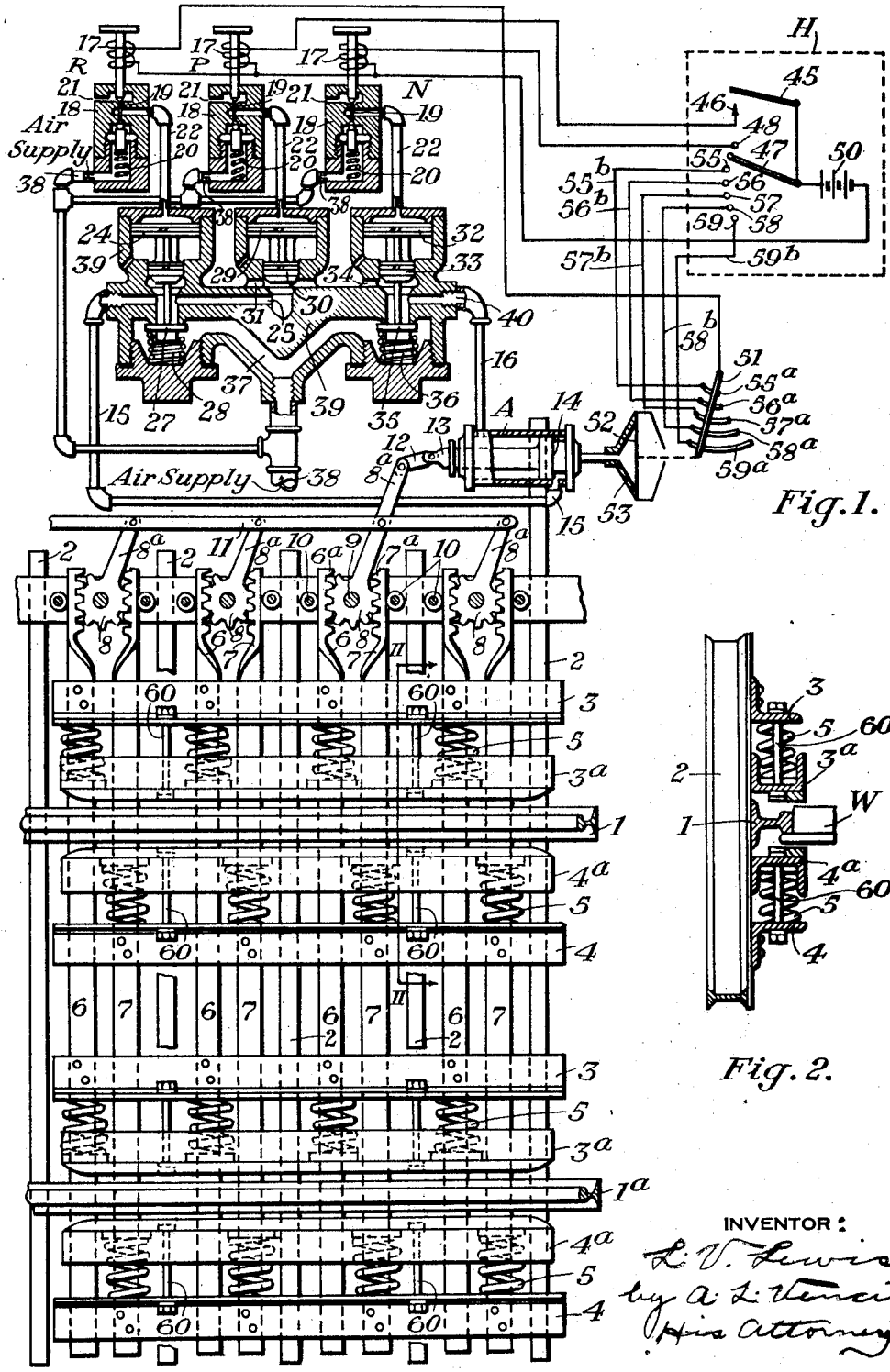


Fig. 1.

Fig. 2.

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RAILWAY BRAKING APPARATUS.

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My invention relates to railway braking apparatus, and particularly to apparatus of the type comprising trackway mechanism adapted to engage part of a railway vehicle.

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

In the accompanying drawing, Fig. 1 is a view, partly diagrammatic, showing one form of braking apparatus embodying my invention. Fig. 2 is a vertical sectional view along line II—II of Fig. 1.

Similar reference characters refer to similar parts in both views.

Referring to the drawing, the reference characters 1 and 1ª designate the track rails of a railway track. These rails are supported, as usual, upon cross ties 2, here shown as steel I-beams.

Each of these rails is provided with braking apparatus comprising a pair of longitudinally extending members 3 and 4 located on opposite sides of the rail. Associated with members 3 and 4 are brake bars 3ª and 4ª, respectively, adapted to engage the opposite faces of a wheel W of a railway vehicle as best illustrated in Fig. 2. Coil springs 5 are interposed between each brake bar 3ª and 4ª and the associated members 3 and 4 to limit the mechanical pressure of the bar against the wheel to that which the springs transmit.

Means are provided for moving the brake bars toward and away from the associated rails. As here shown, this means comprises a plurality of drive rods 6 extending transversely with respect to the track rails, and rigidly attached to each member 3. Associated with each drive rod 6 is a second drive rod 7 extending parallel with rod 6 and rigidly connected with each member 4. One end of each rod 6 is provided with a toothed rack 6ª, and one end of each rod 7 is provided with a similar rack 7ª. The rods 6 and 7 are arranged in pairs and the racks 6ª and 7ª of each pair mesh with a gear 8 pivotally supported by a vertical spindle 9. Each such gear is provided with a lever 8ª. Bearing rollers 10 prevent the racks from springing out of mesh with the associated gear 8. It will be plain that when the upper end of lever 8ª is thrown to the left the corresponding gear 8 is rotated counter-clockwise so that the associated rod 6 is moved downwardly and the corresponding rod 7 is moved upwardly as viewed in Fig. 1. The upper end of each lever 8ª is pivotally connected with a longitudinally extending driving link 11, and it therefore follows that when link 11 is moved to the left, the brake bars for each rail are moved into the braking position, that is, toward the associated rail, and when the link 11 is restored to its right-hand position the bars are moved away from the associated rail into their release position.

The springs 5 are permanently compressed to the desired amount by bolts 60 which also serve as a medium for withdrawing brake bars 3ª and 4ª when members 3 and 4 are withdrawn from braking positions.

The link 11 is operated by a fluid pressure motor device comprising a cylinder A having a piston 14 therein. The piston 14 is connected, by means of a piston rod 13, and a link 12 with the extended end of one of the levers 8 and hence with link 11.

The supply of fluid pressure, usually compressed air, to the cylinder A is controlled by main air valves 27, 30, 33 and 35, which main valves are in turn controlled by three electromagnetic pilot valves R, P and N. Each of these pilot valves comprises a valve body 18 having a valve device 19 therein controlled by a magnet winding 17. The valve 19 is biased to its upper position by a spring 20 and when in such upper position connects pipe 22 with atmosphere through port 21. When magnet 17 is energized the valve 19 moves downward against the bias exerted by spring 20, and pipe 22 is disconnected from atmosphere and connected with a source of fluid pressure, not shown in the drawing, through pipe 38.

The main air valves are located in a valve body 39. This valve body contains a cylinder having a reciprocable piston 24 therein. The upper side of this piston is subjected to the pressure in pipe 22 of valve R. Carried by piston 24 is the main valve 27 biased to the closed position by a coil spring 28. When valve R is de-energized, then, piston 24 and valve 27 are in their upper positions and port 37 is disconnected from port 25 and pipe 15 leading to the right-hand side of cylinder A. If, however, valve R is energized, valve 27 is

opened so that fluid pressure flows from pipe 38, through port 37, valve 27, port 25, and pipe 15 to cylinder A, thereby driving piston 14 to the left and forcing the brake bars toward the rails.

The valve body 39 also contains a piston 29 which is controlled by valve P and which in turn controls the main air valve 30 adapted to at times connect port 25 with atmosphere through port 31. When valve P is de-energized, and valve 27 is closed, piston 29 and valve 30 move into their lower positions under the influence of gravity. When valve P is energized, the upper side of piston 29 is exposed to the pressure from pipe 22. Since the area of piston 29 is greater than that of valve 30, the valve 30 will be moved downwardly even if valve 27 is open, and communication between ports 25 and 31 will thus be interrupted.

In similar manner valve N controls the pressure applied to the upper side of a piston 32 reciprocable in valve body 39 and controlling the two main air valves 33 and 35. A spring 36 biases the piston and the valves controlled thereby to their upper positions. in which pipe 16, leading to the left-hand end of cylinder A, is connected with atmosphere through port 40, valve 33 and port 34. When valve N is energized pressure from pipe 22 forces piston 32 downward, closing valve 33 and opening valve 35, thus supplying fluid pressure to the left-hand side of cylinder A through port 37, valve 35, port 40, and pipe 16. It should be noticed that due to the size of the piston rod 13, the area over which this pressure is effective upon piston 14 is comparatively small. The force exerted upon the piston and the brake mechanism to withdraw the braking bars from the braking position is therefore comparatively small. The purpose of this feature is to avoid the waste of compressed air energy that would result were the piston rod not thus enlarged and a nearly equal piston area used for both brake application and release.

Under certain conditions it is desirable to operate braking apparatus of the type here described, from a point remote from the apparatus, as in the case where a number of sets of apparatus are to be controlled from a single station. If the control valve be located at the control station and the pipes 15 and 16 run to the trackway apparatus, the excessive quantity of air required would make the expense of this purely pneumatic control almost prohibitive; furthermore, the inertia of the large amount of air in pipe lines, etc., would make the functioning of the apparatus sluggish and uncertain, and condensation from the large air volume entailed would result in unreliability of operation.

I therefore prefer to locate the control valves adjacent the cylinder A, and to control these valves electrically from a remote point, such as a control cabin H. For this purpose I provide two manually operable contact levers 45 and 47, located at the point H from which it is desired to control the braking apparatus. Lever 45 is adapted to be moved into engagement with a fixed contact 46 to supply energy to winding 17 of valve P from a suitable source, such as a battery 50. Associated with lever 47 are a plurality of fixed contacts 48, 55, 56, 57, 58 and 59, so disposed that lever 47 may make contact with any selected one of the fixed contacts or with none of them. When contact 47—48 is closed, winding 17 of valve N is energized by current from battery 50, as will be obvious from the drawing.

Communicating with the right-hand end of cylinder A is a pressure responsive device 53 having a diaphragm 52 exposed to the pressure in the cylinder. A pivoted lever 51 is operatively connected with the diaphragm so that when the air in the right-hand side of cylinder A is at atmospheric pressure, lever 51 makes contact with a plurality of contact sectors 55^a, 56^a, 57^a, 58^a, 59^a, which sectors are connected electrically with contacts 55, 56, 57, 58 and 59, respectively, through wires 55^b, 56^b, 57^b, 58^b and 59^b. If, however, the pressure in the right-hand side of cylinder A is increased, diaphragm 52 swings lever 51 toward the right to successively disengage the contact segments, contact 55^a—51 being first broken. It follows, therefore, that for any of the contacts controlled by diaphragm 52, there is a maximum pressure in cylinder A, and if this pressure be exceeded, such contact will be opened. Although I have here illustrated only five contacts controlled by lever 51, it should be understood that this particular number is not essential. Lever 51 is connected with one terminal of winding 17 of valve R, and battery 50 has one terminal connected with lever 47 and the other terminal connected with the remaining terminal of winding 17 of valve R.

In explaining the operation of the apparatus, I will assume that a railway vehicle is moving along the track shown in the drawing, and that the braking apparatus is in the illustrated position, that is, all the manually operable contacts at point H are open, valves R, P and N are all deenergized, the braking apparatus is in the release position, and pressure is disconnected from both sides of cylinder A.

I will also assume that the operator at H wishes to make a light brake application. He first closes contact 45—46, energizing valve P and closing valve 30. He then closes contact 47—55. Valve R then becomes energized over a circuit including contact 51—55^a, and valve 27 is therefore

opened to gradually apply fluid pressure to the right-hand end of cylinder A. This pressure drives piston 14 to the left and moves the brake bars 3^a and 4^a into position for engagement with the wheels of the vehicle. The pressure thus supplied to cylinder A is applied also to diaphragm 52 and after reaching a predetermined value causes contact 51—55^a to open. The circuit for valve R is then interrupted, and valve 27 closes, preventing further increase in the braking force. Should the operator wish to increase the amount of the brake application he can do so by moving lever 47 into engagement with a lower contact, such as 58, thereby again closing the circuit for valve R, this time through contact 51—58^a, and valve R will be energized to open 27. The pressure supplied to cylinder A will then be increased till contact 51—58^a opens, whereupon valve R will again be de-energized. It is, therefore, plain that by closing a selected one of the contacts associated with lever 47, the pressure in cylinder A may be regulated at a definite value and that by proper manipulation of the lever 47 the braking force may be governed to meet the requirement of any class of vehicle either as to weight or speed.

Should the operator desire to reduce the braking pressure he first moves contact arm 47 to a lower pressure contact position, and then opens contact 45—46, thereby deenergizing valve P and allowing a portion of the fluid in the cylinder A to vent to atmosphere through valve 30. This reduction in pressure may be stopped at any time by reclosing contact 45—46.

It is plain from the foregoing that with my invention an operator located at a point remote from the braking apparatus may control the braking pressure accurately and instantaneously.

Should the operator wish to restore the apparatus to the release position, he opens contact 45—46 and all the contacts controlled by lever 47, reducing the pressure in the right-hand side of cylinder A to atmospheric pressure. He then closes contact 47—48. The resulting energization of valve N opens valve 35 to supply fluid pressure to the left-hand end of cylinder A, thereby driving piston 14 to the right and restoring the braking apparatus to the release position. The subsequent opening of contact 47—48 de-energizes valve N, opens valve 33, and valve 35 being closed, vents the left-hand side of cylinder A to atmosphere to restore the apparatus to its normal condition.

In this application I do not make any claim for the invention described and claimed in an application filed on even date herewith, Serial No. 759,209, by John P. Coleman, for railway braking apparatus.

Although I have herein shown and described only one form of 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 brake bar located in the trackway, a fluid pressure motor for operating said bar, a plurality of contacts successively actuated as the pressure supplied to said motor increases, and means including said contacts for supplying fluid pressure to said motor.

2. Railway braking apparatus comprising a brake bar located in the trackway, a motor for operating said bar, a plurality of contacts successively actuated as the energy supplied to said motor increases, and means including said contacts for supplying energy to said motor.

3. Railway braking apparatus comprising a brake bar located in the trackway, a motor for operating said bar, a plurality of normally closed contacts successively opened as the energy supplied to said motor increases, a winding for controlling the supply of energy to said motor, and manually operable means located at a point remote from said motor for supplying current to said winding in series with any selected one of said contacts.

4. Railway braking apparatus comprising a brake bar located in the trackway, a fluid pressure motor for moving said bar into engagement with a part of a railway vehicle, means for supplying fluid pressure to said motor, pressure limiting means responsive to the actual pressure of the fluid in the motor and effective when actuated to discontinue such supply, and manually operable means for selecting the pressure at which said pressure limiting means will be actuated.

5. Railway braking apparatus comprising a brake bar located in the trackway, a cylinder, a piston in said cylinder operatively connected with said bar, a device responsive to the pressure supplied to said cylinder, manually operable means, a first valve controlled by said device and by said manually operable means for admitting fluid pressure to said cylinder, and a second valve controlled solely by said manually operable means for releasing pressure from said cylinder.

6. Railway braking apparatus comprising a brake bar located in the trackway, a cylinder, a piston in said cylinder operatively connected with said bar, means for initiating the supply of fluid pressure to said cylinder, and means responsive to the pressure supplied to said cylinder for discontinuing such supply.

7. Railway braking apparatus comprising a brake bar located in the trackway, a cylinder, a piston in said cylinder operatively connected with said bar, means for initiating the supply of fluid pressure to said cylinder, and means responsive to the pressure in said cylinder for discontinuing such supply when the pressure in the cylinder reaches a predetermined value.

8. Railway braking apparatus comprising a brake bar located in the trackway, a cylinder, a piston in said cylinder operatively connected with said bar, a device responsive to the pressure in said cylinder, a plurality of normally closed contacts controlled by said device and arranged to be successively opened as the pressure in the cylinder increases, and means including said contacts for supplying fluid pressure to said cylinder.

9. Railway braking apparatus comprising a brake bar located in the trackway, a cylinder, a piston in said cylinder operatively connected with said bar, a device responsive to the pressure in said cylinder, a plurality of normally closed contacts controlled by said device and arranged to be successively opened as the pressure in the cylinder increases, an electro-magnetic valve for supplying fluid pressure to said cylinder, and manually operable means located at a point remote from said cylinder for at times supplying current to said valve in series with any one of said contacts.

10. Railway braking apparatus comprising a brake bar located in the trackway, a motor for operating said bar, a plurality of normally closed contacts successively opened as the energy supplied to said motor increases, a plurality of normally open contacts located at a point remote from said motor and each electrically connected with one of said normally closed contacts, manual means for closing any one of said normally open contacts, a winding for controlling the supply of energy to said motor, and a circuit for said winding including whichever of said normally open contacts may be closed and the associated normally closed contact.

11. Railway braking apparatus comprising a brake bar located in the trackway, a cylinder, a piston in said cylinder operatively connected with said bar, a device responsive to the pressure in said cylinder, a plurality of normally closed contacts controlled by said device and arranged to be successively opened as the pressure in the cylinder increases, a plurality of normally open contacts located at a point remote from said cylinder and each electrically connected with one of said normally closed contacts, manual means for closing any selected one of said normally open contacts, an electro-pneumatic valve for supplying fluid pressure to said cylinder, and a circuit for said valve including whichever of said normally open contacts may be closed and the associated normally closed contact.

In testimony whereof I affix my signature.

LLOYD V. LEWIS.