July 27, 1937. T. H. SCHOEPF ET AL 2,088,486

RAILWAY BRAKE MECHANISM

Filed July 8, 1936 4 Sheets-Sheet 1

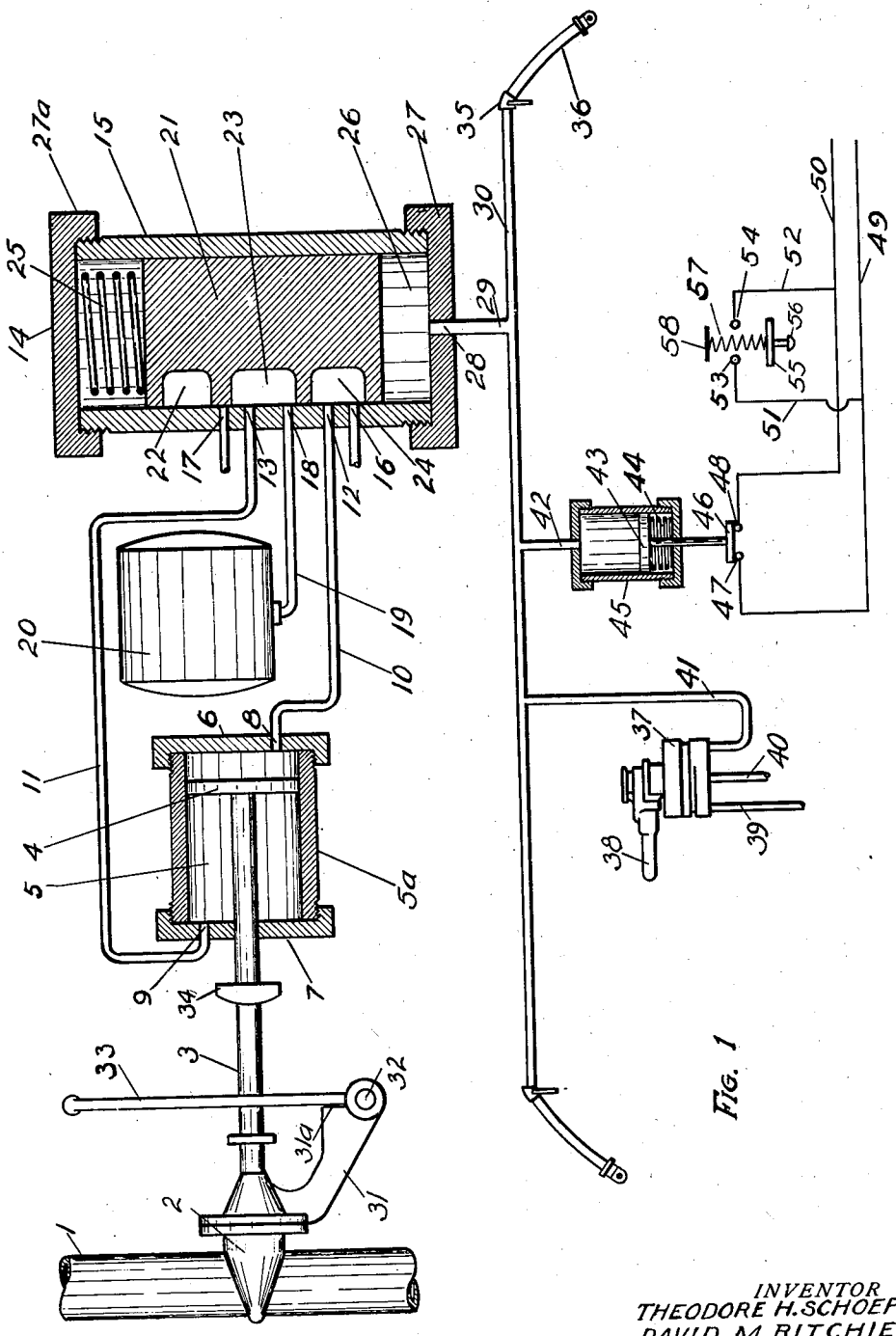


Fig. 1

INVENTOR
THEODORE H. SCHOEPF
DAVID M. RITCHIE

BY Toulmin & Toulmin
ATTORNEYS

July 27, 1937. T. H. SCHOEPF ET AL 2,088,486

RAILWAY BRAKE MECHANISM

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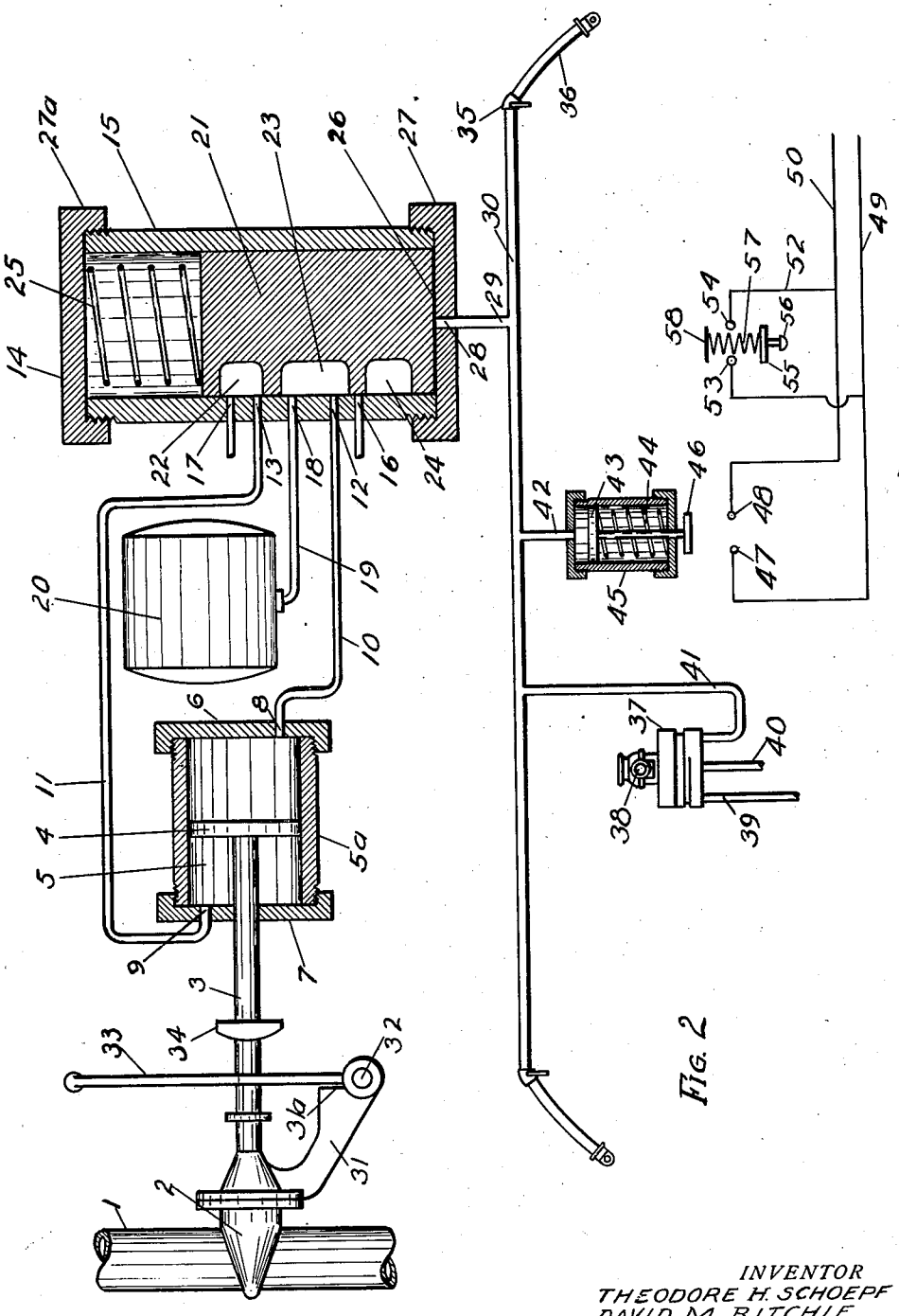


FIG. 2

INVENTOR
THEODORE H. SCHOEPF
DAVID M. RITCHIE
BY Fauhnin & Fauhnin
ATTORNEYS

July 27, 1937. T. H. SCHOEPF ET AL 2,088,486

RAILWAY BRAKE MECHANISM

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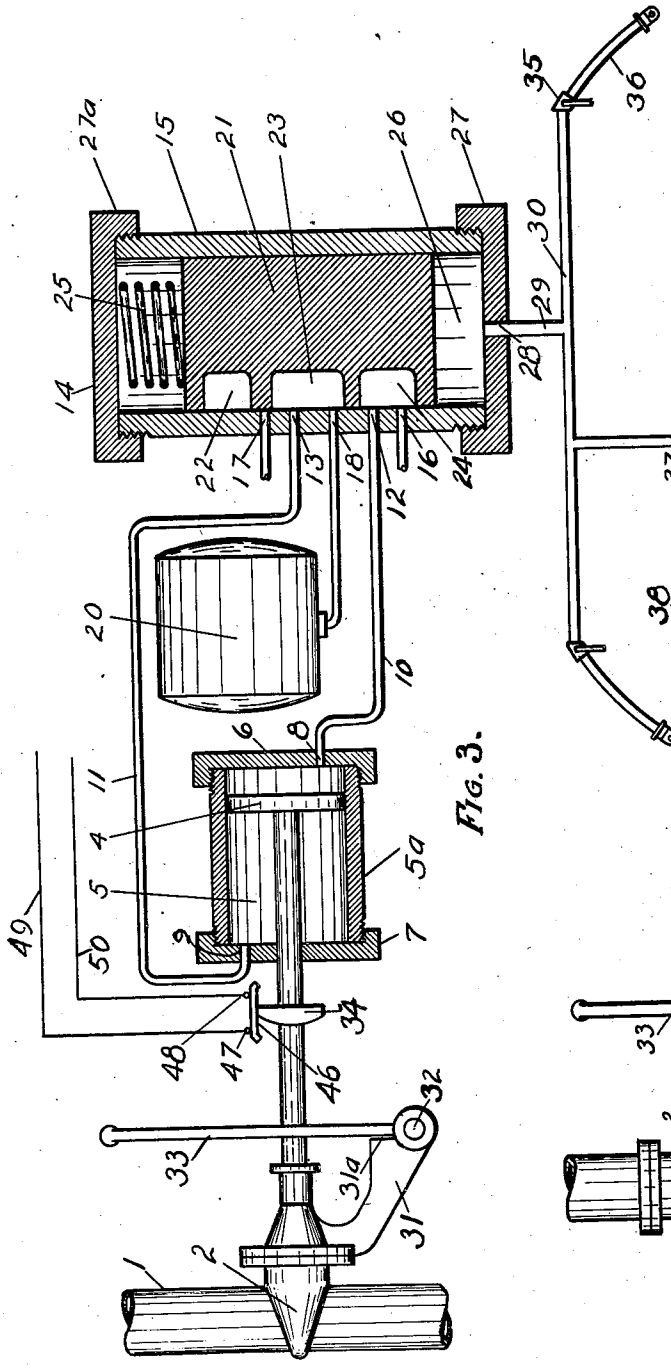


FIG. 3.

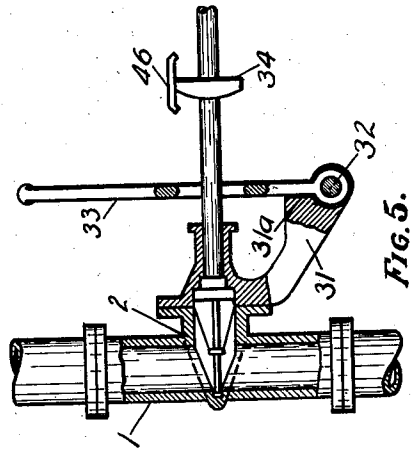


FIG. 5.

INVENTOR
THEODORE H. SCHOEPF
DAVID M. RITCHIE

BY Lauchmin & Lauchmin
ATTORNEYS

July 27, 1937. T. H. SCHOEPF ET AL 2,088,486

RAILWAY BRAKE MECHANISM

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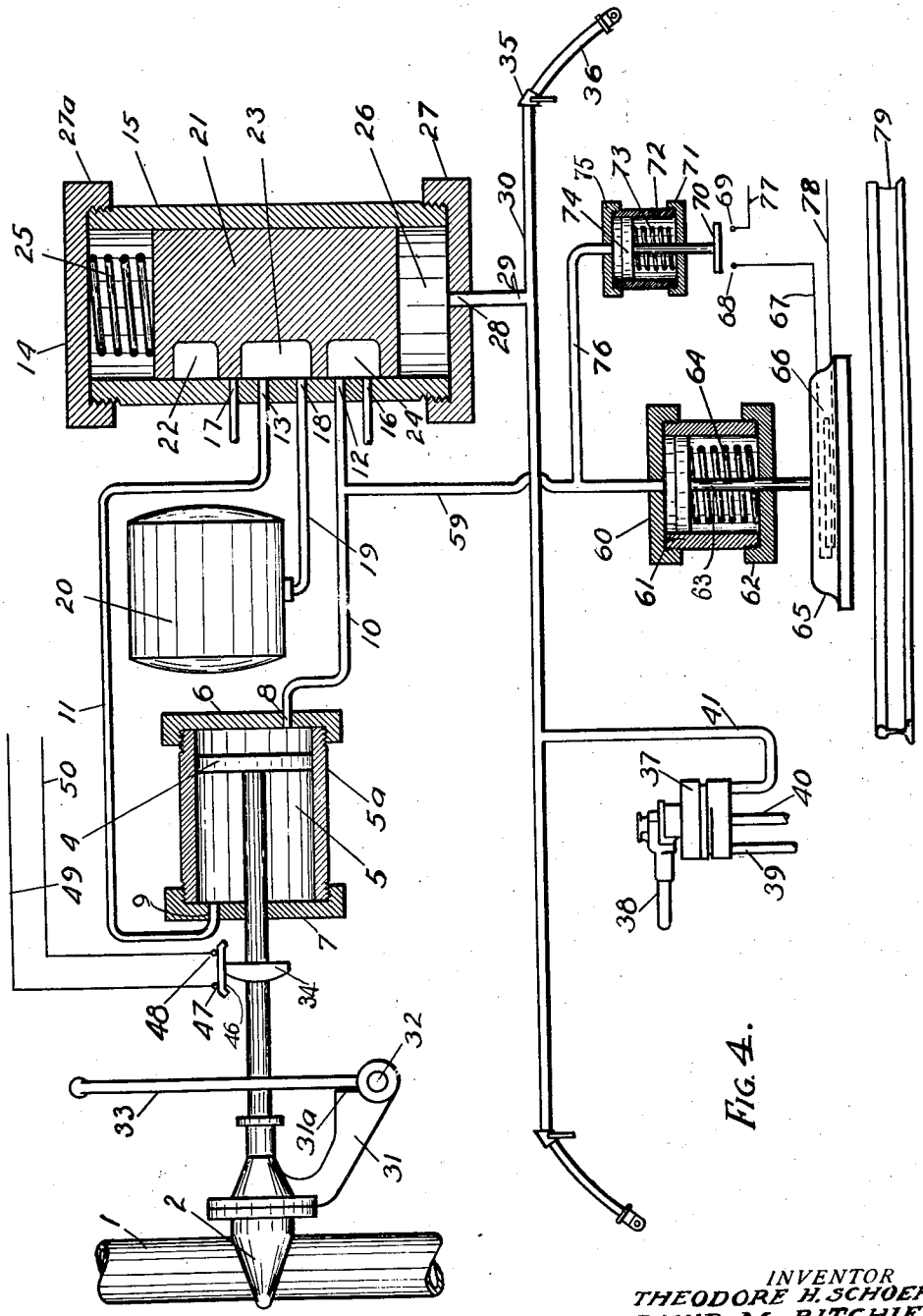


FIG. 4.

INVENTOR
THEODORE H. SCHOEPF
DAVID M. RITCHIE
BY Fauchmin & Fauchmin
ATTORNEY

Patented July 27, 1937

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UNITED STATES PATENT OFFICE

2,088,486

RAILWAY BRAKE MECHANISM

Theodore H. Schoepf and David M. Ritchie, Cincinnati, Ohio, assignors to The Cincinnati Traction Building Company, Cincinnati, Ohio, a corporation of Ohio

Application July 8, 1936, Serial No. 89,650

12 Claims. (Cl. 192—3)

Our invention relates to the control of the supply of steam to a steam engine, or the supply of fuel oil or gas to an internal combustion engine, carried by a railway vehicle and utilized to propel the said vehicle through the intermediary of mechanical means or electrical means, and wherein said vehicle is equipped also with the usual or customary fluid pressure brakes.

The essential object of this invention is to devise a pneumatically operative mechanism whereby the steam or fuel supply is automatically shut off from the engine responsive to manipulation of a control valve to apply the said fluid pressure brakes.

A further object is to devise a means, comprehended in said mechanism, whereby the functioning thereof will take place, or become effective, only when the application of the said fluid pressure brakes is of a predetermined intensity; the said means to be adjustable, so that the said mechanism may be made effective for any and all applications, service and emergency, of the said fluid pressure brakes, or for emergency applications only, as may be predetermined.

A further object is to devise a pneumatically operative mechanism, whereby the electrical circuit for the ignition of the said internal combustion engine is automatically interrupted responsive to manipulation of a control valve to apply the said fluid pressure brakes.

A further object is to devise a means, comprehended in said last named mechanism, whereby the functioning thereof will take place, or become effective, only when the application of the said fluid pressure brakes is of a predetermined intensity; the said means to be adjustable, so that the said mechanism may be made effective for any and all applications, service and emergency, of the said fluid pressure brakes, or for emergency applications only as may be predetermined.

A further object is to combine the two said mechanisms, the one to shut off the fuel supply and the other to interrupt the electrical circuit for the ignition of the said internal combustion engine; herein lies a wide range of selective combinations because of the said adjustments referred to under the last named mechanism and last named means.

A further object is to devise a manually operative mechanism whereby the said supply of steam or fuel may be manually opened to the engine following the automatic shut off thereof responsive to a complete or partial dissipation of fluid pressure, which is abnormal and usually results from leakage when a vehicle stands idle for a protracted time.

A further object is to devise a means whereby the ignition circuit may be established manually under abnormal conditions last described.

Our invention will be better understood from the following description taken in connection with the accompanying drawings:

As a preliminary it is pertinent to explain that we have shown those elements only of the automatic fluid pressure brake system, a section of the steam or fuel supply line including its control valve, and a section of the electrical circuit for ignition including the switch device therein, all as directly associated with the mechanism, devices and means comprehended in our idea. As to the automatic fluid pressure brake system, the development of our idea is concerned only with the control valve and the connected train line, wherein manual manipulation of the control valve causes a reduction of pressure in the train line and responsive thereto the fluid pressure wheel brakes are applied, but the mechanism, devices and means comprehended in our idea will function in response to said reduction in pressure even though the wheel brakes may fail to respond to said reduction.

Referring to the accompanying drawings:

Figure 1 is a diagram partly in section showing the several mechanisms, devices and means, together with interconnecting means, in normal operative position or condition, wherein the control valve for the fluid pressure brakes is in normal or release position, the steam or fuel supply line is open and the electrical circuit for the ignition is closed.

Figure 2 is a diagram partly in section showing the several mechanisms, devices and means, together with interconnecting means, in operative position responsive to manipulation of the control valve resulting in reduction in pressure in the train line and therefore an application of the fluid pressure brakes, wherein the steam or fuel supply line is shut off and the electrical circuit for the ignition is interrupted.

Figure 3 is a diagram partly in section showing essentially the same as Figure 2, except the means for interrupting the electrical circuit for ignition is mechanically attached to the valve in the supply line and actuated with that valve.

Figure 4 is a diagram partly in section showing essentially the same as Figure 3, except a magnetic track brake has been added, which brake is actuated and energized through the

functioning of the relay valve in response to the fluid pressure in the train line.

Figure 5 is a diagram partly in section showing the supply line, a gate valve therein, and the means to manually open and close the valve.

Referring to the drawings in detail, 1 indicates a steam or fuel supply pipe line, wherein is connected the valve 2. While we have shown conventionally a gate valve, yet we wish to include within the scope hereof any suitable type valve well known to those skilled in the art. 3 is the valve stem prolonged and connected to the piston 4 of the air engine generally indicated as 5. The air engine 5 comprises, in addition to the piston 4, the cylinder 5a and the heads 6 and 7. The latter are provided with ports 8 and 9 respectively connected by pipes 10 and 11 respectively with ports 12 and 13 respectively in the relay valve generally indicated as 14. The relay valve 14 comprises the cylinder or body 15, two heads 27 and 27a, piston or slide 21, and spring 25. The cylinder 15 is provided with suitably spaced ports 17, 13, 18, 12 and 16; the head 27 is provided with the port 28; and the piston 21 is provided with suitable recesses 22, 23 and 24 suitably disposed each in relation to the others. Externally of the cylinder 21 the ports 16 and 17 communicate direct to atmosphere, the port 13 is connected by pipe 11 as previously described, the port 18 is connected by pipe 19 with an air tank 20 receiving its supply of compressed air from a suitable source not shown, and the port 12 is connected by a pipe 10 as previously described. The port 28 is connected by pipe 29 with the train line 30 of usual fluid pressure brake. The train line 30 terminates in the usual angle or cut-out cocks 35 and coupling hose 36.

The train line 30 is connected by pipe 41 with the control valve 37 of the fluid pressure brake, 37 is actuated by the manual manipulation of the handle 38, and is connected by pipe 39 with a suitable source not shown, of fluid under pressure, and connected by pipe 40 to a means of exhaust, not shown. The train line 30 is connected by pipe 42 to a pneumatic switch closer having a cylinder 45, piston and stem 43, and springs 44 and 43 have attached thereto the disc 46, which functions to bridge the gap between terminals 47 and 48, and the terminals 47 and 48 are connected to the wires 49 and 50 respectively of the ignition electrical circuit.

The wires 51 and 52 are connected to the wires 49 and 50 respectively and the terminals 53 and 54 respectively. The terminals 53 and 54 comprise parts of a switch normally held open by the spring 57 on the fixed plate 58 and acting under its tension to keep the disc 55 out of contact with 53 and 54. By manually pressing on the button 56 the disc 55 may be depressed to bridge the gap between 53 and 54 and will remain in that position only when the pressure is continued.

A bracket 31 is attached suitably to the valve 2 and has a pin 32, whereby a lever 33 is attached to 31 and may be suitably rotated about 32 as a pivot. The bracket 31 is provided with a shoulder or stop 31a to limit the counterclockwise rotation of 33. The valve stem 3 is provided with a disc, boss or nut 34, suitably disposed so that the lever 33 will engage 34 when rotated clockwise under conditions to be explained later herein.

Method of operation—Normal

As previously described, normal operation is one in which the fluid pressure brakes are released, the steam or fuel supply line is open, and in the case of an internal combustion engine, the electrical circuit for the ignition is closed, all of which is shown in Figure 1.

Referring to Figure 1, the operation is as follows:

The handle 38 is shown in the release position wherein the control valve 37 blanks off the exhaust 40 and establishes communication between 39 and 41, so that the train line 30 and connected pipes 29 and 42 are filled with fluid under pressure, all in a manner well known to those skilled in the art. Therefore, the said pressure is communicated by pipe 29 and port 28 to recess 26 to the under side of slide 21, which overpowers spring 25 sufficiently for the slide 21 to adopt the position shown where balance is restored between 25 and pressure on under side of 21. The recess 24 establishes communication between ports 12 and 16, so that any air under pressure within the cylinder 5a and to the right of piston 4 is exhausted through 8, 10, 12, 24 and 16 to atmosphere. At the same time, although this relationship may be adjusted by change in relative disposition of the ports and recesses in 14, the port 17 is shut off, and the recess 23 establishes communication between ports 13 and 18, so that air under pressure flows from air tank 20 through pipe 19, port 18, recess 23, port 13, pipe 11, port 9 and within cylinder 5a to the left of piston 4. The pressure thus applied to the piston 4 moves it to the right and through the connected stem 3 opens the valve 2 and the supply line 1.

As described, when the train line 30 is filled with fluid under pressure, the connected pipe 42 is also filled with fluid under pressure, which is communicated within cylinder 45 on the upper side of piston 43. That pressure overpowers the resistance of spring 44 and moves 43 and the connected disc 46 downward sufficiently for 46 to contact terminals 47 and 48, thus bridging the air gap between 47 and 48 and completing the electrical circuit for ignition.

Method of operation—Responsive to manipulation of brake control valve to reduce pressure in train line

As previously described, and responsive to manual manipulation of the controller to effect a reduction of pressure in the train line, mechanism, devices and means are actuated whereby a valve closes the steam or fuel supply pipe and a switch interrupts the electrical circuit for the ignition of an internal combustion engine, all of which is shown in Figure 2.

Referring to Figure 2, the operation is as follows:

The handle 38 has been rotated manually to the position shown, wherein the valve 37 blanks off the pipe 39 and establishes communication between exhaust pipe 40 and the pipe 41, thereby exhausting some or all of the fluid under pressure from train line 30 through pipe 41, valve 37 and exhaust pipe 40 to atmosphere.

The said reduction in pressure in train line 30 is communicated by pipe 29 and port 28 to the lower recess 26, and therefore the lower side of 21 and moves the piston 21 to the position shown, wherein the recesses 22, 23 and 24 adopt the positions and effect the communication between ports as shown. Recess 22 establishes communication between exhaust port 17 and port 13, so that any air under pressure that may be in the cylinder 5a to the left of piston 4 is exhausted through

port 9, pipe 11, port 13, recess 22 and port 17 to atmosphere. At the same time recess 23 establishes communication between ports 18 and 12, so that air under pressure flows from tank 20, through pipe 19, port 18, recess 23, port 18, pipe 10, port 8, to the inside of cylinder 5a and on the right hand side of piston 4, which pressure moves the piston 4 and the connected stem 3 with its disc 34 to the left sufficiently to close the valve 2 and shut off the supply pipe 1. The partition, not numbered, between recess 23 and recess 24 in 21 blanks off the exhaust port 16.

At the same time the said reduction in pressure in train line 30 is communicated by pipe 42 to the inside of cylinder 45 and on the upper side of piston 43, and the spring 44 overcomes the reduced resistance on the upper side of 43 and moves it with the connected disc 46 upward, whereby the gap between terminals 47 and 48 is opened and the ignition circuit represented by 49 and 50 is interrupted.

Our invention comprehends that the strength of the springs 25 and 44 may be made such that they will move their respective associated pistons 21 and 43 responsive to some particular reduction in pressure in train line 30 as may be predetermined. We attach importance to this feature, because the intensity of the application of the wheel brakes is roughly proportional to the reduction of pressure in train line 30, and is known as an emergency application when the said pressure is reduced to essentially that of atmosphere.

It may be desired to shut off the supply line 1 responsive to a particular reduction in pressure, and interrupt the electrical circuit for the ignition responsive to a different reduction in pressure, which desired condition may and can be effected in the manner described immediately hereinbefore.

Our invention comprehends means to readily permit a vehicle to be prepared for operation after it has been standing idle and unused for a period of time and the fluid pressure has leaked off, or the fluid pressure has been voluntarily bled off to facilitate repairs, either condition being met with frequently in practice.

Under either of the conditions described, it is quite probable the valve 2 will be actuated to shut off the supply line 1. In that case, the lever 33 may be moved manually to the right, pivoting about the pin 32, to engage or contact 34, whereby the valve 2 is opened, which is applicable to either a steam supply line or a fuel supply line.

Under the same conditions for an internal combustion engine, the electrical circuit for ignition is interrupted in the manner described, and that circuit must be closed to start the engine. It is our invention to provide for this in the manner previously described, whereby pressure on the button 56 depresses disc 55 to bridge the terminals 53 and 54.

Simplified means of interrupting the ignition circuit connected to and operated with the control valve in the supply line

This is shown in Figure 3.

Herein we propose to control the electrical circuit for the ignition of an internal combustion engine by means of a switch, said switch connected to and actuated to open and close with the movable part of the valve in the supply line. However, we wish it understood that the opening and closing of the said switch may be considered as effected by the movement of the piston of the pneumatic motor provided to close and open the valve in the said supply line.

Referring to Figure 3 the operation is as follows:

The indicating numerals for like parts are the same as used in Figure 1 and Figure 2.

The functioning of valve 2, responsive to the pressure in train line 30 as controlled by the valve 37 through the manual manipulation of its handle 38, is as described before.

46 is a plate fastened to and movable with the disc 34, but it may be attached directly to stem 3. The plate 46 is adapted to alternate bridge and interrupt the air gap between the terminals 47 and 48 being connected to the wires 49 and 50 respectively of the ignition electrical circuit.

When the handle 38 is placed manually in proper position, then the train line 30 is filled with fluid under normal pressure, and responsive thereto piston 4, stem 3 and disc 34 are moved to a position as shown, all as described hereinbefore. In that position the plate 46 bridges the terminals 47 and 48, thus completing the electrical circuit for the ignition.

As previously described hereinbefore, responsive to manual manipulation of handle 38 to a new position thus effecting a reduction in pressure in 30, the pneumatic motor 5 functions to move the stem 3 and disc 34 to the left. In that position the plate 46 opens the air gap between 47 and 48 and thus interrupts the ignition circuit 49 and 50.

Further, under the condition previously described, when all compressed air has leaked off, the plate 46 is moved to the right to close the ignition circuit by manually rotating lever 33 about pivot 32 so that the said engine may be started in any of the usual ways.

Method of operation of magnetic rail brake—Responsive to pressure in train line

Herein, the means and devices are the same as previously described to control the supply line and ignition circuit responsive to the fluid pressure in the train line, but a magnetic rail brake has been added, which brake functions responsive also to the fluid pressure in said train line and co-ordinated suitably with the functioning of the said means and devices.

Referring to Figure 4 the construction and operation of the added means and devices is as follows:

Construction

The pipe 59 is connected at one end to the pipe 10 and at the other end to the head 60 and thence to the inside of its associated cylinder 61. Head 60, cylinder 61, together with the head 62, piston and stem 63 and the spring 64 comprise a pneumatic engine connected to the rail brake shoe 65. The shoe 65 is provided with a magnet coil 66, connected by the wire 67 to the terminal 68 of a switch to be described later, and by the wire 78 to a suitable source of electrical power not shown. The pipe 76 connects the pipe 59 to the head 75 and the inside of cylinder 72 of a pneumatic switch closer, said switch closer comprising also a head 71, piston and stem 74, and spring 73. The piston and stem 74 is connected to the plate or disc 70, which, with the terminals 68 and 69, comprise the switch. The terminal 69 is connected by the wire 77 with the said source of electrical power not shown. The rail, with which the brake 65 is associated, is shown at 79.

Operation

Figure 4 shows all of the means and devices in position for normal operation, wherein the pipe 10 has been exhausted of compressed air through 12, 24 and 16 as previously described. Therefore, the pipe 59 has been exhausted of compressed air so that the spring 64 lifts the piston and stem 63, and, therefore, the connected shoe 65 to a position safely remote from the rail 79. Since the pipe 59 has been exhausted of compressed air, the connected pipe 76 is also exhausted and the spring 73 lifts the piston and stem 74, and, therefore the connected plate 70. When the plate 70 is lifted the electrical circuit is interrupted between terminals 68 and 69, and the magnet coil 66 is thus de-energized.

Hereinbefore has been described the manner in which the pipe 10 is filled with compressed air from the tank 20, following manual manipulation of the handle 38 to effect a reduction of fluid pressure in the train line 30. Now, when the pipe 10 is charged with compressed air, then the connected pipes 59 and 76 are also charged with compressed air. From 59 the pressure is built up on the upper side of the piston 63, which overcomes the resistance of the spring 64 and moves downwardly the piston and stem 63 and the connected shoe 65 toward the rail 79. At the same time the pressure from 76 is communicated to and builds up on the upper side of piston 74, which overcomes the resistance of spring 73 and moves downwardly the piston and stem 74 and the connected plate 70 to bridge the air gap between the terminals 68 and 69 and complete the electrical circuit to energize the magnet coil 66. Thus the shoe 65 is moved toward the rail 79 and at the same time the magnet coil is energized, so that the shoe 65, when it reaches the magnetic zone adjacent the rail 79, is magnetically drawn to and against the rail.

In this showing we provide means that upon manual manipulation of a control valve to effect a reduction of fluid pressure in a train line, will responsively apply the customary fluid pressure wheel brakes and magnetic rail brakes, actuate a valve to shut off a fuel supply pipe line and interrupt the ignition circuit in the case where an internal combustion engine is used.

It will be understood that we desire to comprehend within our invention such modifications as may be necessary to adapt it to varying conditions and uses.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a railway vehicle having an internal combustion engine as a prime mover, a fuel supply line, an ignition system for said engine, a pneumatic braking system operable to apply the brakes on the vehicle upon a decrease of pressure in the braking system, means of controlling said decrease of pressure, means affected by said decrease of pressure for opening said ignition circuit, and means affected by said decrease in pressure for closing said fuel supply line.

2. In combination, in a railway vehicle, of a supply pipe for a prime mover, a valve controlling said supply pipe, means of manually operating said valve, automatic means associated therewith for opening and closing said valve according to a change of pressure in said automatic means, a braking system on said vehicle operable by a control of pressure in said system, means for controlling the pressure in said system whereby upon the application of the brakes the change in pressure in the braking system will operate said fuel control valve, an ignition system, and means operable by the change of pressure in the braking system for controlling the operation of said ignition system.

3. In combination, in a railway vehicle, of a supply pipe for a prime mover, a valve controlling said supply pipe, means of manually operating said valve, automatic means associated therewith for opening and closing said valve according to a change of pressure in said automatic means, a braking system on said vehicle operable by a control of pressure in said system, means for controlling the pressure in said system whereby upon the application of the brakes the change in pressure in the braking system will operate said fuel control valve, and a pressure supply means adapted upon a predetermined condition of the braking system to open said fuel supply valve and hold it in open position.

4. In a railway vehicle having a prime mover and a braking system, a fuel supply line for said prime mover, a valve therein, a braking system pressure operated, means for controlling the pressure therein, means connected to the braking system for controlling the position of said fuel valve, and independent pressure means adapted upon a given position of the braking system for opening said valve and maintaining it open.

5. In combination, a fuel supply line for a prime mover, a valve therefor, pressure operated means for operating said valve, an ignition system therefor, means of controlling said ignition system by the movement of said pressure operated means for controlling said valve whereby the ignition system is opened when said valve is closed and the ignition system is closed when said valve is open, and a braking system associated therewith, the change in pressure in which operates said ignition and fuel supply control.

6. In combination, a fuel supply line for a prime mover, a valve therefor, pressure operated means for operating said valve, an ignition system therefor, means of controlling said ignition system by the movement of said pressure operated means for controlling said valve whereby the ignition system is opened when said valve is closed and the ignition system is closed when said valve is open, a braking system associated therewith, the change in pressure in which operates said ignition and fuel supply control, and a supplementary pressure means for maintaining said ignition system and fuel supply in operative condition when said braking system is in an operative position.

7. In combination, a braking system comprising a pressure line for controlling the application of brakes, means of controlling the pressure line, a spring pressed valve in said line, a pressure cylinder controlled by said valve, a piston and piston rod in said pressure cylinder, a source of fluid pressure controlled by said valve for application to said cylinder, a fuel supply line, and a valve therein controlled by the piston rod on the piston in said cylinder.

8. In combination, a braking system comprising a pressure line for controlling the application of brakes, means of controlling the pressure line, a spring pressed valve in said line, a pressure cylinder controlled by said valve, a piston and piston rod in said pressure cylinder, a source of fluid pressure controlled by said valve for application to said cylinder, a fuel supply line, a valve therein controlled by the piston rod on

the piston in said cylinder, and an ignition means controlled by the movement of said piston rod in said cylinder.

9. In combination, a braking system comprising a pressure line for controlling the application of brakes, means of controlling the pressure line, a spring pressed valve in said line, a pressure cylinder controlled by said valve, a piston and piston rod in said pressure cylinder, a source of fluid pressure controlled by said valve for application to said cylinder, a fuel supply line, a valve therein controlled by the piston rod on the piston in said cylinder, a second fluid pressure cylinder, a switch controlled thereby, and an ignition system controlled by said switch.

10. In combination, a braking system comprising a pressure line for controlling the application of brakes, means of controlling the pressure line, a spring pressed valve in said line, a pressure cylinder controlled by said valve, a piston and piston rod in said pressure cylinder, a source of fluid pressure controlled by said valve for application to said cylinder, a fuel supply line, a valve therein controlled by the piston rod on the piston in said cylinder, a second fluid pressure cylinder, a switch controlled thereby, an ignition system controlled by said switch, and a supplementary manual switch means for controlling said ignition system.

11. In combination, a braking system comprising a pressure line for controlling the application of brakes, means of controlling the pressure line, a spring pressed valve in said line, a pressure cylinder controlled by said valve, a piston and piston rod in said pressure cylinder, a source of fluid pressure controlled by said valve for application to said cylinder, a fuel supply line, a valve therein controlled by the piston rod on the piston in said cylinder, a second fluid pressure cylinder, a switch controlled thereby, an ignition system controlled by said switch, a supplementary manual switch means for controlling said ignition system, and a supplementary manual means for controlling said fuel valve.

12. In combination, a pressure operated braking system comprising a rail brake, pressure controlled means for applying said brake, pressure controlled means for controlling the energization of said brake, a fuel supply means for a prime mover, means connected with the braking system for controlling said fuel supply means in coordination with the application of said brake, an ignition system for said prime mover, and means controlling said ignition system according to the application of said brake.

THEODORE H. SCHOEPF.
DAVID M. RITCHIE.