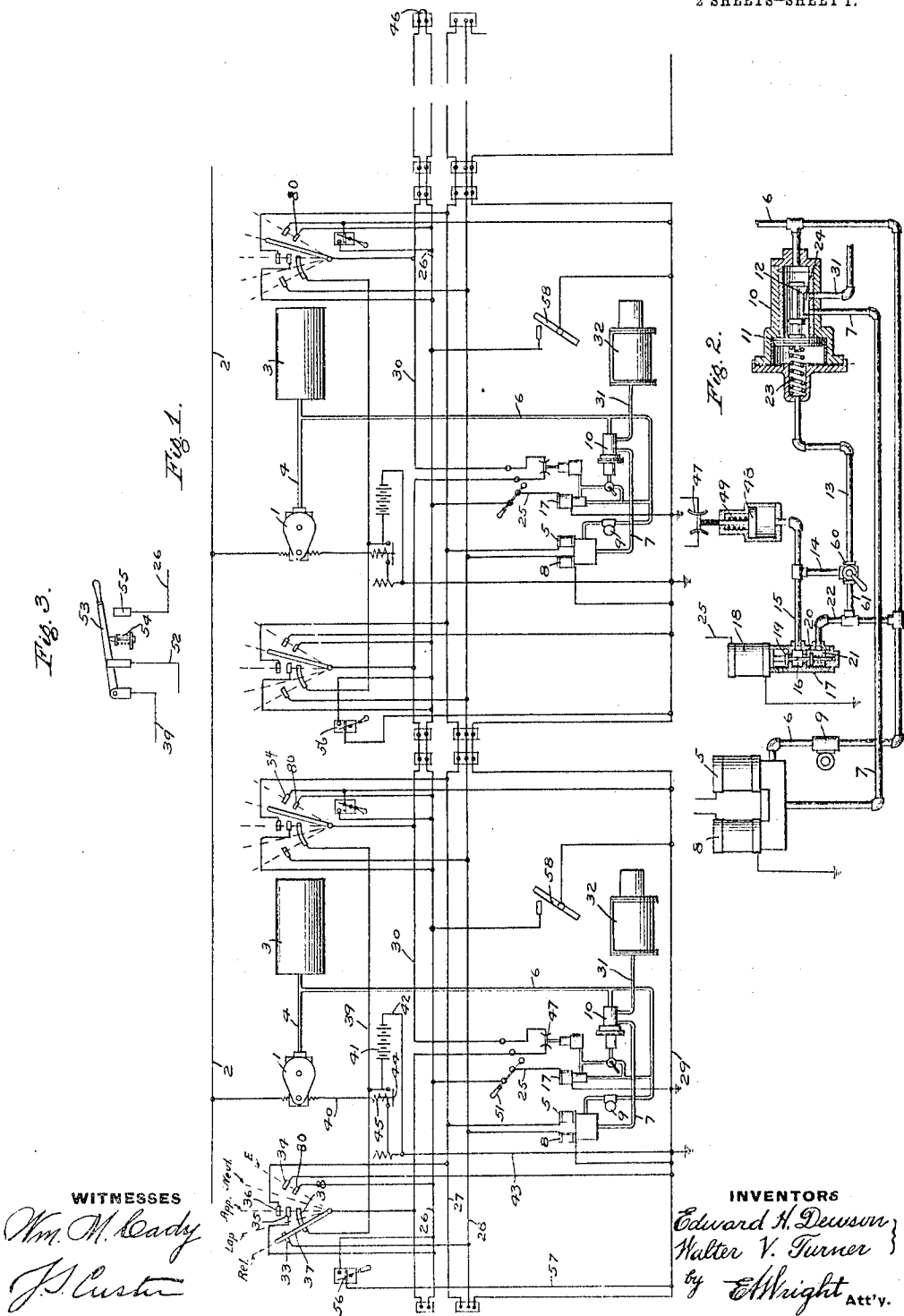


E. H. DEWSON & W. V. TURNER.
 AUTOMATIC ELECTRIC AIR BRAKE.
 APPLICATION FILED APR. 12, 1909.

1,048,507.

Patented Dec. 31, 1912.
 2 SHEETS-SHEET 1.



WITNESSES
Wm. M. Cady
J. Luster

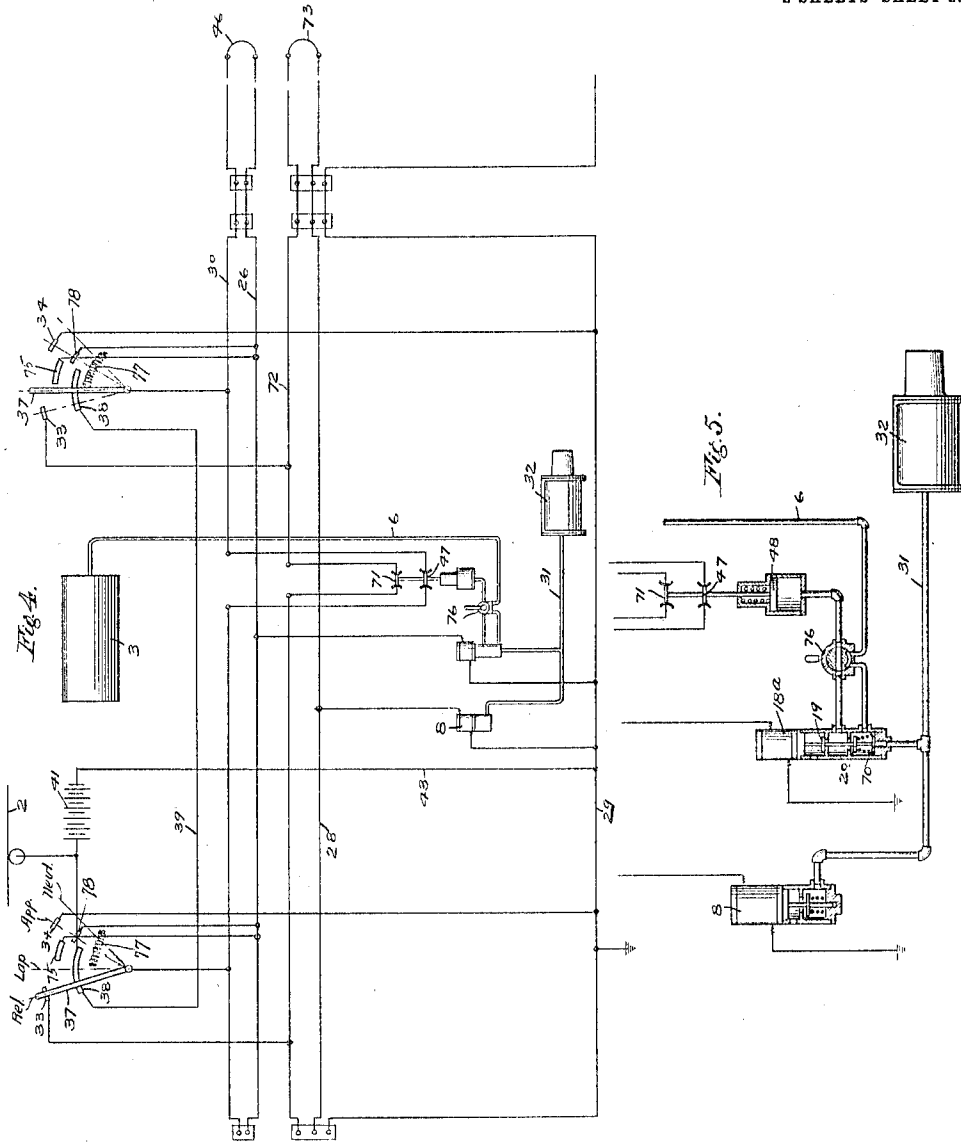
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Edward H. Dewson
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UNITED STATES PATENT OFFICE.

EDWARD H. DEWSON, OF NEW YORK, N. Y., AND WALTER V. TURNER, OF EDGEWOOD, PENNSYLVANIA, ASSIGNORS TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

AUTOMATIC ELECTRIC AIR-BRAKE.

1,048,507.

Specification of Letters Patent.

Patented Dec. 31, 1912.

Application filed April 12, 1909. Serial No. 489,428.

To all whom it may concern:

Be it known that we, EDWARD H. DEWSON and WALTER V. TURNER, citizens of the United States, residents of New York, in the county of New York and State of New York, and Edgewood, in the county of Allegheny and State of Pennsylvania, respectively, have invented new and useful Improvements in Automatic Electric Air-Brakes, of which the following is a specification.

This invention relates to an automatic electrically controlled train brake system in which the brake applying mechanism, such as fluid pressure brake apparatus, of the car equipments are controlled by electrically operated devices or magnets, which are all connected in a train line circuit and governed by a brake switch upon the head car of the train.

One of the objects of our present invention is to provide improved circuit connections for the electrically controlled brake applying mechanism of each car such that a break-in-two of the train, or a rupture or grounding of the circuit, will automatically cause the brakes to be applied upon all the cars of the train; and this feature of our improvements comprises, besides the train line wire to which the electrically operated devices, or magnets, of the respective car equipments are connected, an additional train line wire included in the circuit and connected at one end to the other train wire. Another object is to provide means for locally opening the circuit through the additional train line wire so that the brakes will be applied upon all the cars of the train, whenever the local circuit through the controlling magnet is ruptured, or when for any reason the local controlling magnet is deenergized; and this feature comprises a switch located in the additional train line circuit and controlled by an electrically operated device or magnet in the local controlling circuit, the same magnet that controls the brake applying mechanism preferably being employed for this purpose.

Another feature of our improvements contemplates circuit connections and switch mechanism under the control of the motorman for readily resetting or closing the local train line switches after the same have been opened in making an application of the

brakes, and this preferably comprises switch connections for temporarily closing a circuit to supply current to the main train line wire independently of the additional train line wire, and thereby energize the magnets or electrical controlling devices located in the local circuits connected to the main train wire, to close the local switches in the additional train wire and reestablish the circuit.

Another feature of our improvements contemplates the provision of circuit connections and switch means adapted to be operated either manually or by a trip device, for closing a short circuit from the train wire to which brake controlling magnets are connected, or for grounding the same, for the purpose of deenergizing the electrical devices or controlling magnets and effecting an application of the brakes on all the cars of the train.

These, as well as other features of our improvements, will now be more fully described and set forth in the appended claims.

In the accompanying drawings; Figure 1 is a diagrammatic view of an electrically controlled train brake system, of the type having means for controlling the brakes in service and a separate emergency mechanism for applying the brakes in an emergency, and showing our improvements applied thereto; Fig. 2 a view in detail of the brake equipment for a car as employed in the system shown in Fig. 1; Fig. 3 a detail view of a switch mechanism for resetting the switches in the additional train wire after an emergency application; Fig. 4 a diagrammatic view illustrating the application of our improvements to an electrically controlled train brake equipment having a single application and a release magnet mechanism for operation both normally in service and for applying the brakes upon breaking of the additional train wire or otherwise disrupting the circuit; and Fig. 5 a view, upon a larger scale, of the brake equipment for a car as employed in the construction shown in Fig. 4.

According to the system illustrated in Fig. 1 of the drawings, each car may be equipped with a motor driven air compressor 1 operated by current from the trolley 2 and adapted to compress air into a main or storage reservoir 3 to which the

compressor is connected by pipe 4. The brakes may be operated in service by any desired construction of electrically controlled mechanism, such as an electro-magnet 5 for operating valve means adapted to control the supply of air from pipe 6, connected to the main reservoir 3, to a pipe 7 leading to the brake cylinder; and a release magnet 8 governing a valve means for controlling the exhaust of air from the brake cylinder. A feed valve 9 is preferably inserted in the supply pipe 6 to limit the degree of pressure which may be supplied to the brake cylinder in service applications.

In order to operate the brakes in emergencies, an emergency valve device 10 is provided, comprising a movable abutment 11 and a slide valve 12 operated thereby. The valve chamber side of the abutment 11 is connected to the main reservoir pipe 6 and the piston chamber side is connected by pipes 13, 14, and 15 to a chamber 16 of an operating magnet valve mechanism 17. The magnet valve mechanism 17 comprises an electro-magnet 18 and valves 19 and 20 operated thereby, the valve 19 being adapted to control the release of air from the piston chamber of the movable abutment 11 and the valve 20 to control the admission of air thereto, the air being supplied from chamber 21 which is connected by pipe 22 to the main reservoir pipe 6. When the fluid pressures on opposite sides of the abutment are balanced the spring 23 is adapted to maintain the parts in their inner position, as shown in Fig. 2, in which position a cavity 24 in the valve 12 connects the service application and release pipe 7 with pipe 31 leading to the brake cylinder 32. One terminal wire 25 of the emergency magnet is connected to a train wire 26, and a terminal wire of the service application magnet 5 and of the release magnet 8 are respectively connected to train wires 27 and 28, the other terminals of the magnets 5, 8, and 17 being connected to ground, preferably through a common ground wire 29 extending through the train.

A suitable brake switch is provided on each end of the car, and, as shown diagrammatically in Fig. 1 of the drawings, is provided with contacts 33, 34, 35, and 36 connected respectively to train wires 28, 29, 26, and 27, the movable contact member 37 of the brake switch being connected to an additional or emergency train wire 30. A contact 38 is also provided which is connected to a wire 39 through which the brake controlling current is supplied.

The current may be taken from the local air compressor motor circuit wire 40 and preferably a storage battery 41 is provided for furnishing the operating current when the pump is idle and the pump motor circuit open. The storage battery 41 is connected

up in a circuit wire 42 which leads from the wire 39 to the ground wire connection 43 of the pump motor circuit and a switch 44 governed by a solenoid 45 in the pump motor circuit controls the connection of the battery circuit wire 42 with the pump circuit wire 40. By this means when the pump is working the solenoid 45 is energized to close the switch 44 and permit the storage battery 41 to charge up, but when the pump circuit is open, the switch 44 is also opened and current for operating the brakes is then derived from the storage battery 41. On the last or rearmost car of the train the additional train wire is connected by a suitable loop plug 46 with the train wire 26 of the emergency valve magnets 18. According to another feature of our improvements each car may also be provided with means for automatically controlling the circuits of the emergency mechanisms which may comprise a switch 47 arranged in the additional train wire 30 and an operating piston 48 therefor, one face of which is open to pipe 15. Fluid pressure on this face of the piston tends to close the switch 47 and an opposing spring 49 tends to open the switch.

The brake switch has five positions as follows, release position, in which the movable contact member 37 connects the contacts 33 and 38, so that current flows through wire 39 to contact 38, thence to contact 33 and through release train wire 28, thus completing the circuit through the release magnets 8, thus operating the release valve means to open pipe 7 and thereby the brake cylinder, to the atmosphere. Current also flows from the contact 38 through the movable contact 37 to the additional train line wire 30 and thence by way of the return loop 46 through the train wire 26 to the emergency magnets 18. When a magnet 18 is energized, the corresponding valve 19 is closed and the valve 20 is opened so that fluid under pressure is supplied from the pipe 22 to pipe 15 and thence to the emergency switch piston 48, thus maintaining all of the switches 47 closed. Air also flows through pipes 14 and 13 to the outer face of the piston 11, and the fluid pressures on opposite sides of the piston being then balanced the spring 23 maintains the parts in the normal position with cavity 24 connecting pipes 7 and 31. In the next or lap position the release circuit is opened by the movable contact member moving off from the contact 33 so that the release magnet on each car closes the exhaust port from the brake cylinder, while the emergency circuit remains closed through contact 38. In service application position, the emergency circuit is still closed and as contact 36 is now connected to contact 38, current flows through the service application train wire 27 and energizes the application magnets 5.

The application valve means on each car is thus operated to supply air from the reservoir to the brake cylinder, and the release magnets 8 being deenergized, the exhaust through pipe 7 is closed in this position.

5 The brake switch is turned back to lap position when the desired brake cylinder pressure is obtained and the pressure may be increased or graduated off at will, by moving the handle either to application position or to release position and then back to lap.

10 In emergency position, contact 34, leading to the ground, is connected by the movable contact member 37, with a contact 15 80 leading to the train wire 26, so that said train wire circuit is grounded or short-circuited and current flow is directly to the ground. Each emergency magnet 18 being thus deenergized, permits the valve spring 20 to close the corresponding valve 20 and open exhaust valve 19, thus venting air from the emergency piston 11. The piston 11 is thereupon shifted to emergency position, closing the pipe 7 and opening communication from the emergency valve chamber to the brake cylinder pipe 31. Air at full reservoir pressure in the valve chamber then flows to the brake cylinder to apply the brakes in an emergency application. At the 30 same time the venting of air from pipe 15 also releases air from switch piston 48, so that the spring 49 causes the switch 47 to be opened, thus breaking the circuit of the emergency mechanisms through the additional train wire. A neutral position is also 35 provided in which position only, the brake switch handle may be removed. As in this position the circuits are all open, the movement of the brake switch to neutral position also causes an emergency application of the brakes. Whenever an emergency magnet 40 18 is deenergized, as by the rupture of the local brake circuit or other cause, the valve 19 is operated to vent air from the corresponding switch piston 48, so that the circuit through the additional or emergency train wire 30 is opened and the emergency magnets on all the cars of the train are thereupon deenergized, thus causing an 45 emergency application of the brakes throughout the train. A three way cock 60 may be interposed between pipes 13 and 14, which is adapted normally to connect said pipes and provide communication from the emergency magnet mechanism 17 to the emergency valve device 10; but in case an emergency magnet or its local circuit becomes disabled, the cock 60 may be turned so as to cut off communication between pipes 13 50 and 14 and at the same time connect the piston chamber of the emergency valve device 10 with a pipe 61 opening into the reservoir supply pipe 22. By this means the emergency valve device may be maintained 65 in normal position, even when the emer-

gency mechanism is out of order, so that in such case the brakes may still be operated on that car by means of the service application and release magnets 5 and 8. The spring 49 acting on piston 48 is preferably 70 made strong enough to resist a pressure of fifty pounds or so on the piston 48, so that in starting out, the emergency switches are not closed until the pressure in the main reservoirs of the cars has been pumped up to at least fifty pounds. 75

After an emergency application, the switches 47 will be open and consequently the emergency magnets cannot be operated to shift the emergency valves back to normal position. In order to close the switches 80 in such cases an additional contact 35 connected to the train wire 26 may be arranged in the brake switch in the application position so that upon moving the brake switch to this position after an emergency application, connections are made so that current 85 flows through wire 39 to contact 38, thence by the movable contact member 37 to contact 35 and then through the train wire 26 90 to the emergency magnets 18. The emergency magnets are thus energized and air is supplied to the switch pistons 48, shifting the same to close the switches 47; and air 95 also flows to the emergency pistons 11, which are thereupon moved to normal position in which the cavity 24 connects the pipes 7 and 31. Thereafter the brakes may be released by turning the brake switch to release position, as will be understood. 100 Where a local emergency magnet circuit fails, the corresponding switch 47 will not be closed as the magnet 18 is not energized and in order to cut out this particular switch, so as to permit normal operation of the emergency mechanism on the other cars, 105 a hand switch 51 may be provided. This switch is adapted normally to close the circuit of the emergency magnet device 17, but upon burning out or failure of this local 110 circuit, the switch is shifted by hand to open that circuit and close a circuit across the wires leading to the switch 47. The emergency train line circuit is thus completed so far as this car is concerned and emergency 115 applications may thereafter be obtained on the other cars when desired.

In some cases, a separate resetting switch device may be employed, such as illustrated in Fig. 3, in which a movable switch blade 120 53 is permanently connected to the current wire 39 and has continual connection normally with wire 52 leading to contact 38 of the brake switch. A spring device 54 tends 125 to maintain the switch blade 53 in its normal position and a contact 55 connected to the train wire 26 is arranged in the path of the switch blade, so that by pressing upon the blade 53, connection may be made with the contact 55. By this means current is 130

supplied to the train wire 26 and serves the same purpose as the contact 35 in the brake switch. As soon as the switch blade is released, the circuit connection to the train wire 26 is broken. This last described separate switch device in connection with adjustment of the switch springs 49 serves as a safety device, for in starting out, the motorman cannot proceed until the compressors have pumped up fifty pounds pressure on all the cars, except by holding down the resetting switch continually with one hand. If desired, an additional position may be provided in the brake switch, preferably adjacent to release position, in which position contact 35 may be placed, so that upon movement to this additional position the emergency apparatus may be reset. A suitable spring may be employed to act against the movable contact member 37, in a direction tending to return the contact member from the additional position to release position. A conductor's switch 56 may be provided at each end of the car and this switch is arranged to connect the train wire 26 with a wire 57 leading to ground, so that an emergency application may be effected by operation of the conductor's switch. A trip actuated switch 58 in a ground connection wire leading from the train wire 26 may be located on the car in grounding said train wire and causing an emergency application of the brakes upon engagement with a trip located along the track.

In Fig. 4 of the drawings, our improvements are shown applied to a brake equipment in which one magnet and valve means operate to supply air to the brake cylinder in service and emergency applications of the brakes. In this construction the release magnet and valve means 8 is connected directly to the brake cylinder pipe 31, and the application magnet 18^a, in addition to the valves 19 and 20 operates a valve 70 which is adapted to control the supply of air from the reservoir or source of supply directly to the brake cylinder in both service and emergency applications. When the magnet 18^a is energized the valves 19 and 70 are held closed and air is supplied from the reservoir pipe 6 through the open valve 20 to the switch piston 48. Upon deenergization of said magnet the valve 20 is closed, and valve 19 is opened to vent air from the piston 48, and likewise valve 70 opens so as to supply air from pipe 6 to the brake cylinder. The switch piston 48 operates a switch 71 in addition to the switch 47, and this switch 71 is located in a train wire 72 which is connected by a loop plug 73 to one end of the release train wire 28. The brake switch contacts 33, 34, 37, and 38 are the same as those employed in the construction

shown in Fig. 1 except that release contact 33 is connected to the return release wire 72 instead of the wire 28 and in addition a contact 75 is provided intermediate application position and lap position, which contact is connected to the application train wire 26. The operation of this form of apparatus is as follows: In release position, the release magnet 7 is energized to open the exhaust from the brake cylinder and the application magnet 18^a is also energized through the connection of contact 38 with the movable contact member 37, the current flowing through the additional train wire 30 the terminal loop 46 to the application train wire 26 and the application magnets 18^a. In application position the ground contact 34 is connected to the train wire 30 and the application magnets 18^a being thus deenergized the valve 70 on each car is opened to supply air to the brake cylinder. If only a service application is desired the brake switch is moved back to lap position in which current is supplied from contact 38 to the train wire 30, so as to close the application valve and cut off further flow of air to the brake cylinder. It will be noted that with this construction the piston 48 is operated and switches 47 and 71 are caused to open the application and release circuits every time the brake switch is moved to application position to effect a service application of the brakes; and in order to reset the switches so as to permit further applications of the brakes, a contact 75 may be inserted in the brake switch in a position intermediate application position and lap position. The contact 75 is connected to the application train wire 26, so that as the movable contact member passes from application position to lap, a circuit is formed from the source of current through connected contacts 38 and 75 to the train wire 26. The magnets 18^a are thus energized and the valve 20 is opened to supply air to the piston 48 and thereby close the switches 47 and 71. A spring device 77 may be arranged in the brake switch so as to tend to move the contact member 37 from application position to lap, so that it will not be possible for the motorman to leave the brake switch handle in a position intermediate application and lap positions, where, the connection being made to resetting contact 75, an emergency action of the brakes would then be prevented on all the cars forward of a break-in-two or the point of disruption of the application circuit, as current could still flow through the contact 75 to the train line 26.

The object of the switch 71 in the additional return train wire 72 is to insure the opening of the release magnet circuit on all the cars of the train; as in case the brake switch handle happens to be in release po-

sition when the application circuit is broken current would otherwise still flow to the release magnets on those cars forward of the break and the release valves being open, the corresponding brake cylinders could not be charged with air. The same result may be secured by providing a spring in the brake switch for returning the switch from release position to lap, so that the handle cannot be left in release position; and so if the main train wire is ruptured the release valves will be closed and fluid admitted to the brake cylinder will be prevented from escaping. A cock 76 may be provided for normally opening communication from the application valve means to the piston 48 and from the reservoir supply pipe 6 to said valve means, the cock having a position for closing the above connections and for connecting the supply pipe 6 directly to the piston 48. The purpose of this is to provide means for maintaining the switches 47 and 71 closed on a car in case the application magnet is out of commission; so as to permit the full control of the brakes on all the other cars of the train. In order to provide against possible cases where a current flow might still exist on some cars through the emergency magnets 17 even after rupture of the additional train wire 30, the emergency contact in the brake switch, the conductor's switch and the trip devices have been preferably constructed so as to ground the train wire 26 and thereby insure the application of the brakes on all the cars of the train, as a short circuit is thus provided for any currents which might exist in the application magnet circuit. In order to insure the grounding of the circuit of the application magnets, a contact 78 connected to train wire 26 may be placed in the brake switch, so as to form a connection in application position from the train wire 26 directly to ground, thus possible stray or other currents in this wire will be short circuited in application position.

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

1. In a brake system for trains, the combination with a car brake equipment having means for applying brakes in service applications and an electrically operated mechanism for effecting an emergency application of the brakes, of two train wires extending through the train and connected together at one end, one of said train wires being connected to one terminal of the electrically operated mechanism of each car, and a source of current normally energizing said circuit through the train line wires whereby upon the breaking of said circuit the brakes will be applied on all the cars of the train.

2. In a brake system for trains, the com-

bination with a plurality of car brake equipments each having a release magnet for controlling release of brakes, and an electrically controlled mechanism for effecting a pneumatic application of brakes, of a train line wire connected to each release magnet, a main train line wire connected to said electrically controlled mechanisms, another wire extending through the train and connected at one end to the main train wire, and a source of current normally energizing the main wire circuit.

3. In a brake system for trains, the combination with a car brake equipment having application and release magnets for controlling the brakes in service, and electrically controlled mechanism for effecting emergency brake applications, of a main train line wire connected to said electrically controlled mechanism, an emergency wire also extending through the train and connected at one end to the main train wire, and a source of current normally energizing the circuit through said train line wires.

4. In a brake system for trains, the combination with a plurality of car brake equipments having application magnets operating on a normally open train line circuit for controlling service applications, of emergency magnets operating on a normally closed circuit including two train line wires connected together at one end, for effecting emergency applications of the brakes.

5. The combination with two or more cars forming a train, each car of which is provided with an electrically controlled brake mechanism for applying the brakes in service, and means for effecting an emergency application of the brakes, of a source of electrical energy, a main train wire having the local emergency brake circuits connected thereto in parallel, an emergency train wire extending through the train and connected at one end of the train with said main train wire and adapted to normally complete a circuit for said emergency means including said source of electrical energy, to thereby effect an emergency application of the brakes upon breaking of the emergency train wire.

6. The combination with two or more cars forming a train, of an electrically controlled service and emergency brake on each car, a main train wire connected to a terminal of each local emergency brake circuit, and an emergency train wire extending through the train and connected to one end of the main train wire, whereby the breaking of said emergency train wire will operate to effect an emergency application on all the cars of the train.

7. The combination with two or more cars connected up in a train, of a fluid pressure brake apparatus on each car for controlling the brakes in service, an electrically con-

trolled mechanism on each car for effecting an emergency application of the brakes, two train wires extending through the train and connected at one end, one of said train wires being connected to a terminal of each local emergency brake circuit, and a source of electrical energy normally in circuit with said emergency mechanisms, whereby the breaking of the other train wire is adapted to cause an emergency application of the brakes throughout the train.

8. In a brake system for trains, the combination with a car brake equipment having electrically controlled mechanism for effecting an application of brakes, of a train line wire included in the circuit for the electrically controlled mechanism, and a switch governed by the electrically controlled mechanism for opening and closing the circuit through the train line wire.

9. In a brake system for trains, the combination with a car brake equipment having electrically controlled brake applying mechanism, of two train line wires connected together at one end and included in the circuit for said mechanism, and a switch in the train line circuit governed by the electrically controlled mechanism.

10. In a brake system for trains, the combination with a car brake equipment having electrically controlled brake applying mechanism, a train line wire connected to said mechanism, another wire extending through the train and connected to the other train wire at one end, and a switch governed by the electrically controlled mechanism for opening and closing the circuit through the latter train wire.

11. In a brake system for trains, the combination with a car brake equipment having electrically controlled brake applying mechanism, two train line wires connected together at one end, one wire being connected to said electrically controlled mechanism, a switch in the other train line wire adapted to be opened when said electrically controlled mechanism is deenergized, and means for supplying current to the train wire connected to said mechanism to reset said switch.

12. In a brake system for trains, the combination with a car brake equipment having electrically controlled brake applying mechanism, two train line wires connected together at one end, one wire being connected to said electrically controlled mechanism, a switch in the other train line wire adapted to be opened when said electrically controlled mechanism is deenergized, and a manually operated switch device for closing the circuit to the first train wire to reenergize the electrical mechanism and reset the switch.

13. In a brake system for trains, the combination with a car brake equipment having electrically controlled brake applying mechanism, two train line wires connected together at one end, one wire being connected to said electrically controlled mechanism, a switch in the other train line wire adapted to be opened when said electrically controlled mechanism is deenergized, and a brake switch device having contacts adapted in one position to effect the deenergization of said electrical mechanism to apply brakes, and contacts adapted in another position to close the circuit to the first train wire and energize the electrical mechanism to reset the train line switch.

14. In a train brake system, the combination with a car brake equipment having an electrically controlled brake applying mechanism, two train line wires connected together at one end, one wire being connected to the electrically controlled mechanism of each car, and means for closing a short circuit from said latter train wire to ground for deenergizing said mechanism to effect an application of the brakes.

15. In a train brake system, the combination with a car brake equipment having an electrically controlled brake applying mechanism, two train line wires connected together at one end, one wire being connected to the electrically controlled mechanism of each car, and a brake switch having contacts for normally supplying current to one train wire and other contacts for closing a short circuit from the other train wire to ground.

16. In a train brake system, the combination with a car brake equipment having a fluid pressure operated valve device for applying brakes, of a fluid pressure operated switch for controlling a train line circuit, and a magnet valve mechanism connected in said circuit for controlling said valve device and switch.

17. In a brake system for trains, the combination with an automatic valve device operating upon a reduction in fluid pressure to apply the brakes, of a normally energized electric circuit running through the train, an electrically controlled mechanism in said circuit for controlling the operation of said valve device, and a switch device in said circuit and operating upon reducing the fluid pressure on said valve device to locally open said circuit.

In testimony whereof we have hereunto set our hands.

EDWARD H. DEWSON.
WALTER V. TURNER.

Witnesses:

WM. M. CADY,
A. M. CLEMENTS.