No. 809,707. PATENTED JAN. 9, 1906.

J. B. LINN.

PNEUMATIC TRAIN CONTROL SYSTEM.

APPLICATION FILED OCT. 16, 1902.

3 SHEETS—SHEET 1.

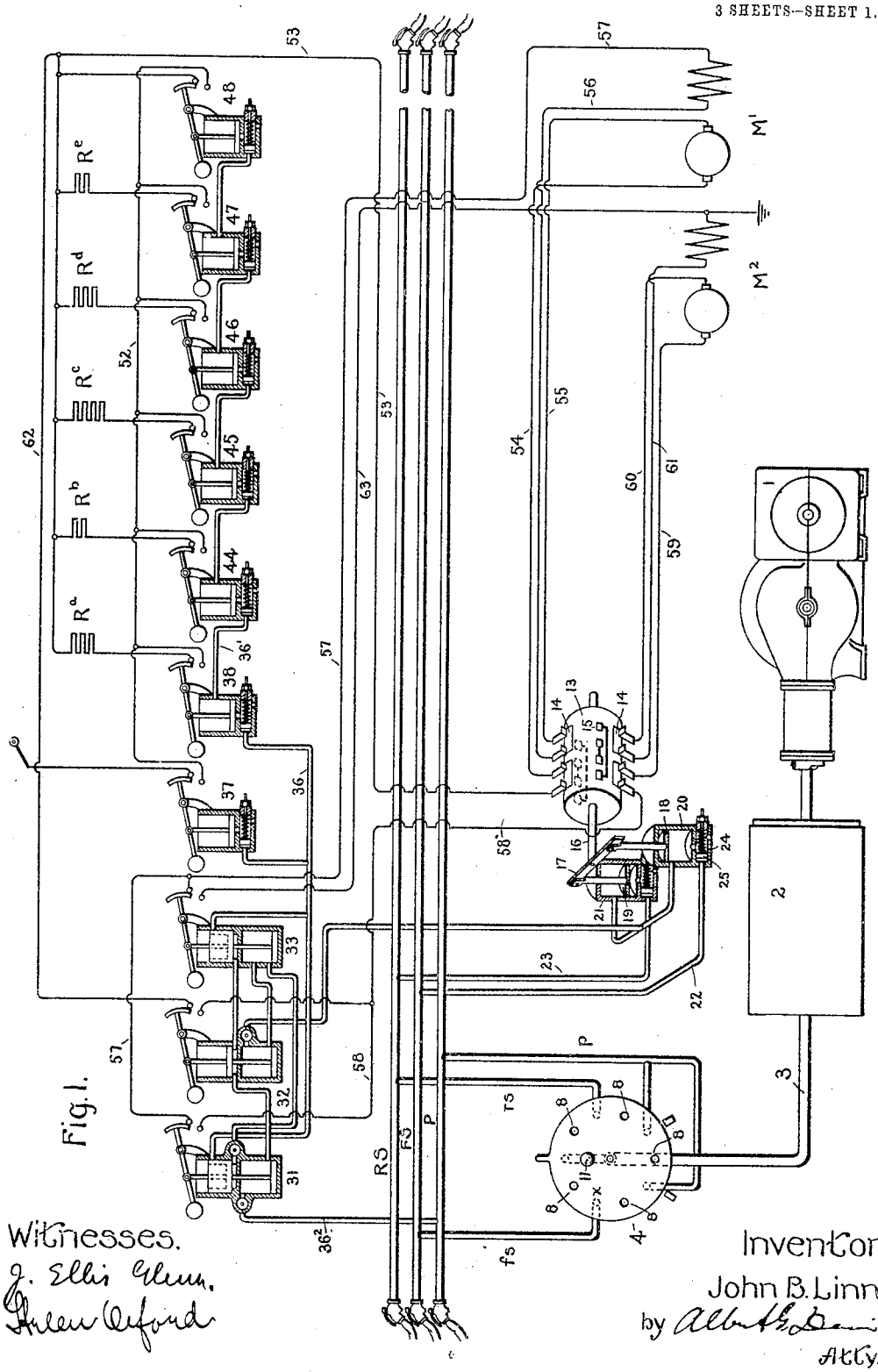

Fig. 1.

Witnesses.
J. Ellis Glenn.
Helen Orford

Inventor:
John B. Linn.
by Albert G. Davis
Atty.

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3 SHEETS—SHEET 2.

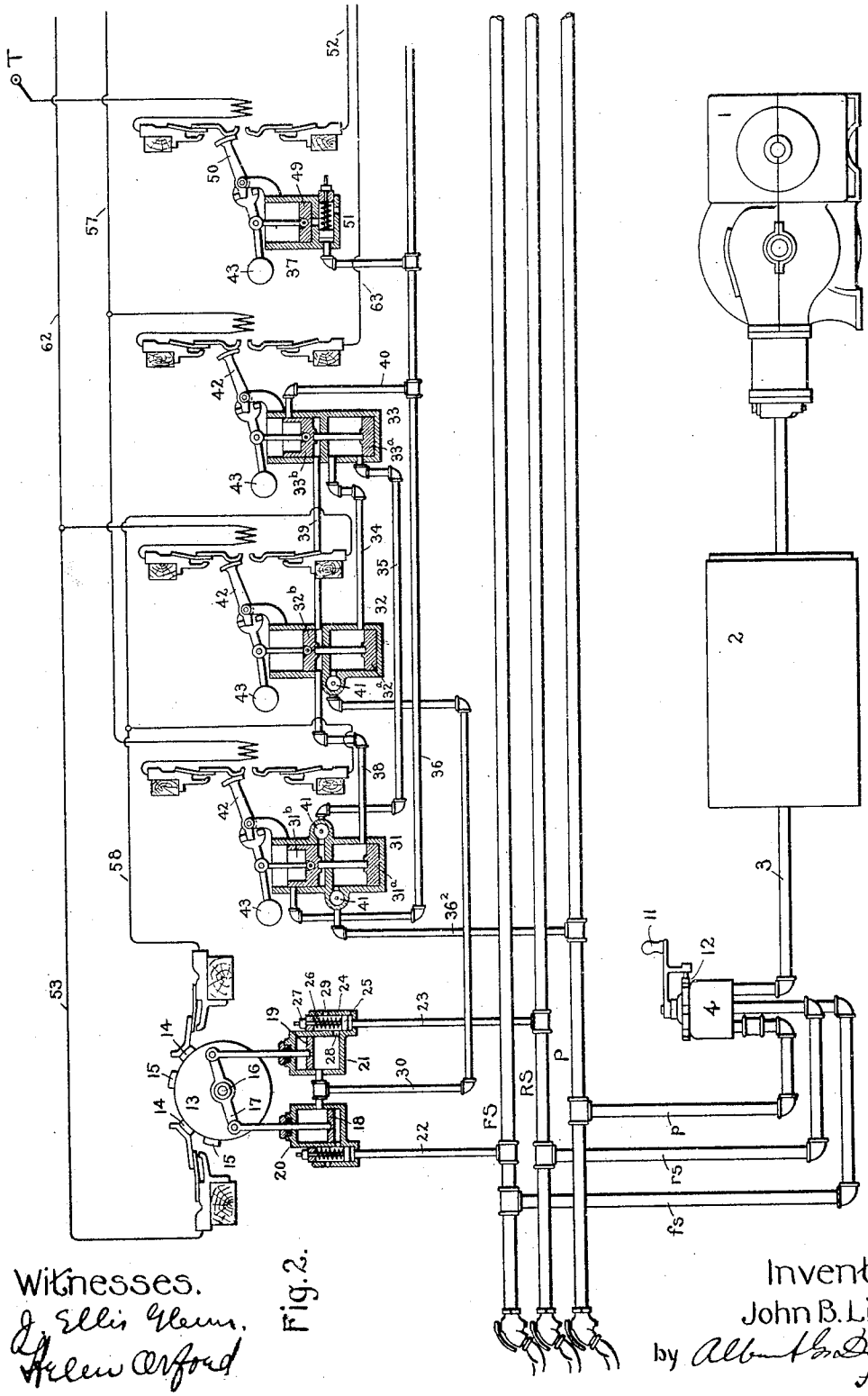

Fig. 2.

Witnesses.
J. Ellis Glenn.
Helen Orford

Inventor.
John B. Linn.
by Albert G. Davis
Atty.

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3 SHEETS—SHEET 3.

Fig. 3.

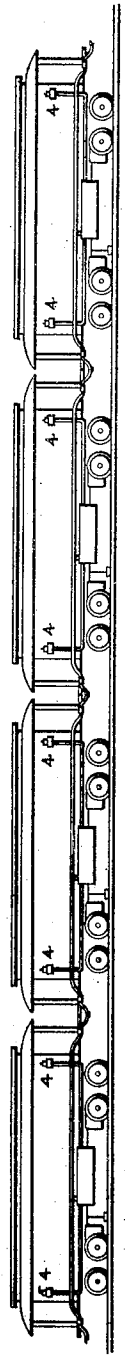


Fig. 7.

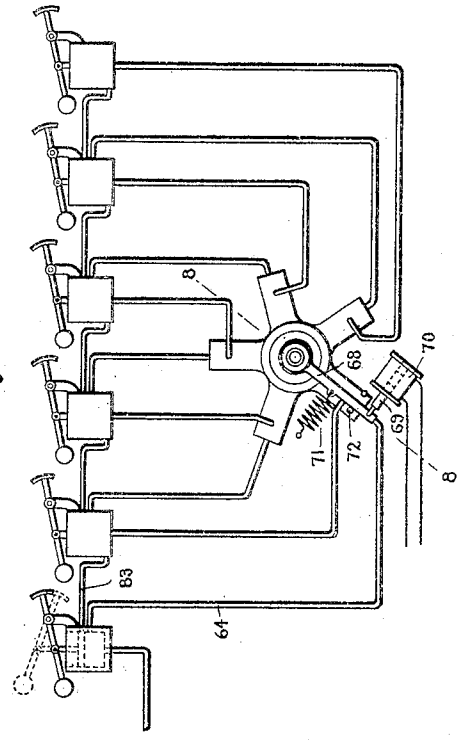


Fig. 8.

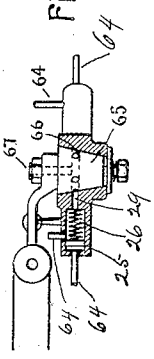


Fig. 9.

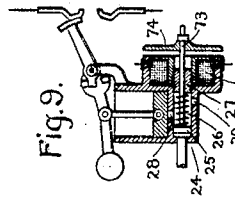


Fig. 10.

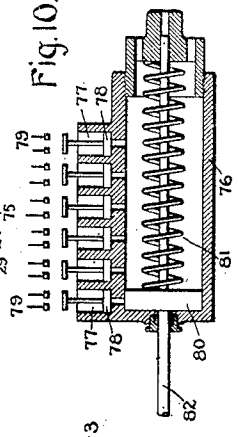


Fig. 4.

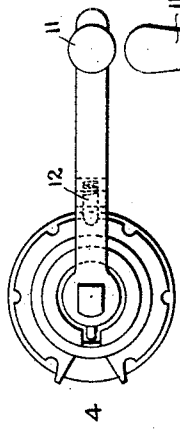


Fig. 5.

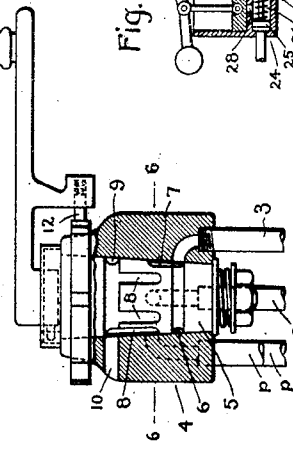
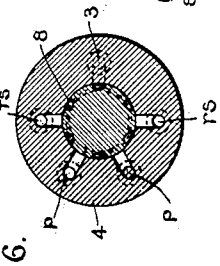


Fig. 6.



Witnesses.

J. Ellis Glenn.

Helen A. Ford

Inventor.

John B. Linn.

by Albert G. Davis

Atty.

UNITED STATES PATENT OFFICE.

JOHN B. LINN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

PNEUMATIC TRAIN-CONTROL SYSTEM.

No. 809,707. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed October 16, 1902. Serial No. 127,464.

To all whom it may concern:

Be it known that I, JOHN B. LINN, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Pneumatic Train-Control Systems, of which the following is a specification.

This invention relates to systems of electric-motor control in which a series of separately-actuated contacts control the supply of current to the motor. It is of especial use in connection with electric railway motor-cars and trains, wherein each motor-car is provided with one or more electric motors controlled by a main controller which in turn is controlled by any one of a plurality of master-controllers on the several cars.

The object of my invention is to utilize fluid-pressure to actuate the separate contacts of the main controller and to provide means for securing the automatic operation of certain of said contacts at a predetermined rate. To this end I provide the usual set of electric contacts for connecting the motors in series and in parallel, for cutting out resistance from the motor-circuit and for reversing the connections of the armatures in order to run the car backward, and I operate all these contacts separately by means of movable abutments actuated by fluid-pressure, preferably compressed air, taken from a suitable source of supply carried on the car or train. The air is conveyed through three train-pipes which are provided at each end with coupling devices for connecting them with similar pipes on adjoining cars. A single valve, somewhat resembling the engineer's valve of an air-brake system, serves as a master-controller to admit the fluid-pressure to any given pipe. The movable abutments are preferably pistons moving in cylinders and provided with rods pivoted to switch-levers for opening and closing the motor-circuits. The reversing-switch is similarly operated by pistons.

In the accompanying drawings, Figure 1 is a diagram of a system of motor-control embodying my invention. Fig. 2 is a view on a larger scale of a portion of said diagram, showing the mechanical parts more accurately. Fig. 3 is a side elevation of a train of four motor-cars equipped with my invention. Fig. 4 is a top plan view of the master-controller. Fig. 5 is a side sectional elevation of the same. Fig. 6 is a cross-section of the same on the line 6 6, Fig. 5. Fig. 7 is a diagram embodying a current-limiting device. Fig. 8 is a section of the said device on the line 8 8, Fig. 7. Fig. 9 is a longitudinal section of a modified contactor, and Fig. 10 is a similar section of a multiple contactor.

An electrically-operated air-compressor 1 delivers air to a reservoir 2, from which it flows through a pipe 3 to the master-controller valve 4. This is preferably a turning-plug valve, comprising the plug 5, containing a circumferential groove 6 in constant communication with the supply-pipe 3. A longitudinal groove 7 communicates with the groove 6. Three train-pipes FS, RS, and P extend through the car and have branches *fs*, *rs*, and *p* entering the valve-casing at suitable points in the plane of the upper part of the groove 7, the pipe P having two terminals, as shown in Fig. 6. The plug has five longitudinally-arranged grooves 8, spaced apart the same distance as the terminals of the pipes. These grooves all open into a circumferential groove 9 in constant communication with an exhaust-port 10. The precise relative location is seen best in Fig. 1, where the plug is shown as a disk with holes instead of grooves 8. It will be seen that when the plug is turned by its handle 11 the air-supply groove 7 will be brought into communication with either the FS or the RS pipe and then with the P pipe. The exhaust-grooves open all these pipes to the atmosphere between the "off" position and either of the power positions. The handle can be locked in any of its positions by a spring-catch 12, entering suitable notches in the valve-casing. At each end of the train-pipes is the usual angle-cock and a flexible coupling-hose for connecting similar pipes on adjacent cars when two or more motor-cars are made up into a train. When the fluid-pressure is let into either the pipe FS or RS, preferably in such a manner as to maintain the pressure in said pipe substantially constant, it first operates the reversing-switch 13 to make the proper circuit connections to cause the motors M' M^2 to run forward or backward, as the case may be. The reversing-switch is preferably a rotatable cylinder carrying contact-segments 14 15. Its shaft 16 has a double rock-arm 17, to the ends of which are connected the movable abutments, preferably pistons 18 19, each in its cylinder 20 21.

The working end of the cylinder 20 is connected by a branch pipe 22 with the pipe FS, and the working end of the cylinder 21 is connected with pipe RS by the branch pipe 23. In each pipe is interpolated an exhanst device—that is, a device for opening the cylinders to the atmosphere when the pressure in the pipes 22 23 is reduced. This consists, preferably, of a valve-chest 24, containing a piston-valve 25, held yieldingly at one end of the valve-chest by a spring 26, which is adjustable by means of a nut 27, screwed into the end of the valve-chest opposite the piston-valve and serving as a guide for the valve-stem. The pipes 22 23 enter the end of the valve-chest where this piston-valve rests. In one side of the valve-chest is a port 28, connecting the chest with the cylinder 20 or 21. In the side of the valve-chest is a vent 29. When the fluid-pressure enters this valve-chest, it lifts the piston-valve until it can enter through the port 28 into the cylinder 20 or 21. When the air-pressure in the pipe is reduced, the piston-valve falls and the air in the cylinder 20 or 21 is permitted to exhaust directly to the atmosphere through the vent 29. When the piston 18 or 19 rises, it uncovers a pipe 30, through which the air passes to the upper cylinder of the series contactor 31 through the lower cylinders of the two parallel contactors. The series contactor and the two parallel contactors 32 33 are each preferably composed of two cylinders in tandem, with a piston in each cylinder connected to a common piston-rod, to which is pivoted the switch-arm. The upper piston is for closing the switch and the lower one for opening it. The pipe 30 runs to the upper end of the lower cylinder of the contactor 32. From a point just above the piston 32^a when at the lower end of this cylinder a pipe 34 runs to the upper end of the lower cylinder of the contactor 33. From a point just above the piston 33^a when at the lower end of this cylinder a pipe 35 runs to the lower end of the upper cylinder of the series contactor 31. From a point near the top of this cylinder a pipe 36 runs to the trolley-contactor 37 and the first resistance-controlling contactor 38. Each of these contactors is preferably a cylinder with a piston whose rod is pivoted to the corresponding switch-arm. The piston 31^b in the upper cylinder of the series contactor is long enough to normally close the end of the pipe 36. The lower cylinder of the series contactor communicates by a pipe 36^2 with the parallel pipe P. From the lower end of this cylinder just above the piston 31^a runs a pipe 38 to the lower end of the upper cylinder of the contactor 32 below the piston 32^b. A pipe 39 runs from below this piston to a point below the piston 33^b in the upper cylinder of the contactor 33. This piston is long, like the piston 31^b, to normally close a branch pipe 40, running to the pipe 36. Quick-action exhaust-valves 41 are provided at suitable points, similar in construction to those attached to the reverse-cylinders 20 21. The contactors 31 32 33 all move with sufficient friction to remain in the position to which the air-pressure carries them until their switch-arms 42 are positively actuated in a reverse direction by air-pressure in their other cylinder. Counterweights 43 may be used also to insure a quick opening of the switches.

The resistance-controlling contactors are numbered 38 44 45 46 47 48. Each of these, and also the trolley-contactor 37, consists, preferably, of a cylinder containing a piston 49, whose rod is connected with the switch-arm 50. The air-supply pipe enters the bottom of the cylinder through a quick-action exhaust device 51. From a point near the top of each resistance-controlling cylinder a pipe 36′ passes to the quick-action exhaust device at the bottom of the next cylinder. By making the admission-ports from the valve-chests to the cylinders small enough a retarding effect can be obtained, so that the contactors will operate comparatively slowly and in succession.

With the switch-actuating cylinders in the positions shown in Fig. 1 and with the master-controller handle turned to the second notch, bringing the air-admission port 7 to the position marked *x* in Fig. 1, air will flow from the reservoir 2 into the pipe *fs* and thence into the main train-pipe FS. From this pipe the air will flow into the pipe 22 on each motor-car and after raising the piston-valve 25 in the valve-chest 24 it will flow freely into the cylinder 20 and lift the piston 18, thereby rocking the reverser to forward position. The air then flows through the pipe 30 and the lower cylinders of the contactors 32 33 (thus maintaining the parallel switches in their inoperative position) to the upper cylinder of the series contactor 31, lifting the piston 31^b and closing the series switch. Thence the air flows through the pipe 36 and operates the trolley-contactor 37 and the first resistance-contactor 38. As soon as the latter closes the air passes into the cylinder of the second contactor 44, cutting out the first section R^a of the motor resistance. The succeeding sections R^b R^c are similarly cut out as the contactors 45 to 48 successively operate. Now suppose the master-controller handle 11 to be turned to the third notch, this opens all three pipes FS, RS, and P and allows the pressure to escape from the contactors 31, 37, 38, 44 to 48, inclusive, restoring all the parts to the position shown in Fig. 1. The valve-handle is now moved to the fourth notch, letting air into pipe P and closing the pipes FS and RS. The air passes through the pipe 36^2, closing the quick-exhaust device 41, enters the lower cylinder of the series contactor 31, and moves the piston 31^a to the bottom, and thereby opens

the series switch, flows through pipes 38 and 39, lifting the pistons 32^b and 33^b, thereby closing the parallel switches, and passes on by branch pipe 40 and pipe 36 to the contactors 37 38, 44 to 48, inclusive. The air cannot escape rearwardly from pipe 36 because it is closed by the piston 31^b.

The power-circuit when the motors are in series is as follows: from trolley T to contactor 37, thence through wire 52 to the last contactor 48, thence by wire 53 to one of the reversing-switch segments 14, thence by wire 54 to the armature of the motor M′, back by wire 55 to another segment 14, wire 56 to the field-coil of motor M′, thence by wire 57 to the series contactor 31, wire 58, segment 14, wire 59, armature of motor M^2, wire 60, segment 14, wire 61, and field-coil of motor M^2 to ground. When connected in parallel, the current from the contactor 48 divides between wires 53 and 62, the latter leading to the parallel contactor 32 and thence to the motor M^2. The field-coil of motor M′ is grounded through the contactor 33 and the wire 63.

As stated above, the quick-action exhaust device is a retarding device. It is therefore a time-limiting mechanism. If, however, it is desired to regulate the operation of the resistance-controlling contactors by a current-limiting device, some such mechanism as is shown in Figs. 7, 8, and 9 may be used. In the arrangement illustrated in Figs. 7 and 8 each pipe 64 which conducts the compressed fluid from one contactor-cylinder to the next contactor-cylinder has contained therein an exhaust device comprising the piston 25, spring 26, and exhaust-port 29, as above described. The exhaust-ports 29 all lead to a casing in which a rotatable plug-cock 65 is located. This plug-cock 65 contains the ports 66, which communicate with the exhaust-port 67, formed in said plug and which normally register with the exhaust-ports 29. To retard or entirely check the progression of the contactors, it is merely necessary to partially or wholly close the exhaust-ports 29 by rotating the plug 65. The angular degree of rotation can be made to correspond with the current flowing in the motor-circuit by connecting the handle 68 of the plug with the core 69 of a solenoid 70 included in the motor-circuit. A spring 71 normally holds the handle against a stop 72 with the passages 64 wide open; but any abnormal current energizes the solenoid to such a strength that it overcomes the tension of the spring and turns the plug, thus checking the operation of the contactors until the counter electromotive force of the motors cuts down the motor-current and weakens the solenoid enough to let the spring retract the handle 68. In the arrangement shown in these figures a separate exhaust-pipe 83 is provided between each of the contactor-cylinders and the one next succeeding it. The actuation of each of the contactors closes the end of the exhaust-pipe for the next contactor; but when the air is exausted in the train-pipes the falling of the actuating-piston of the first contactor in the series will open the exhaust for the second contact-cylinder as soon as the piston in the first cylinder has moved far enough to uncover the end of the pipe 83, and so on, for the rest of the series. This makes the action of the contactors more speedy than if the air were exhausted through the automatic valve.

If desired, the separate quick-action exhaust devices may be electrically retarded in admitting air to the contactor-cylinders. Such a modification is shown in Fig. 9, where the stem 73 of the piston-valve 25 is continued through the spring-adjusting nut 27, and carries an amature 74, forming part of the magnetic circuit of an electromagnet, whose coil 75 may be either in series with the main motor-circuit, or in a relay-circuit normally open, but closed by an electromagnetic relay-switch in the main circuit. When the piston-valve is in a closed position, the pressure area is small and the magnetic circuit short, so that the valve will not operate if the coil is energized beyond a predetermined point; but after the valve has opened the magnetic circuit will be so materially lengthened that the air-pressure on the valve will be greatly in excess of the pull of the magnet, thus insuring that the coils will prevent a too rapid closing of the contactors, but will not cause the opening of contactors already closed. The electromagnet-coils 75 may be connected in series in the motor-circuit, or they may be connected in series with one another in a relay-circuit controlled by an operating-coil on the motor-circuit.

In Fig. 10 is shown a multiple contactor, wherein the long cylinder 76 has connected with it at intervals along one side a series of cylinders 77, each containing a piston 78, adapted to close the circuit 79 of one of the motor resistances when fluid-pressure is admitted under said piston. In the long cylinder 76 is a piston 80, movable against the tension of a spring 81. By means of a pipe 82 the motorman can admit fluid-pressure to the cylinder, and as the piston recedes it uncovers in regular succession the ports leading to the contactors. The spring is so tempered and the ports are so arranged that the latter are opened one by one in response to given increments of pressure—say at thirty, forty, fifty, sixty, seventy, and eighty pounds. By observing a gage connected with the pipe 82, the motorman can control the contactors absolutely by varying the pressure.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A motor-controller of the separately-actuated-contact type, comprising speed-controlling contacts operated by fluid-pressure, and means for automatically regulating the rate at which said contacts close.

2. A motor-controller of the separately-actuated-contact type, comprising resistance-controlling contacts operated by fluid-pressure, and means for automatically retarding the successive operation of said contacts.

3. A motor-controller of the separately-actuated-contact type, comprising resistance-controlling contactors adapted to be operated by fluid-pressure, means for admitting fluid-pressure to the first of said contactors, and means whereby each contactor automatically admits pressure to the next.

4. A motor-controller of the separately-actuated-contact type, comprising resistance-controlling contactors adapted to be operated by fluid-pressure, means for admitting fluid-pressure to the first of said contactors, means whereby each contactor automatically admits pressure to the next, and means for automatically retarding the flow of pressure between said contactors.

5. A motor-controller of the separately-actuated-contact type, comprising resistance-controlling contactors adapted to be operated by fluid-pressure, means for admitting fluid-pressure to the first of said contactors, means whereby each contactor automatically admits pressure to the next, and a time-limiting device for automatically retarding the flow of pressure into said contactors.

6. A motor-controller of the separately-actuated-contact type, comprising resistance-controlling contactors adapted to be operated by fluid-pressure, means for admitting fluid-pressure to the first of said contactors, means whereby each contactor automatically admits pressure to the next, and a pneumatic valve controlling the flow of pressure into each contactor.

7. A motor-controller of the separately-actuated-contact type, comprising resistance-controlling contactors adapted to be operated by fluid-pressure, means for admitting fluid-pressure to the first of said contactors, means whereby each contactor automatically admits pressure to the next, a valve-chest adjacent to each contactor through which the pressure passes, and a piston in the valve-chest controlling the outlet therefrom.

8. A motor-controller of the separately-actuated-contact type, comprising resistance-controlling contactors adapted to be operated by fluid-pressure, means for admitting fluid-pressure to the first of said contactors, means whereby each contactor automatically admits pressure to the next, means for automatically retarding the flow of pressure into said contactors, and means for permitting an unobstructed flow from said contactors.

9. A motor-controller of the separately-actuated-contact type, comprising a plurality of cylinders, movable abutments in said cylinders, contacts actuated by said abutments, pipes connecting said cylinders, and pneumatic valves in said pipes for controlling the flow of compressed fluid from one cylinder to another.

10. A motor-controller of the separately-actuated-contact type, comprising contact elements each consisting of two cylinders in tandem, a movable abutment in each cylinder attached to a common rod, and a contact-arm connected with said rod.

11. In a fluid-pressure motor-controller, the combination with a contact-arm, of two movable abutments, one for closing it and the other for opening it.

12. In a fluid-pressure motor-controller, the combination with two contact-arms, of two movable abutments for each arm, one for closing it and the other for opening it, each closing abutment receiving fluid-pressure from the working side of the opening abutment for the other arm.

13. In a fluid-pressure motor-controller, the combination with two contact-arms, of two movable abutments for each arm, one for closing it and the other for opening it, pipes connecting the working side of each opening abutment with the working side of the other closing abutment, and a single pipe for conveying the fluid-pressure from each closing abutment to other apparatus, said pipe being closed by the closing abutments when the contact-arms are open.

14. In a fluid-pressure motor-controller, the combination with a reversing-switch, of a series switch, parallel switches, a trolley-switch and resistance-controlling switches, movable abutments for actuating all of said switches by fluid-pressure, and pipe connections for holding the parallel switches open when the series switch closes, and vice versa.

15. In a fluid-pressure motor-controller, the combination with three train-pipes, of a reversing-switch connected with two of said pipes, a series switch, trolley-switch and resistance-switches all in series with said reversing-switch and actuated by a single charge of air from either of said pipes, and parallel switches connected with the third pipe and in series with the trolley-switch and resistance-switches and operated by a single charge of air from said third pipe.

16. In a fluid-pressure motor-controller comprising reversing and resistance controlling and series and parallel controlling switches, the combination with train-pipes connected to the motor-controller, of a valve for admitting fluid-pressure to said pipes in succession to operate the parts of the controller and for exhausting all of said pipes when changing from one pipe to another.

17. In a fluid-pressure motor-controller, the combination of a valve having a turning plug containing two circumferential grooves, one longitudinal groove connecting with one of said circumferential grooves, and several lon-

gitudinal grooves connecting with the other, an air-supply pipe leading to the first circumferential groove, an exhaust-port leading to the other, and a plurality of train-pipes adapted to connect with the several longitudinal grooves.

18. In a controller for electric motors, the combination with a plurality of separately-actuated contacts for varying the motor speed, of a pneumatic actuating device for each contact, and pneumatic means for controlling said devices from a distance by compressed fluid under substantially constant pressure.

19. The combination with a plurality of motors, of a plurality of master-controllers connected by pipes in multiple relation, and separate individually and pneumatically actuated contacts regulated by the master-controller for connecting the motors in series and parallel.

20. In a system of train control, the combination with a plurality of cars united to form a train, of motors for propelling the train mounted upon more than one of the cars, separate pneumatically-actuated contacts for connecting the motors in series and in parallel, and a master-controller for pneumatically regulating the operation of said contacts.

21. In a system of train control, the combination with a plurality of electric motor-cars united to form a train, of a plurality of separate pneumatically-actuated contacts on each car for changing the grouping of the motors, a master-controller mounted on each motor-car, and pneumatic connections whereby the master-controllers may operate the motor-controllers.

22. In a system of train control, the combination with a plurality of electric motor-cars united to form a train, of a plurality of separately-actuated contacts for changing the resistance of the motor-circuits, pneumatic mechanism for operating said contacts automatically and successively by compressed fluid at substantially constant pressure, a master-controller on each motor-car, and pneumatic connections between the master-controllers and the said mechanism.

23. In a system of motor-control, a plurality of contacts operating in automatic succession, pneumatic actuating means for said contacts, and means controlled by the current in the motor-circuit for automatically regulating the rate at which said contacts close.

24. A motor-controller of the separately-actuated-contact type, comprising speed-controlling contacts operated by fluid-pressure, and means for automatically checking the successive operation of said contacts without affecting the contacts already operated.

25. A motor-controller of the separately-actuated-contact type, comprising successively-operating speed-controlling contacts operated by fluid-pressure, and means controlled by the current in the motor-circuit for checking the progression of said contacts without affecting the contacts already operated.

26. A motor-controller of the separately-actuated-contact type, comprising resistance-controlling contactors adapted to be operated by fluid-pressure, means for admitting compressed fluid to the first of said contactors, means whereby each contactor automatically admits the compressed fluid to the next, and means controlled by current in the motor-circuit for automatically retarding the flow of compressed fluid to said contactors.

27. A motor-controller of the separately-actuated-contact type, comprising successively-operating contactors adapted to be operated by fluid-pressure, means for admitting the compressed fluid to the first of said contactors, means whereby each contactor automatically admits the compressed fluid to the next, a pneumatic valve controlling the flow of compressed fluid to each contactor, and means for operating said valve to check the progression of the contactors.

28. A motor-controller of the separately-actuated-contact type, comprising successively-operating contactors adapted to be operated by fluid-pressure, means for admitting compressed fluid to the first of said contactors, means whereby each contactor automatically admits compressed fluid to the next, a pneumatic valve controlling the flow of compressed fluid to each contactor, and means controlled by the current in the motor-circuit for operating said valve to check the progression of the contactors without affecting those already operated.

29. In a system of motor control, a controller comprising a plurality of separately-actuated contacts, pneumatic actuating means for said contacts, and automatic means for compelling said contacts to be operated in succession.

30. In a system of motor control, a controller comprising a plurality of separately-actuated resistance-controlling, series and parallel contacts, pneumatic actuating means for said contacts, a master-controller and suitable connections for causing the operation of certain of said contacts, and automatic means for causing other of said contacts to be operated in succession.

31. In a system of motor control, a controller comprising a plurality of separately-actuated contacts, pneumatic actuating means for said contacts, a master-controller and suitable connections for causing the operation of certain of said contacts, and automatic means for compelling other of said contacts to be operated in succession.

32. In a system of motor control, a controller comprising a plurality of separately-actuated contacts, pneumatic actuating means for said contacts, automatic means for compelling

said contacts to be operated in automatic succession, and means for checking the rate of succession.

33. In a system of motor control, a controller comprising a plurality of separately-actuated contacts, pneumatic actuating means for said contacts, automatic means for causing said contacts to be operated in automatic succession, and automatic means for checking the rate of succession.

34. In a system of motor control, a controller comprising a plurality of separately-actuated contacts, pneumatic actuating means for said contacts, a master-controller and suitable connections for causing the operation of certain of said contacts, automatic means for causing other of said contacts to be operated in automatic succession, and automatic means for checking the automatic succession of the contacts.

35. In a system of motor control, a controller comprising a plurality of separately-actuated contacts, pneumatic actuating means for said contacts, a master-controller and suitable connections for causing the operation of certain of said contacts, automatic means for compelling other of the contacts to be operated in automatic succession, and means for checking the automatic succession of the contacts.

36. In a system of motor control, a pneumatically-actuated motor-controller, a pneumatically-actuated reversing-switch, a source of compressed-fluid supply, means under the control of the operator for regulating the admission of compressed fluid to the actuating means for the reversing-switch, and means controlled by the actuating means for the reversing-switch for regulating the admission of compressed fluid to the controller-operating means.

37. In a system of train control, each of a plurality of cars having a reversing-switch, a motor-controller and operating means therefor, two train-pipes operatively related to said operating means, and means for admitting compressed fluid to said pipes for operating the reversing-switches to give forward and reverse motor connections and for operating the several motor-controllers.

38. In combination, a pneumatically-actuated switch, a reversing-switch, and pneumatically-actuated means for actuating said reversing-switch and for controlling the admission of compressed fluid to the actuating means for the pneumatically-actuated switch.

39. A motor-controller comprising a plurality of separate contacts, pneumatic actuating means therefor, and means whereby the operation of certain of said contacts is made dependent upon the operation of certain others of said contacts.

40. A motor-controller comprising a plurality of separate contacts and automatic, pneumatic actuating means therefor, the arrangement of parts being such that the operation of certain of said contacts is dependent upon the operation of certain others of said contacts.

In witness whereof I have hereunto set my hand this 13th day of October, 1902.

JOHN B. LINN.

Witnesses:
W. R. HORNER,
ALFRED CAVILEER.