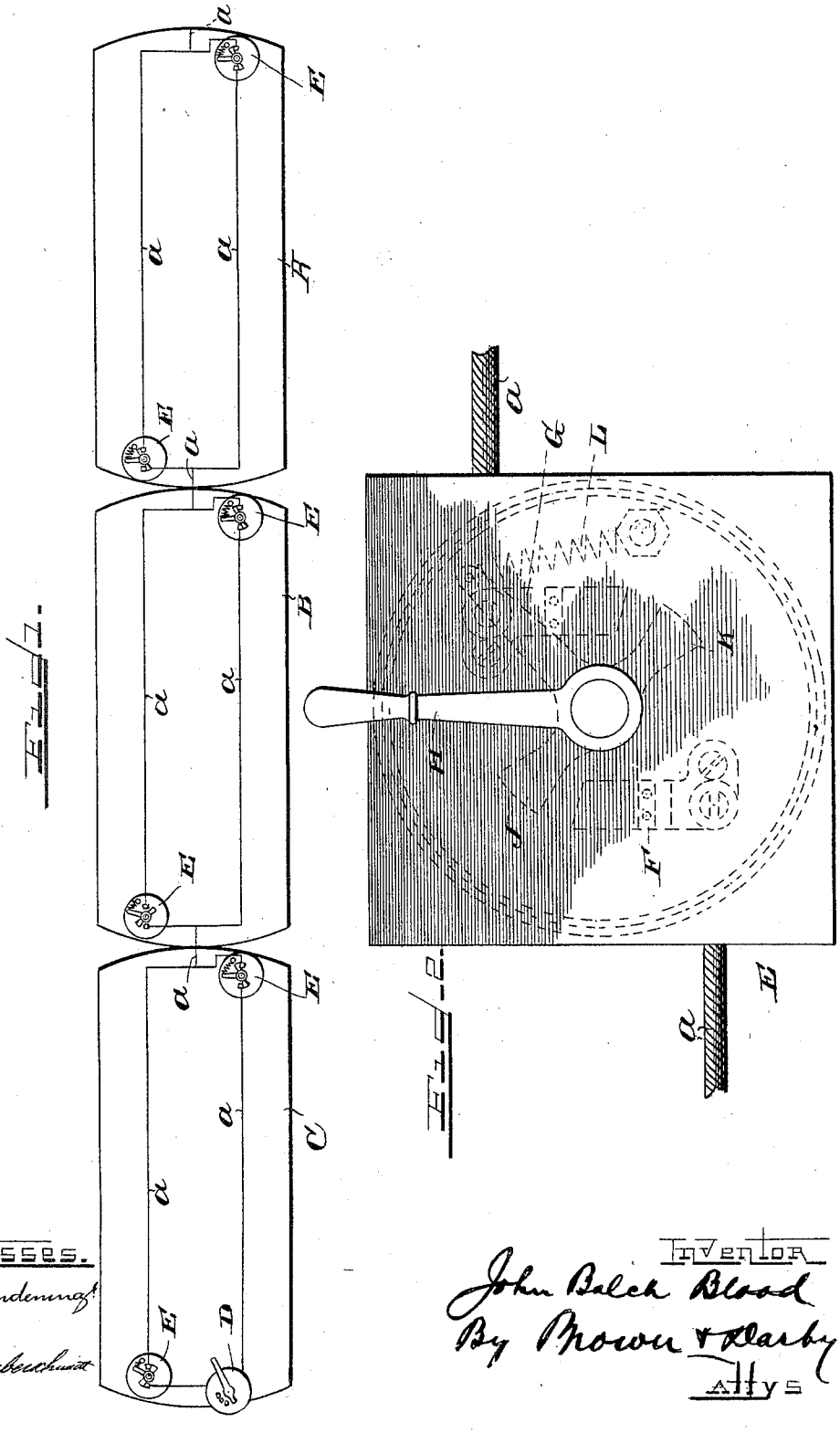
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STARTING MECHANISM FOR TRAINS.

(Application filed Aug. 28, 1901.)

(No Model.) 2 Sheets—Sheet 1.



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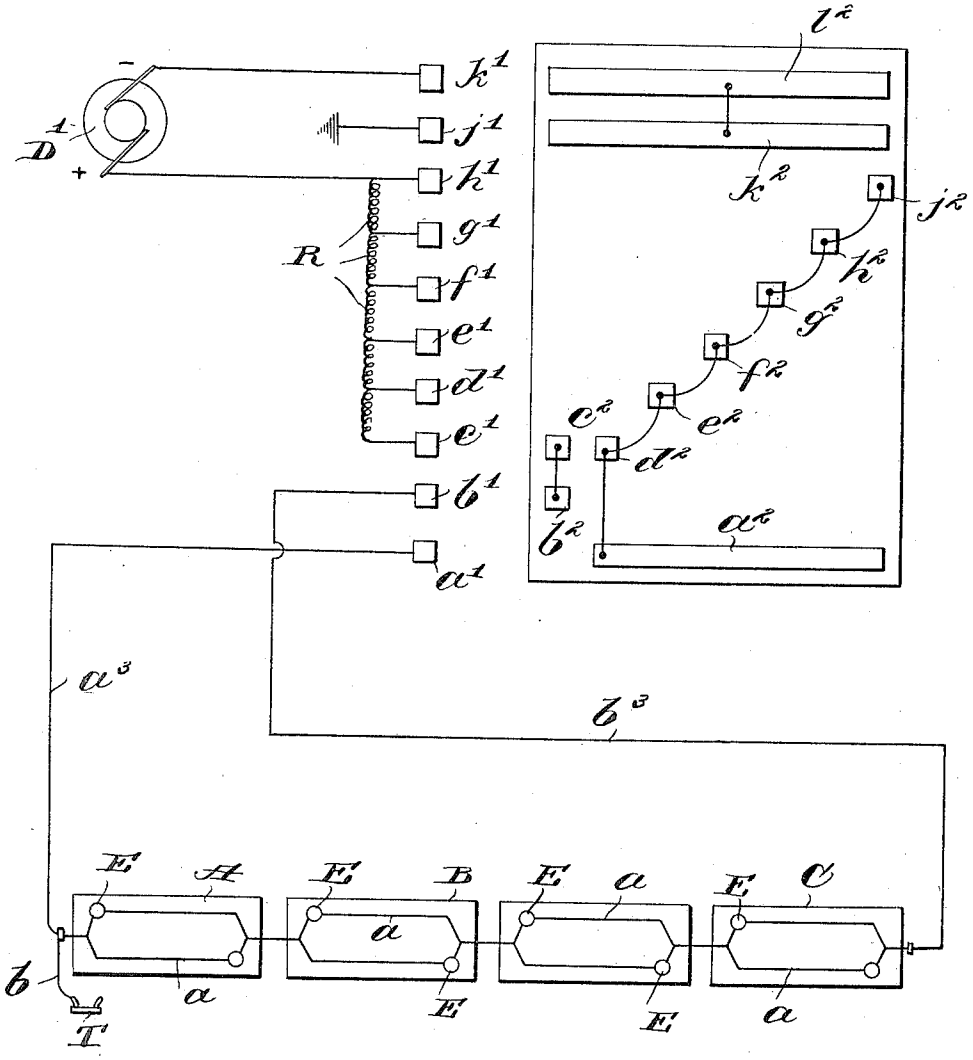
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Fig. 5.



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UNITED STATES PATENT OFFICE.

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STARTING MECHANISM FOR TRAINS.

SPECIFICATION forming part of Letters Patent No. 706,295, dated August 5, 1902.

Application filed August 28, 1901. Serial No. 73,547. (No model.)

To all whom it may concern:

Be it known that I, JOHN BALCH BLOOD, a citizen of the United States, residing at Newburyport, in the county of Essex and State of Massachusetts, have invented a new and useful Starting Mechanism for Trains, of which the following is a specification.

This invention relates to starting mechanism for trains.

The object of the invention is to provide an arrangement of starting mechanism for electric or other cars which is simple and efficient and which avoids the delays incident to the giving of signals.

Other objects of the invention will appear more fully hereinafter.

The invention consists, substantially, in the construction, combination, location, and arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

It is the usual custom at present to start trains from stations or street-crossings or the like by a signal system in which the guard or conductor of the last car of the train gives a signal forward as soon as his car is ready to start, which signal is transmitted successively by the guards or conductors of the various cars of the train to the driver or motorman, who starts up the train or car immediately upon receipt of the signal from the guard or conductor of the car next adjacent to the motor-car. This system involves much loss of time, due to the transmission of successive signals from one car to another throughout the train and also by reason of the fact that the signals do not start until the rear or last car of the train is clear for starting, even though the intermediate cars of the train are already in condition for the train to start. It frequently happens that the intermediate cars of the train are ready for starting the train or the platforms thereof are cleared for starting before the last or rear car of the train is ready for the train to start. In such cases it is necessary to await the giving of the signal from the rear car and then for the guard or conductor of each succeeding car to transmit that signal forward to the motorman or driver before the motor-controllers are actuated for starting up the train. It is the special purpose of my present invention to avoid this delay.

In an electric system of control in order to start the train the motorman or driver manipulates the controller-handle to actuate the controller to the first notch. This action applies an electric pressure, either directly to the motors for propelling the train, as in case of ordinary street-cars, or to the control device by which the circuits of the motors are completed. In carrying out my invention I propose to apply this electric pressure, whether applied directly to the motor or to the motor-circuit-controlling mechanism, as soon after all the cars are clear and ready for starting as possible, and in accomplishing this result I provide a circuit and arrange the same to extend throughout the train, and which circuit is in electric connection with the source of electric pressure at the rear end of the train only. At each platform of the car is placed a switch in series in said circuit. Each switch is normally kept in open position in any suitable manner—as, for instance, by means of a spring—and each switch should be placed in convenient position to be operated by the guards or conductors. The circuit above referred to is arranged to extend forward and into the driver's or motorman's cab and is connected to the controller in the same manner as the pressure-circuit is connected thereto. It will be noted, as above stated, that all the switches are in series with each other and that when all the switches are closed the electrical conditions for starting are the same as in the systems at present employed, the only difference being that the pressure is obtained from the rear car and is transmitted through the train to the forward car. Under these conditions it will be seen that in order to start the train all of the platform-switches must be closed and the controller must be on the first position or first notch, and in case any switch is open or the controller is not on the first notch or in its first position the train will not start.

Referring to the accompanying drawings, Figure 1 is a view in diagrammatic plan of a construction and arrangement embodying the principles of my invention; and Fig. 2 is a

similar view, upon an enlarged scale, of a switch. Fig. 3 is a diagram showing the arrangement of circuits and controller.

Reference-signs A B C designate cars in the train; D, the controller, which is usually placed at the front end of the front car of a train and through which the propelling motor or motors are controlled.

E designates a series of switches, one placed on the platform at each end of each car of the train in convenient position to be manipulated by a guard or conductor stationed upon the car-platform.

a designates an electric circuit extending throughout the train and including in series therein all of the switches E, said circuit being connected to the motor D′ in the usual manner, as will be more fully explained hereinafter, and at the rear end of the rear car of the train being in electrical connection through wire *b* to a source of electric pressure—as, for instance, the trolley-wire or third rail, as indicated at T, Fig. 3. The construction of each switch is the same and is more clearly shown in the enlarged view, Fig. 2, and may comprise stationary contact-points F G, respectively connected to the terminals of circuit *a*, and the handle or lever H, connected to suitable coöperating contact-points J K, whereby when said handle H is manipulated the contact-points J K are respectively and coincidently brought into electrical connection with the points F G. The contact-points J K may be normally held out of contacting relation with contact-points F G in any suitable manner—as, for instance, by spring L. The second position or notch of the controller D may serve to complete a direct connection from the source of electric pressure to the motors, or, as the case may be, to suitable motor-controlling devices, and the first position of the controller is arranged to complete the series circuit, above referred to, and which includes the switches E therein to the motor or, as the case may be, to the motor-controlling devices.

Referring now to Fig. 3, wherein is illustrated in diagram a form of wiring connections suitable for use in connection with my invention, reference-signs a' b' c' d' e' f' g' h' j' k' designate, respectively, the stationary contact-fingers of the controller; a^2, b^2, c^2, d^2, e^2, f^2, g^2, h^2, j^2, k^2, and l^2 contact-strips on the controller-cylinder. The contacts b^2 and c^2 are in electrical communication with each other, and the contacts k^2 l^2 are in electrical communication with each other, and the contacts a^2 d^2 e^2 f^2 g^2 h^2 j^2 are in electrical connection with each other. Contact-fingers c' d' e' f' g' h' have suitable resistances R interposed therebetween. Contact a' is in electrical connection through wire a^3 with the trolley T, and contact b' is in electrical connection through wire b^3 with the train-starting circuit. An examination of this diagram shows that when the controller-cylinder is moved to its first position contacts K′ and j' are coupled up through contact-strips l^2 and k^2, and similarly contacts c' and b' are coupled up through contacts c^2 b^2. This is the position of the controller prior to starting the car, and circuit is completed when the controller is in this position as follows: From trolley T through wire *b*, through the train-starting line A and all of the switches E throughout the train in series, wire b^3 to contact b', contact b^2, contact c^2, contact c', through all the resistances R, the motor D′, contact k', contacts l^2 k^2, to contact j' to ground. It will be observed that nothing occurs by reason of this circuit so long as any one of the car-switches E is open, and said circuit will not be completed until the car-switches E are closed and the controller is in its first position and the trolley-pressure is supplied to the motor through all the resistances R and the train starts up. The motorman thereupon moves or shifts the controller to its next or second position. Thereupon the train-starting circuit is broken and the trolley-pressure, instead of traversing the circuit which includes the car-switches in series, is brought directly to contact a' through wire a^3, thence through contact a^2 to contact d^2, to contact c', and on, as before, through all the resistances R, the motor, and to ground or return. This gives the motorman complete control of the current, and he then speeds up by shifting his controller from notch to notch, thereby successively cutting out the resistances R in the usual or ordinary manner.

The method of operation is as follows: The normal condition of the apparatus with a train at a station and at rest would be for all of the platform-switches to be open and the controller on the "off" position. The driver or motorman then places the controller on the first notch or in its first position. This, however, does not start the train, for the reason that the platform-switches are open and no potential or pressure is thrown on the translating devices controlled by the driver's or motorman's controller. As each guard or conductor finds his platform clear and his car ready for starting he immediately snaps in his platform-switch. The last switch of the series thrown in by a guard or conductor completes the starting-circuit from a source of electric pressure throughout all the cars of the train to the controller D at the front end of the front car and finding said controller in its first position to the motor or other translating device, and the train starts up. It will be noted that it is immaterial in what order the platforms are cleared or in what order the platform-switches are closed, no successive signaling being required, the only requirement being that all the switches are closed. It may be that the intermediate cars of the train are ready to be started before all the cars are ready; but the train will not start until all the cars are ready and the platforms clear or the gates closed, and the instant the last car to be cleared or the last switch to be

closed is closed the closing of such last switch supplies the pressure necessary for starting the train. As soon as the train starts up the driver or motorman moves his controller to the second notch, thereby taking the potential or pressure direct from the source of pressure in the ordinary manner. The guards or conductors then know that the motorman is in full control and the platform-switches are released, thereby disconnecting or breaking the train-circuit, and the train proceeds with the motorman or driver in full control of the current and motor-circuit.

It will be observed that in the drawings I have shown a switch device E located upon each end of each car and that the arrangement on one car is symmetrical with that on the other cars of the train. This is the arrangement in a multiple-unit or plural-unit system—that is, a system in which any car may be detached from a train without disturbing the relation of the remaining cars of the train and also be capable of complete control in itself, and similarly other cars similarly equipped may be added to the train without disturbing their relation with respect to the apparatus. Of course it will be understood that a control device or switch E may be located only on one end of one car of the train, and consequently with any system except the plural-unit or multiple-unit system only one switch on each car would be sufficient. It will also be seen that I have shown a controller D located at one end of one of the cars; but it is to be understood that when my invention is applied to a multiple-unit or plural-unit system a similar controller is to be employed on each end of each car.

In the foregoing description I have described an electric fluid-pressure controlled by the switches E. My invention in its broadest sense, however, contemplates a system of control whereby the starting impulse is consequent upon coincident conditions of pressure devices situated throughout the train. Therefore my invention is not limited to the use of electrical pressure in this connection; but air or any other suitable pressure may be used in the train system with air valves or switches or other similar controlling devices mounted upon the cars in place of the electric switches E and still fall within the spirit and scope of my invention. It is also obvious that the principles of my invention may be employed with other systems of propulsion—such, for instance, as air, steam, or other fluid-pressure motors. It will also be noted that my invention is best applicable to a system in which is employed a master-controller for controlling the motors and which master-controller is actuated from the controller on the end of the front car of a train rather than by a direct control, for the reason that with an indirect system of control the current carried by the train-circuit employed in connection with my invention need only be small in comparison with the current required to actuate the translating devices. At the same time, however, a direct system would be perfectly feasible. Moreover, with a direct system of control using potential direct from the source of pressure an auxiliary circuit might be employed, whereby the train-line will carry only current sufficient or necessary to operate a magnet to make the direct-pressure connection for the controller in the driver's or motorman's cab. Thus it will be observed that the main feature of my invention is the starting of a train by pressure which is applied to the controlling devices the instant the car-switches are all closed and in whatever order said switches may be closed.

Many variations and changes in the details would readily occur to persons skilled in the art and still fall within the spirit and scope of my invention. I do not desire, therefore, to be limited or restricted to the exact details shown and described; but,

Having now set forth the object and nature of my invention and a construction embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is—

1. A starting system for a train of cars, comprising pressure-controlling devices situated throughout the train, and means whereby the starting impulse is consequent upon the coincident condition of all of said pressure devices, as and for the purpose set forth.

2. A starting system for trains including pressure-controlling devices mounted upon each car, a motor or other propelling device, said motor being controlled in its starting movements by coincident conditions of the pressure-controlling devices on all the cars, as and for the purpose set forth.

3. A starting system for trains, comprising a controller, a train-circuit, means for supplying pressure thereto, said means provided with devices throughout the train for controlling such pressure, as and for the purpose set forth.

4. In a starting system for trains, a controller arranged to control the supply of pressure to the motors, and pressure-control devices arranged on each car of the train in series with each other, as and for the purpose set forth.

5. In a starting system for trains, a train-circuit, switches arranged upon each car and in series with said train-circuit, a controller, said circuit supplying pressure to said controller, as and for the purpose set forth.

6. In a starting system for trains, a circuit arranged to extend throughout the train and communicating with a source of pressure, a controller to which such pressure is connected, and switches arranged on the various cars of the train and in series with said circuit, as and for the purpose set forth.

7. In a starting system for trains, a train-circuit communicating with a source of pressure, a controller arranged in said train-circuit, and normally open switches arranged in

series with each other in said circuit and placed upon the various cars of the train, as and for the purpose set forth.

8. In a starting system for trains, a motor, a controller for controlling the supply of pressure thereto, a train-circuit for said controller for initially controlling the supply of pressure to said translating devices, and a normally open switch arranged at each end of each car of the train, said switches being included in series with each other in said open circuit, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 17th day of August, 1901, in the presence of the subscribing witnesses.

JOHN BALCH BLOOD.

Witnesses:
EDWARD J. WILLIS,
A. G. MATHIASON.