No. 763,108. PATENTED JUNE 21, 1904.

F. C. NEWELL.

ELECTRIC BRAKE.

APPLICATION FILED APR. 1, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 2.

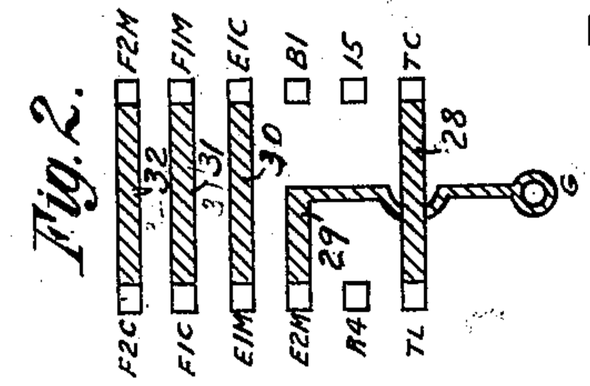
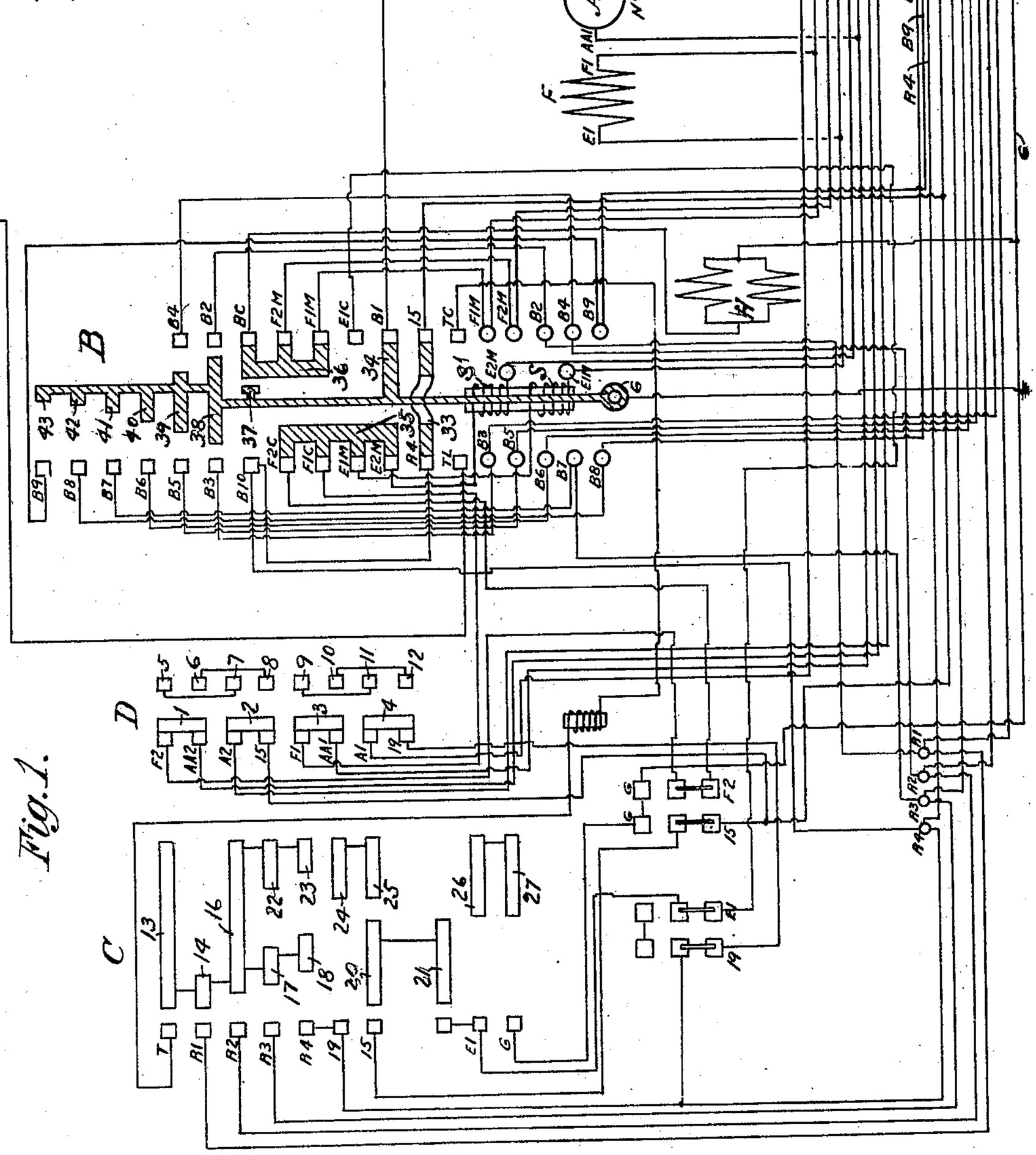


Fig. 1.



WITNESSES:

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

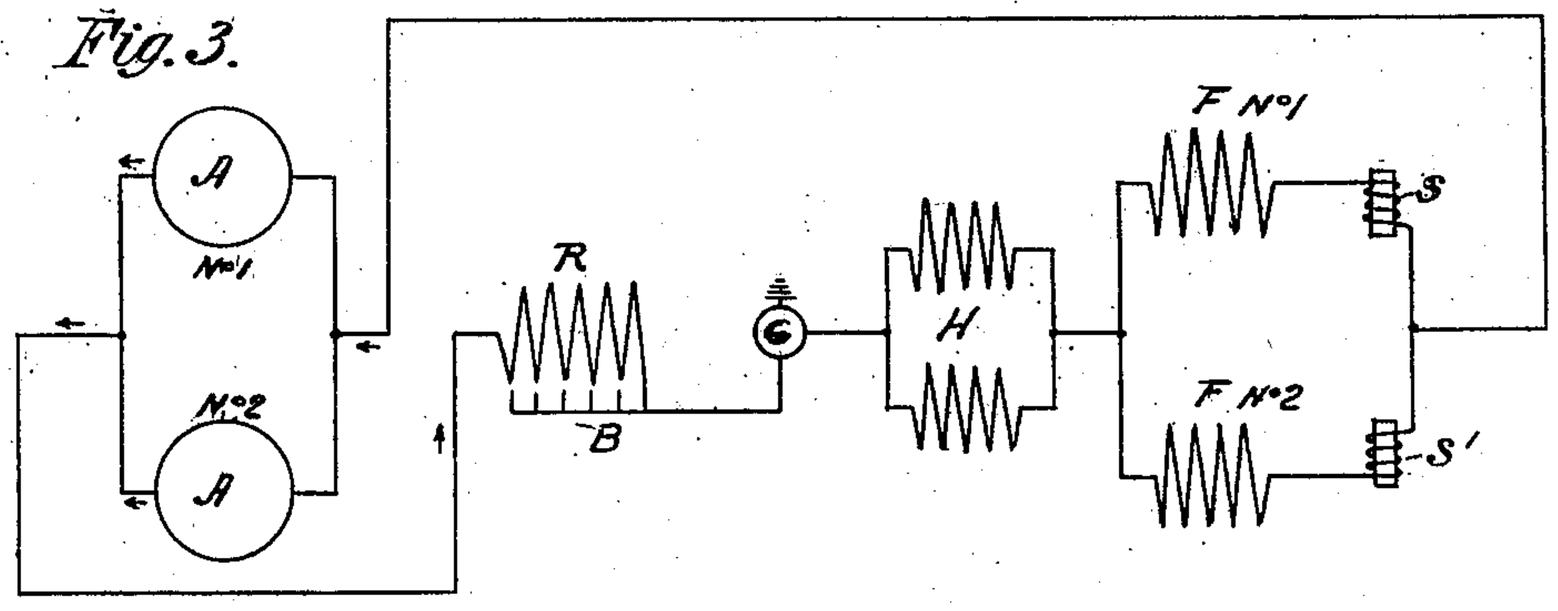


Fig. 4.

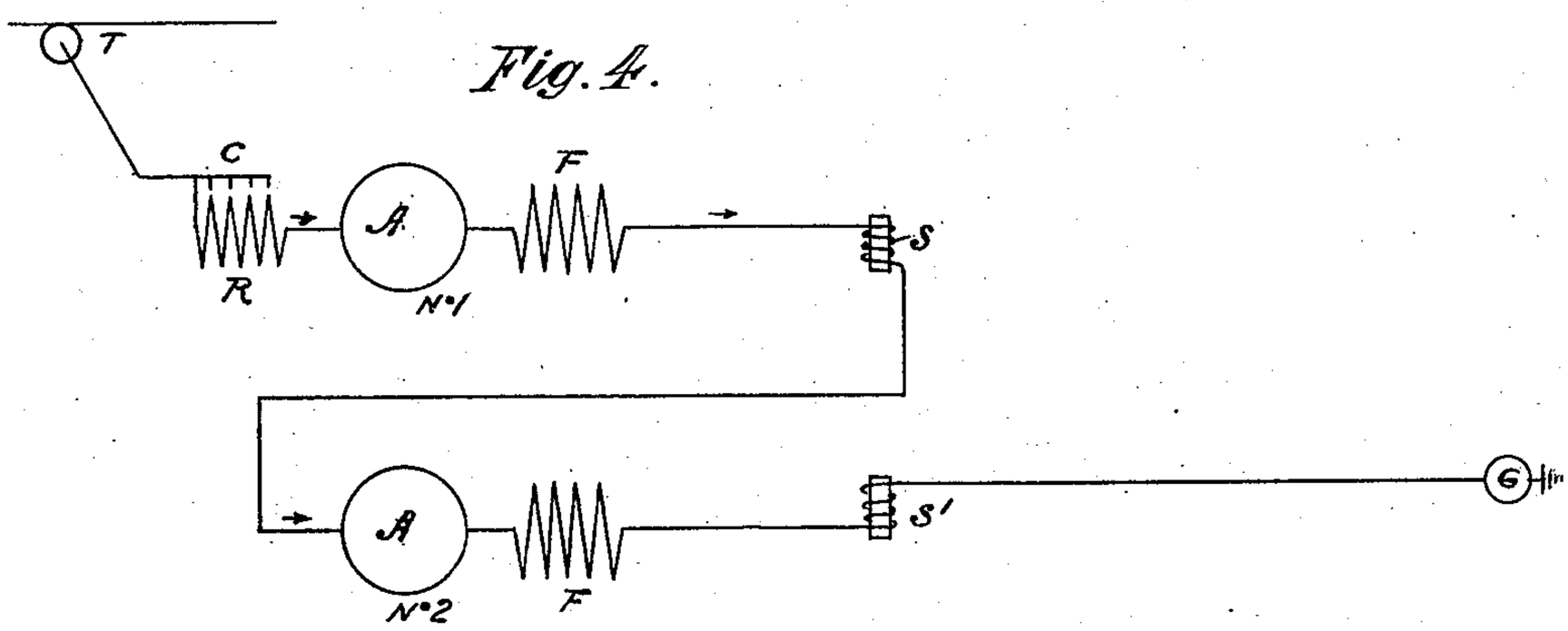
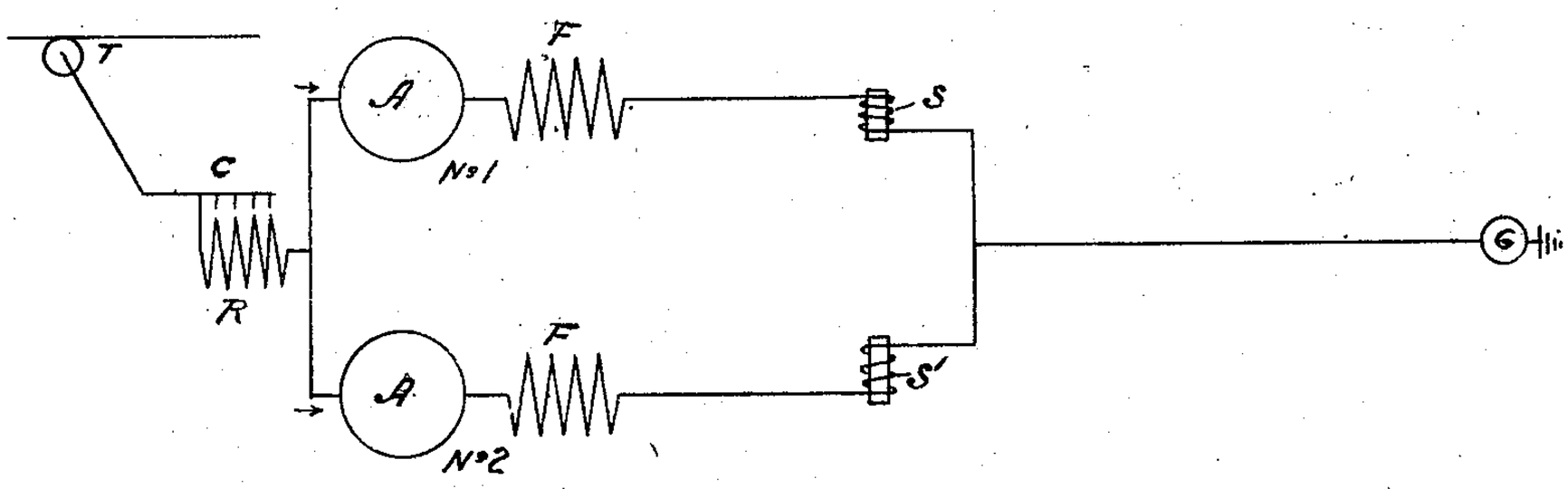


Fig. 5.



WITNESSES:

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No. 763,108. Patented June 21, 1904.

UNITED STATES PATENT OFFICE.

FRANK C. NEWELL, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

ELECTRIC BRAKE.

SPECIFICATION forming part of Letters Patent No. 763,108, dated June 21, 1904.

Application filed April 1, 1902. Serial No. 100,965. (No model.)

To all whom it may concern:

Be it known that I, FRANK C. NEWELL, a citizen of the United States, residing in Wilkinsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Electric Brakes, of which improvement the following is a specification.

My invention relates to electric brakes for cars, and has for its object to provide a new and improved form of braking-controller and circuit connections by means of which the brakes may be applied more evenly and gradually than heretofore and also whereby the injurious effect of the leakage from the brake-magnet coils to ground is prevented.

Another object of my invention is to provide a blow-out magnet for the contact-points of the braking-controller and having coils so arranged in the circuits that the full current that is flowing through the system either in the running or in the braking circuits shall be utilized to energize said magnet.

With these and other objects in view the invention consists in certain novel combinations and arrangement of parts, all as hereinafter more fully described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a diagram showing an application of my improved braking-controller to an ordinary car equipment of two motors and a running-controller, the braking-controller being shown in its first braking position, while the running-controller is shown in open or "off" position. Fig. 2 is a diagram showing the arrangement of the contact-points of the braking-controller when in its running position, the resistance-points being omitted. Fig. 3 is a diagram showing the course of the current in the brake-circuit corresponding to the positions of the running-controller and the braking-controller as shown in Fig. 1. Fig. 4 is a diagram showing the course of the current in running when the braking-controller is in its running position shown in Fig. 2 and the running-controller is in any one of its series positions, and Fig. 5 is a corresponding diagram of circuits when the running-controller is in any one of its multiple positions.

My improved braking-controller B is designed to be employed in connection with any ordinary form of series-parallel running-controller C and is adapted when moved to its first braking position to cut out the motors from the line-circuit and to connect them up to act as generators in a local brake-circuit including brake-magnets and a rheostat and by further movements to gradually cut out the rheostat-resistance, and thus control the current in the brake-circuit. Heretofore in the use of braking-controllers of this type the brake-magnets have been located in the circuit between the armatures and fields of the motors, while the contact-bars of the braking-controller were insulated from the ground and the brake-circuit had connection with the ground only at the field-outlets. As a result of this arrangement any leakage from the brake-magnet coils to ground acted as a shunt to the fields to that extent, and thus weakened the force of the application of the brakes.

According to my improved construction the resistance-bars on the braking-controller, as well as one end of the brake-magnet coils are connected directly to the ground, while the field-outlets in the braking-circuit are insulated therefrom. By means of this arrangement all injurious effects due to leakage at the brake-magnet coils are avoided. The location of the ground connection at the end of the brake-magnet coils also serves as a condenser for the current in the brake-circuit at this point and prevents the inductive kick of the brake-magnet coils at the time of making or breaking the circuit.

I also provide my improved braking-controller with a blow-out magnet, the coil of which comprises two sections S and S′, which are inserted in the outlet-leads from the respective fields of the motors. By means of this arrangement I secure the full strength of the current in either the running or in the braking circuits to energize the blow-out magnet,

which will not only extinguish the arcs at the contact-points when the braking-controller is operated to regulate the current in the brake-circuit, but will also enable the motorman to throw the braking-controller at any time in case of emergency when the running-controller is on any one of its live positions without liability of burning out the contact-points of the braking-controller.

I have shown an ordinary form of series-parallel running-controller C, having contact-bars 13, 14, 16, 17, 18, 20, and 21, adapted to make contact with the stationary points when running with the motors in series, and other bars 22, 23, 24, 25, 26, and 27 for running in parallel, and reversing-switch D, having the the usual bars 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12, all of which construction is well understood by those familiar with the art.

My improved braking-controller B is provided with an increased number of resistance-points, some of which correspond with the resistance-points of the running-controller, while others are inserted between these, thus dividing up the rheostat-resistance into a larger number of smaller steps, whereby the brakes may be applied and released much more smoothly and gradually than heretofore. If the switches or controllers be placed in position for braking on the first point, as shown in Fig. 1, the line-current from the trolley T will be cut off, and the current in the braking-circuit will flow from the armatures A of the generators through leads A′ and A^2, respectively, to corresponding bars 4 and 2 on the reversing-switch, thence from bar 4 by lead 19 to R^4 and B^8 of the resistance, and from bar 2 by lead 15 to contact-bar 33 on the braking-controller to R^4 and B^8 of the resistance, then through all the resistance R and by lead B′ to bar 34 on the braking-controller and to the ground G, thence through the brake-magnet coils H and by lead BC to bar 36 on the braking-controller, thence by leads F′ M and F′ and F^2 M and F^2 through the fields of both motors, through outlet-leads E′ and E^2, blow-out magnet-coils S and S′, and leads E′ M and E^2 M to contact-bar 35 on the braking-controller, thence by leads F′ C and F^2 C to bars 3 and 1, respectively, on the reversing-switch, and through leads A A′ and A A^2 back to the respective armatures. This circuit is indicated diagrammatically in Fig. 3 of the drawings. Further movement of the braking-controller for regulating the current in the brake-circuit merely varies the amount of resistance thereby by bringing the various contact-bars 38, 39, 40, 41, 42, 43, and 37 in contact with their respective fingers B^2, B^3, B^4, B^5, B^6, B^7, B^8, B^9, and B^{10}, at which last point all the resistance is cut out. All of the resistance-controlling bars are grounded directly on the base of the braking-controller, as is also bar 29, which is connected to the field-outlet lead E^2 M in running position. When the braking-controller is thrown to running position, as shown in Fig. 2, and the running-controller is moved to its first series position, the line-current will flow from the trolley T through lead TL, bar 28 on the braking-controller, lead TC to bars 13 and 14 on running-controller, lead R′, which also corresponds with resistance-point B^2 in the braking-circuit, through the resistance to R^4 and by lead 19 to contact-bar 4 on reversing-switch, lead A′ through armature A of No. 1 motor, lead A A′ to bar 3 on reversing-switch, lead F′ to F′ C and bar 31 on braking-controller, lead F′ M through field of No. 1 motor, through E′ M and section S of blow-out magnet coil to bar 30 on braking-controller, leads E′ C and E′ to bars 21 and 20 on running-controller, lead 15 to bar 2 on reversing-switch, lead A^2 through armature of No. 2 motor, lead A A^2 to bar 1 on reversing-switch, lead F^2 to F^2 C and bar 32 on braking-controller, lead F^2 M through field of No. 2 motor, lead E^2 M and section S′ of blow-out magnet-coil to bar 29 on braking-controller, and thence to ground G. This circuit is indicated in the diagram shown in Fig. 4. Movement of the running-controller to its other series positions results in varying the resistance in the circuit, as is well understood. When the running-controller is moved to its first parallel position, the current will flow from the trolley through lead TL, bar 28 on braking-controller, lead TC to bars 13 and 16 on running-controller, lead R^2 through a portion of the resistance and R^4 to lead 19. Here the current divides, one part flowing directly to bar 4 on reversing-switch, lead A′ through armature No. 1, lead A A′ to bar 3 on reversing-switch, lead F′ to F′ C and bar 31 on braking-controller, lead F′ M through field of No. 1 motor, through lead E′ M and section S of blow-out magnet-coil to bar 30 and E′ C on braking-controller, lead E′ to bars 26 and 27 on running-controller, and thence to the ground G. The other part of the current passes from lead 19 to bars 24 and 25 on running-controller, lead 15 to bar 2 on reversing-switch, lead A^2 through armature of No. 2 motor, lead A A^2 to bar 1 on reversing-switch, lead F^2 to F^2 C and bar 32 on braking-controller, lead F^2 M through field of No. 2 motor, through lead E^2 M and section S′ of blow-out magnet-coil to bar 29 on braking-controller, and thence to the ground G. This circuit is shown diagrammatically in Fig. 5 of the drawings.

It will be noticed that the blow-out magnet of the braking-controller is energized by the full current passing through the circuits either when braking or when running in series or in parallel, and this is an important feature of my invention.

I have shown the resistance divided up into ten steps or divisions for controlling the brake-circuit and into four divisions for the running-

circuits, in which R′ corresponds with B^2, R^2 with B^4, R^3 with B^7, and R^4 with B^{10}; but my invention is not limited to any particular number of steps or divisions of the resistance, since this may be divided up into as many sections as desired, and my improvement may also be used with various forms of running-controllers having a greater or less number of resistance-points.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with one or more generators, of a braking switch or controller adapted to connect up the generators in a braking-circuit, a brake-magnet coil in said circuit and a ground connection for one end of said coil, the field-outlets in the braking-circuit being insulated from the ground.

2. The combination with two or more generators, of a braking switch or controller adapted to connect up the generators in parallel in a braking-circuit, and a brake-magnet coil having one end grounded, located in the circuit between the armatures and fields of the generators.

3. The combination with two or more generators, of a braking-controller adapted to connect up the generators in parallel in a braking-circuit and to control the resistance in said circuit, a rheostat and a brake-magnet coil located in said circuit between the armatures and fields of the generator, and a ground connection for one end of the brake-magnet coil.

4. The combination on an electric car, of two or more motors, a running-controller, a braking switch or controller adapted to cut off the line-circuit and to connect up the motors in parallel to act as generators in a local brake-circuit, a brake-magnet coil located in said circuit between the armatures and fields of the generators, and a ground connection for one end of said brake-magnet coil.

5. The combination with one or more generators, of a braking-controller having contact-bars for connecting up the generators in a braking-circuit and for varying the resistance in said circuit, the resistance-regulating bars being grounded, a brake-magnet coil and a ground connection for one end of said coil.

6. The combination on an electric car, of one or more motors, a running-controller having a number of resistance-points for controlling the line-current to the motors, and a braking-controller for cutting out the line-circuit and connecting up the motors to act as generators in a local circuit and having a larger number of resistance-points for controlling the current in the local circuit, the resistance-steps for the braking-controller being smaller than those of the running-controller.

7. The combination on an electric car, of one or more motors, a running-controller having a number of resistance-points connected to certain sections of the rheostat or resistance for controlling the current in the line-circuit, and a braking-controller for cutting out the line-circuit and connecting up the motors to act as generators in a local circuit, the said braking-controller having a larger number of resistance-points, some of which correspond with those of the running-controller and others connected to the rheostat or resistance at intermediate points.

8. The combination on an electric car, of one or more motors, a running-controller, a separate braking-controller having contact-points adapted to cut out the line-circuit and to connect up the motors to act as generators in a local brake-circuit, and a blow-out magnet-coil for the braking-controller located in both the running and braking circuits.

9. The combination on an electric car, of two or more motors, a series-parallel running-controller, a separate braking-controller having contact-points adapted to cut out the line-circuit and to connect up the motors to act as generators in a local brake-circuit, and a blow-out magnet-coil for the braking-controller so located as to receive the full current either of the braking-circuit or of the line-circuit when running either in series or in parallel.

10. The combination on an electric car, of two or more motors, a running-controller, a braking-controller adapted to cut out the line-circuit and to connect up the motors to act as generators in a local brake-circuit, and a blow-out magnet-coil for the braking-controller, said coil being arranged in sections so located that each section receives the current from one motor in the braking-circuit and in the line-circuit when running in parallel, while the full line-current passes through both sections when running in series.

11. The combination on an electric car, of two or more motors, a running-controller, a braking-controller adapted to cut out the line-circuit and to connect up the motors to act as generators in a local brake-circuit, and a blow-out magnet-coil for the braking-controller, said coil being arranged in sections and each section located in one of the field-leads of one of the motors.

In testimony whereof I have hereunto set my hand.

FRANK C. NEWELL.

Witnesses:
R. F. EMERY,
JAS. B. MACDONALD.