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PATENTED AUG. 25, 1903.

F. C. NEWELL.  
ELECTRIC BRAKE.

APPLICATION FILED DEC. 31, 1902.

NO MODEL.

Fig. 2.

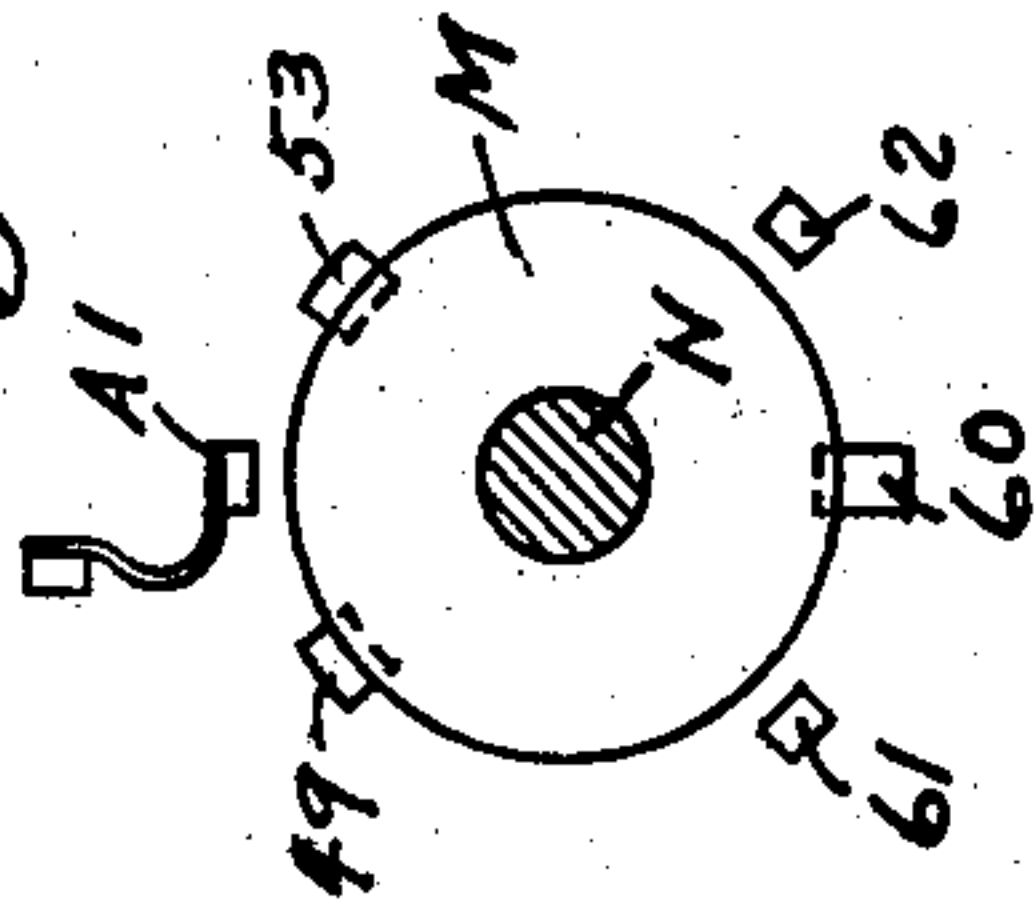
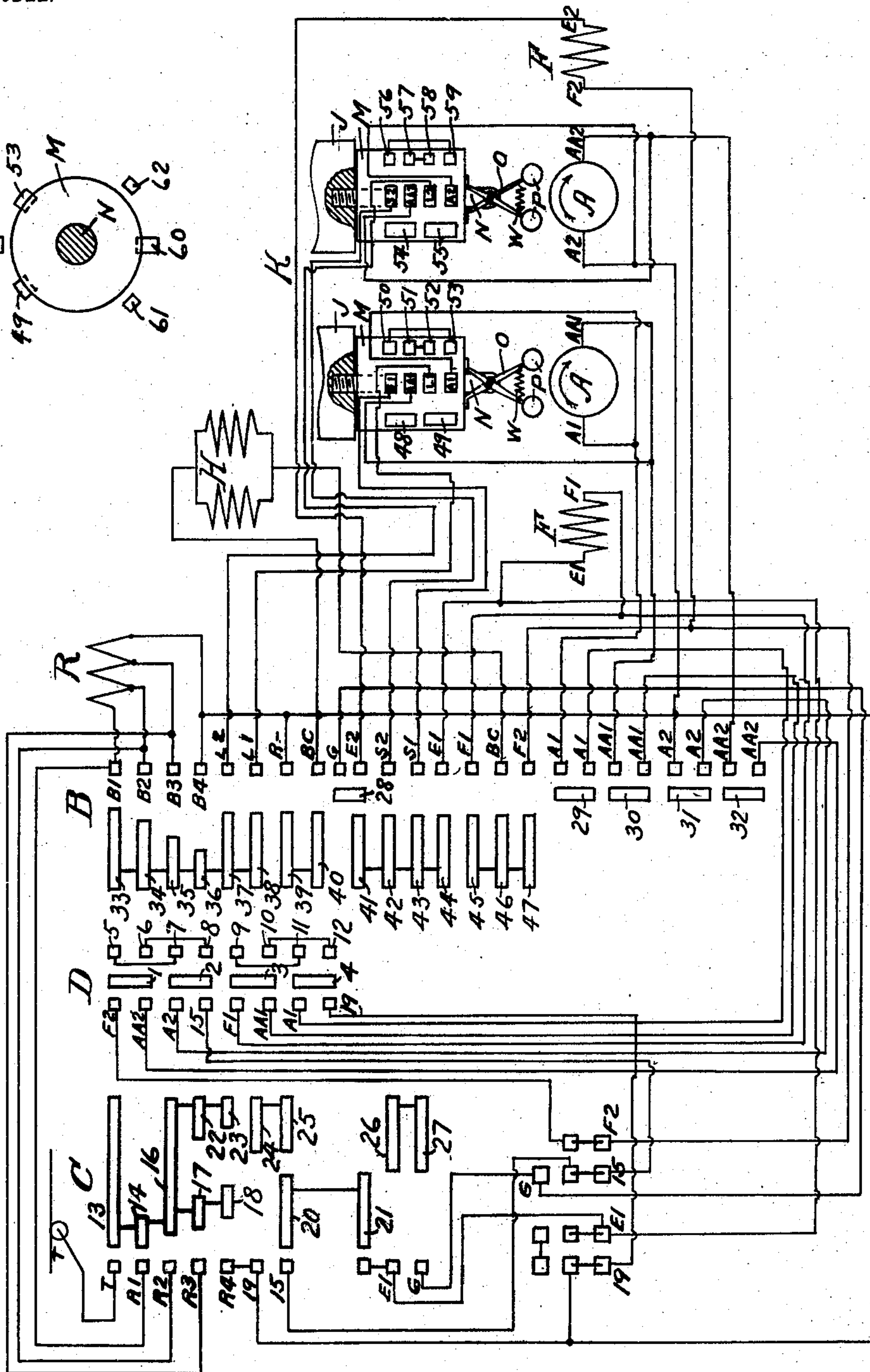


Fig. 1.



WITNESSES

Gas. B. MacDonald.  
J. Custer

INVENTOR,

Frank C. Newell

By E. Wright

Att'y.



# 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. 737,265, dated August 25, 1903.

Application filed December 31, 1902. Serial No. 137,299. (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, in the county of Allegheny, State of Pennsylvania, have invented a certain new and useful Improvement in Electric Brakes, of which improvement the following is a specification.

This invention relates to electric brakes for cars and particularly to electrically-propelled cars, in which the motors are used as braking generators for supplying the local brake-circuit. Heretofore it has usually been the practice to provide these cars with a power-controller, a reversing-switch, and a braking-controller, the latter being adapted to connect up the motors to act as generators and to control the current so generated in a local brake-circuit. This form of equipment has always been arranged for braking only when the car is moving in the direction for which the reversing-switch is set. It sometimes happens, however, that a car will start to move in a direction opposite to that for which the reversing-switch is set—as, for instance, on a grade where the motorman loses control of the car and it starts to run backward downgrade. If the brake switch or controller is then thrown without first moving the reversing-switch, it will have no effect, since the leads are connected up in the reverse direction to that in which the armatures are revolving, and no current will be generated in the brake-circuit. This condition often leads to serious accidents, since the motorman rarely has sufficient knowledge or presence of mind to throw the reversing-switch at such times.

The principal object of this present invention is to provide an automatic reversing-switch which will always set up the proper combination of circuits for braking when the car is moving in either direction, so that the brake-switch or controller may always be depended upon for stopping the car.

Another object is to so arrange the circuits and brake-switch contact-points that the automatic reversing device will in no way interfere with the proper manipulation of the power-controller and reversing-switch for running the car.

In the accompanying drawings, Figure 1 is a circuit-diagram of a car equipment provided with two motors, a power-controller, a reversing-switch, a braking-controller, and my automatic reversing-switch; and Fig. 2 is an end view of one of the automatic reversing-switches.

According to the illustration in the diagram, the power-controller C, reversing-switch D, and braking-controller B for one end of the car only are shown; but it will be understood that the circuits are extended to a duplicate set of these devices at the opposite end of the car in the usual way.

The running or power controller C is of the ordinary series-parallel type, having contact-bars 13, 14, 16, 17, 18, 20, and 21 for making contact with the stationary fingers when running with the motors in series and other bars 23 to 27, inclusive, for use in running with the motors in parallel. The reversing-switch D is provided with the usual contact-bars 1 to 12, all of which construction is well known to those familiar with the art.

The improved braking-controller B has one set of contact-bars, 28 to 32, which are adapted to make contact with the stationary fingers or points when this controller or switch is in position for running, while another set of bars, 33 to 47, are arranged to engage the stationary contact-points when the switch is in the braking positions.

As a preferred form of automatic reversing-switch K, the same is shown provided with contact-bars 48 to 59 and formed in two sections, each of which comprises a drum M, rotatably and slidably mounted on a shaft or spindle N, which is secured in the end of armature-shaft U or some other rotating part of the car. On the spindle is pivoted a pair of arms O, carrying the centrifugal weights or balls P at one end and bearing against the drum N at the other end. A spring W normally tends to force the arms toward each other and the drum against the end of the rotating shaft, thus causing sufficient frictional contact to rotate the drum with the shaft. The springs W are so adjusted that when the car is moving at normal or any predetermined rate of speed the centrifugal force



of the balls P will turn the arms upon their pivot and relieve the pressure with which the drum bears against the shaft. The switches are shown in their neutral or open position, with the stationary fingers between the opposite sets of contact-bars, and the drum may also be provided with a projecting pin or lug 60, adapted to engage oppositely-located fixed stops 61 and 62, so that the drum can rotate only from one of its positions to the other. It will now be apparent that when the car comes to a stop the speed-controlled device tends to force the friction members of the automatic switch device into contact, so that when the car starts to move the switch will be thrown to one position or the other, according to the direction the car is moving. Then as the speed of the car increases the speed-controlled device will relieve the pressure between the friction members, and thus prevent excessive wear and resistance, the switch remaining in the position to which it is thrown until the direction of movement of the car is reversed.

The automatic reversing-switch could obviously be used without the speed-controlled device, if desired, and while I have shown a particular form of switch it is to be understood that my invention is not limited thereto, but that any form of automatic reversing-switch operated by the movement of the car may be used. Various other forms of speed-controlled devices may also be used in the place of that shown for throwing off the friction-clutch or relieving the pressure between the friction members of the device.

The operation is as follows: It being desired to run the car forward, the hand-operated reversing-switch D and the braking-controller B are set in their corresponding positions and the running-controller C moved to its first point. The current then enters from trolley T to bars 13 and 14, thence by lead R' through resistance R, lead 19 to bar 4 on reversing-switch, lead A' to bar 29 on the braking-controller, and through armature A of No. 1 motor, lead A A' to bar 30 on the braking-controller and to bar 3 on reversing-switch, lead F' through field F of No. 1 motor, lead E' to bars 21 and 20 on running-controller, lead 15 to bar 2 on reversing-switch, lead A<sup>2</sup> to bar 31 on braking-controller and to armature A of No. 2 motor, lead A A<sup>2</sup> to bar 32 on braking-controller and to bar 1 on reversing-switch, lead F<sup>2</sup> to field F of No. 2 motor, lead E<sup>2</sup> to bar 28 on braking-controller, and thence to ground G or return-trolley. When the car starts to move, the automatic reversing-switch will immediately be thrown to forward position, with bars 48, 49, 54, and 55 engaging the stationary contact-fingers S', A A', L', A', S<sup>2</sup>, A A<sup>2</sup>, L<sup>2</sup>, and A<sup>2</sup>; but this will have no effect upon the running or power circuits, since the leads S', S<sup>2</sup>, L', and L<sup>2</sup> are open at the braking-controller. Further movements of the running-controller serve to control the current in the usual way. When it is desired

to apply the brakes, the running-controller is thrown to "off" position and the braking-controller is moved to first braking position. The current may then be traced as follows: From the armatures of the motors, now acting as generators, by leads A' and A<sup>2</sup> to bars 49 and 55, respectively, of automatic reversing-switch, thence by respective leads L' and L<sup>2</sup> to contact-bars 38 and 37 on braking-controller, thence to bar 33 and through the resistance R to R—, contact-bars 39 and 40 on braking-controller, lead B C through brake-magnet coils H to contact-bars 46, 45, and 47 on braking-controller. Here current divides, one line returning by lead F' to field of No. 1 motor, lead E' to bars 44 and 43 on braking-controller, thence by lead S' to bar 48 on automatic reversing-switch, and by lead A A' back to armature of No. 1 motor. The other branch of the current returns from bar 47 by lead F<sup>2</sup> to field of No. 2 motor, lead E<sup>2</sup> to bars 41 and 42 on braking-controller, lead S<sup>2</sup> to bar 54 on automatic reversing-switch, and by lead A A<sup>2</sup> back to armature of No. 2 motor. Further movement of the braking-controller serves to cut out resistance in the brake-circuit in the usual way. If after thus being brought to a stop the car should start to run downgrade backward, the automatic switch K would be immediately reversed and the braking-controller could be used to stop the car, the same as in forward braking. Tracing the course of the current under these conditions, the armatures revolving in the opposite direction from what they were before the current flows from the armatures by leads A A' and A A<sup>2</sup> to the respective bars 51 52 and 57 58 of the switch K, thence by leads L' and L<sup>2</sup>, as before, to the resistance, through the fields, returning by leads S' and S<sup>2</sup> to bars 50 53 and 56 59 on the switch K, thence by the respective leads A' and A<sup>2</sup> back to the armature of the motors. It will thus be seen that the automatic reversing-switch always sets itself in position to establish the proper connections for the brake-circuit, no matter in which direction the car may be moving. It will also be noted that when the braking-controller is thrown to any of its braking positions the hand-operated reversing-switch D is cut out from the brake-circuit altogether, so that even if switch D should accidentally be thrown by hand during the braking it would interfere in no way with the brake-circuit. After being brought to a stop at any time the car may be started again merely by the usual movements of the controllers.

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

1. The combination on an electric car of one or more motors, a braking switch or controller adapted to connect up the motor or motors in a local brake-circuit, and a reversing-switch operated by the movement of the car.

2. The combination with one or more gen-



erators, of a braking-controller adapted to connect up the generators in a brake-circuit, and a reversing-switch operated by a movable part of the generator.

5 3. The combination on an electric car of one or more motors, a power-controller, a hand-operated reversing-switch, a braking-controller, an automatic reversing-switch, and means operated by the movement of the car  
10 for throwing said automatic switch.

4. The combination on an electric car of one or more motors, a braking-switch for connecting up the motor or motors in a local brake-circuit, an automatic reversing-switch and  
15 means having frictional engagement with a rotating part of the vehicle for operating said reversing-switch.

5. The combination with an automatic reversing-switch and means having frictional  
20 engagement with a rotating part of a vehicle for operating said switch, of a speed-controlled device for relieving the friction between said parts when the speed exceeds a certain rate.

25 6. The combination with one or more motors and a braking-switch for connecting up the

motor or motors in a local brake-circuit, of an automatic reversing-switch, a friction mechanism operated by the movement of the vehicle for throwing said reversing-switch  
30 and a speed-controlled device acting upon said friction mechanism.

7. The combination with one or more motors and a hand-operated reversing-switch, of an automatic reversing-switch operated by the  
35 movement of the car and a braking-switch adapted to cut out the hand-operated reversing-switch when moved to braking position.

8. The combination with one or more motors and a hand-operated reversing-switch, of an  
40 automatic reversing-switch operated by the movement of the car and a braking-switch adapted to cut out the hand-operated reversing-switch when in braking position and to cut out the automatic switch when in run-  
45 ning position.

In testimony whereof I have hereunto set my hand.

FRANK C. NEWELL.

Witnesses:

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