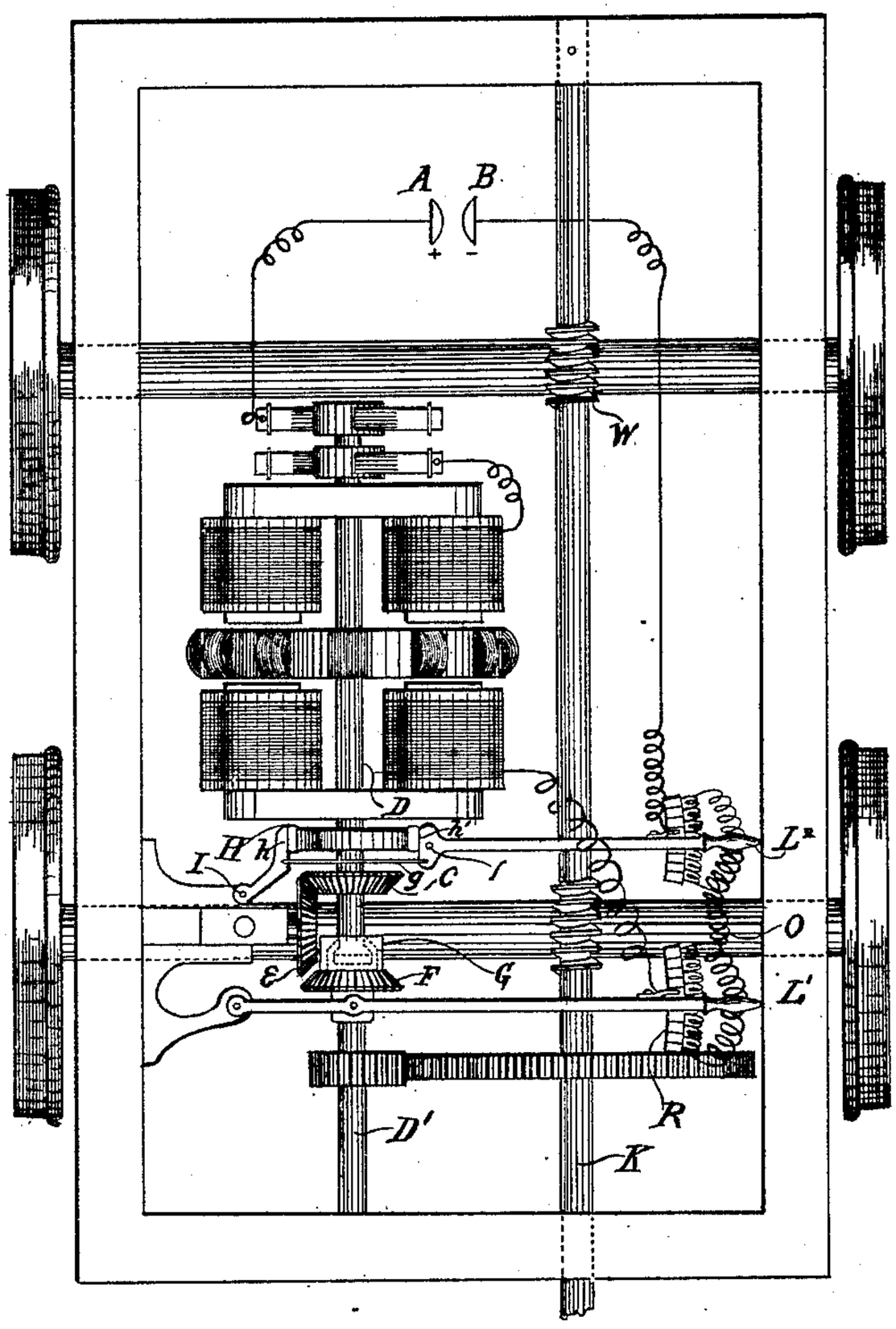
(No Model.) 2 Sheets—Sheet 1.

E. M. BENTLEY.

ELECTRIC CAR MOTOR.

No. 424,699. Patented Apr. 1, 1890.

FIG. 1.



WITNESSES

F. O. Blackwell.

F. P. Prindle.

INVENTOR

Edward M. Bentley

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Attys.

(No Model.) 2 Sheets—Sheet 2.

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ELECTRIC CAR MOTOR.

No. 424,699. Patented Apr. 1, 1890.

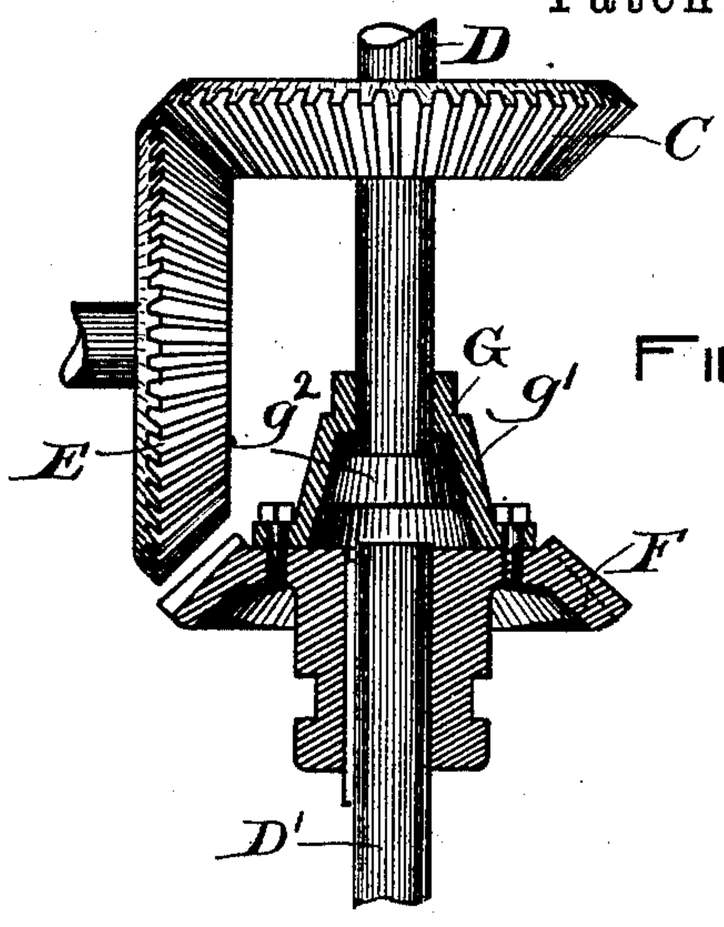

FIG. 2.

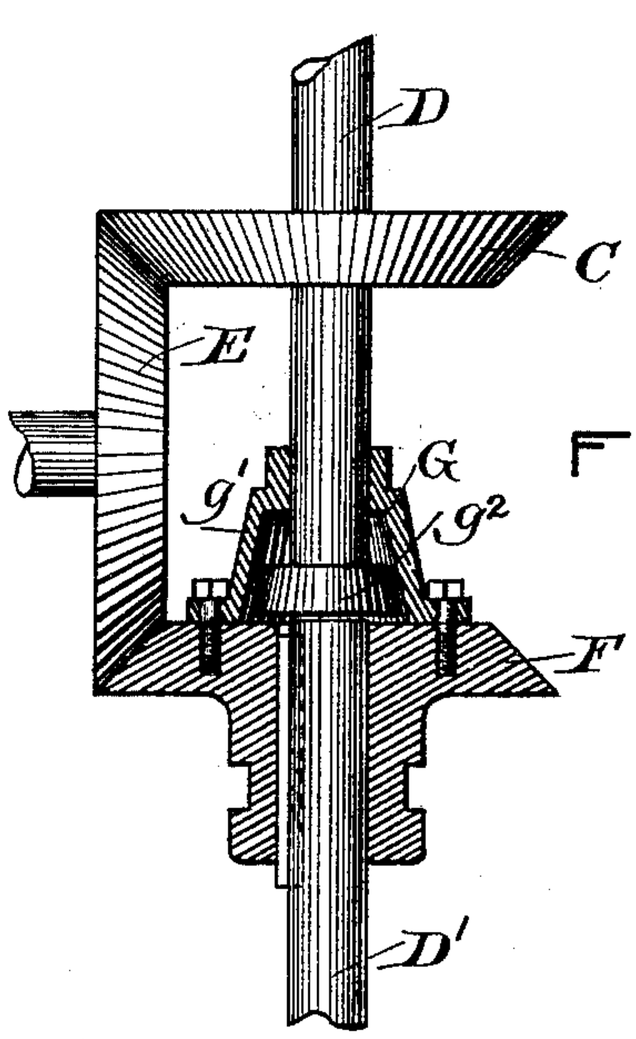

FIG. 3.

WITNESSES:

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ATTYS.

UNITED STATES PATENT OFFICE.

EDWARD M. BENTLEY, OF NEW YORK, N. Y.

ELECTRIC-CAR MOTOR.

SPECIFICATION forming part of Letters Patent No. 424,699, dated April 1, 1890.

Original application filed July 10, 1885, Serial No. 171,195. Divided and this application filed July 30, 1887. Serial No. 245,758.

(No model.)

To all whom it may concern:

Be it known that I, EDWARD M. BENTLEY, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Electric Motors, of which the following is a specification.

My invention relates to a method of and apparatus for operating electric motors so that they may be readily controlled and the relative directions of movement of the motor and driven mechanism reversed, the said method being especially applicable to motors employed in propelling vehicles on an electric railway and arranged in multiple-arc circuit. When two or more motors are in multiple arc with one another, it is desirable that in stopping the operation of the machine driven by either of the said motors the motor should be mechanically disconnected from its load. It is also desirable that the commutator-brushes of the motor should have a constant direction of lead, so that the motor may constantly rotate in one direction, while mechanical devices are employed to reverse the connection of the motor with its load, so that while the motor runs in a constant direction the mechanism driven thereby may run in relatively-opposite directions. I have found it desirable that the motors used in this manner should have their armature-coils and their field-magnet coils in series with each other, so that when there is any decrease in the counter electro-motive force of the motor the consequent increase of current in the motor-circuit will act to strengthen the power of the field-magnets.

My invention is shown in the accompanying drawings, wherein—

Figure 1 is a plan having the circuits leading to and from the motor represented diagrammatically, and Figs. 2 and 3 are details of the clutch mechanism.

For changing mechanically the connection of the motor with the vehicle I employ the mechanism controlled by the lever L′. D is the motor-shaft, upon which is the beveled friction or gear wheel C. This wheel C meshes with a similar wheel E, and E in one position of lever L′ engages with a third wheel F, which is on shaft D′, so that for a given direction of rotation of D an opposite direction of rotation is imparted to D′. In the other position of lever L′ wheel F, which has a sliding motion on D′, is thrown out of engagement with E, and at the same time a friction-clutch G between D and D′ is thrown into action, so that a given direction of rotation of D imparts the same direction of rotation to D′. The friction-clutch, as shown in Figs. 2 and 3, consists of two cone-shaped members g' g^2, the former of which is fixed upon shaft D, and the latter is attached to the gear or friction wheel F and moves therewith toward and away from shaft D. The gear or friction wheel upon shaft D′ engages with corresponding wheels upon the counter-shaft K, and upon the shaft K are worms W, engaging with worm-wheels on the axles of the car. The lever L′ also controls a resistance R in the motor-circuit, so that when the lever is in its middle position the maximum resistance is inserted in the motor-circuit, and any racing of the motor when freed from its load is thus automatically prevented. The circuit after leaving the motor, to which it may be readily traced from contact A, goes to an insulated contact-piece upon lever L′, which is adapted to sweep over a series of contact-plates, so as to include more or less of resistance R in the motor-circuit, and from this resistance R the circuit passes by wire O to a similar resistance controlled by lever L^2, and thence passes to a negative contact B.

On the shaft D is a brake-wheel H. The brake-shoes h' h' are on opposite sides of the wheel, the former being pivoted at I and the latter at f. A rod g connects the two shoes, so that a single movement of lever L^2 operates them both to apply them or remove them simultaneously to or from the brake-wheel H. The lever L^2 also controls a resistance in the motor-circuit, so that the current through the motor may be decreased at the same time that the brake is applied.

It will be seen by applying the brake directly to the motor-shaft a mechanical advantage is gained through the intermediate gearing between the motor and the axle of the car.

The method of using my invention will be readily understood from the foregoing de-

scription of the mechanism employed, for let it be supposed that the motor is driving the car or other driven mechanism in one direction, and that it is desired to reverse the direction of movement. The lever L′ will be shifted sufficiently to disconnect the load from the motor. The motor is also regulated so as to prevent its racing, and then when the momentum of the driven mechanism has been reduced to such an extent that it will not overpower the motor the lever L′ is moved still farther, and the load is again connected to the motor, which will then drive it in the opposite direction, the relative directions of movement of the motor and driven mechanism being changed without reversal of the motor. Furthermore, when it is simply desired to stop and start the driven mechanism without altering the direction of movement, the same method is employed, except that the lever L′ is moved back again to its original position instead of forward to shift the mechanical connections.

This application is a division of my application, Serial No. 171,195, filed July 10, 1885.

What I claim is—

1. The method of reversing the direction of movement of mechanism driven by an electric motor operating upon a constant-potential circuit, which consists in disconnecting the mechanism from the said motor, regulating the motor to prevent racing of the same, shifting the mechanical connections between the motor and driven mechanism, so that the relative directions of movement of the motor and driven mechanism will be reversed, and, finally, in reconnecting the motor with its load when the momentum of the driven mechanism has been reduced to a point where it will not overpower the motor, substantially as set forth.

2. The method of controlling the movement of mechanism driven by an electric motor, which consists in disconnecting the driven mechanism mechanically from the motor, regulating the freed motor to prevent racing of the same, and, finally, in reconnecting the mechanism with the motor, substantially as set forth.

3. The combination, with an electric motor having its commutator-brushes set with a constant direction of lead, of a driven mechanism operated by said motor, power-transmitting gearing between the motor and driven mechanism, a mechanical reversing device for altering the relative directions of movement of the motor and driven mechanism, and a regulator to prevent racing of the motor when freed from the driven mechanism, substantially as described.

4. The combination of an electric motor and a driven mechanism with a mechanical reversing-gear for altering their relative directions of movement, and a regulator for controlling the electric motor, automatically operated by the reversing-gear, substantially as described.

5. The combination of an electric motor on a constant-potential circuit with a driven mechanism, an intermediate clutch for connecting and disconnecting the motor and driven mechanism, and a regulator for the motor, automatically operated upon the disengagement of the motor from its load to prevent racing of the motor, substantially as described.

6. The combination of an electric motor and driven machine operated thereby, a brake for arresting the movement of the driven mechanism, a regulator for the motor, and a common controlling device for both the regulator and brake, substantially as described.

7. The combination of a reversing mechanism between the motor and its load and a resistance in the motor-circuit controlled thereby.

8. The combination, with an electric motor and its load, of an intermediate speed-reducing mechanism and a brake for arresting the movement of the driven load applied through said intermediate mechanism.

9. The combination, with an electric motor and its load, of intermediate speed-reducing mechanism, a brake-wheel on the motor-shaft, and a brake for arresting the movement of the load applied through said wheel, substantially as described.

EDWARD M. BENTLEY.

Witnesses:
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ROBT. W. BLACKWELL.