(No Model.) 3 Sheets—Sheet 1.

W. BIDDLE & P. KENNEDY.

ELECTRIC CAR LIGHTING SYSTEM.

No. 517,998. Patented Apr. 10, 1894.

Fig. 1.

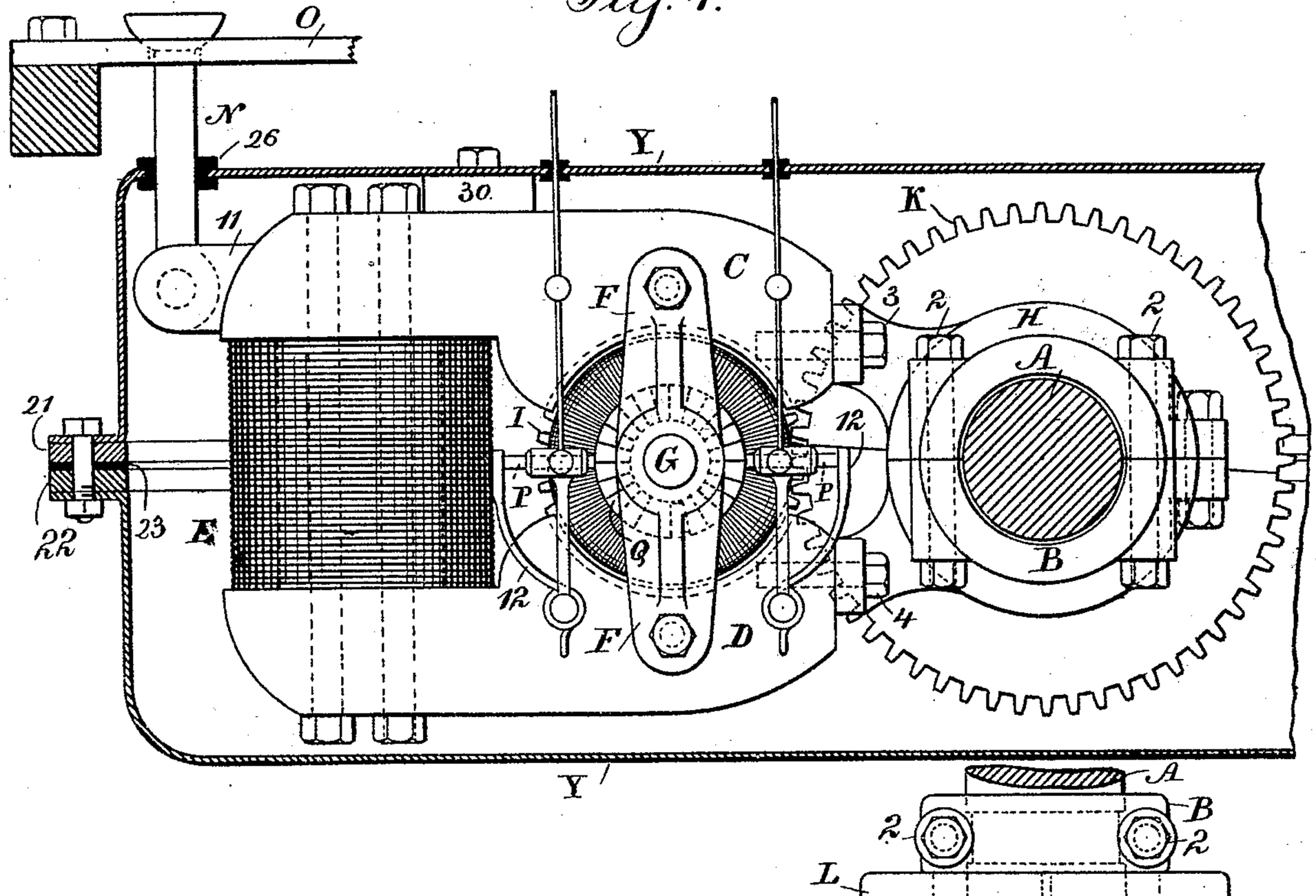

Fig. 2.

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(No Model.)

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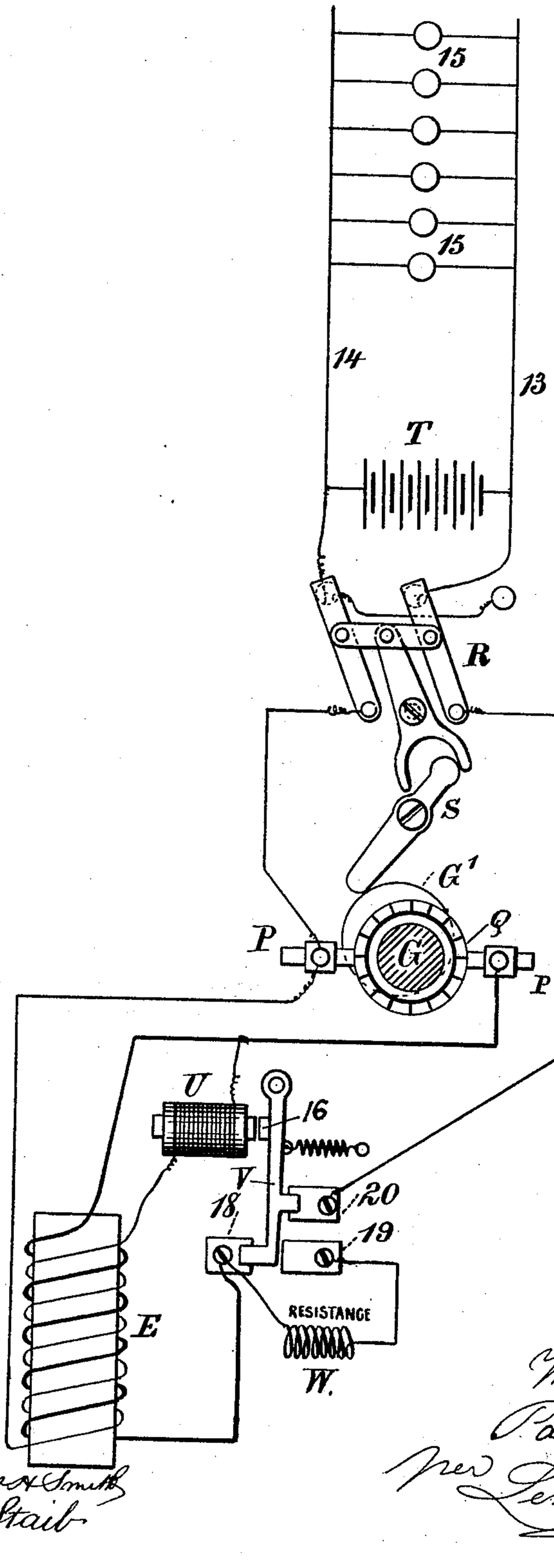

Fig. 3.

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Fig. 4.

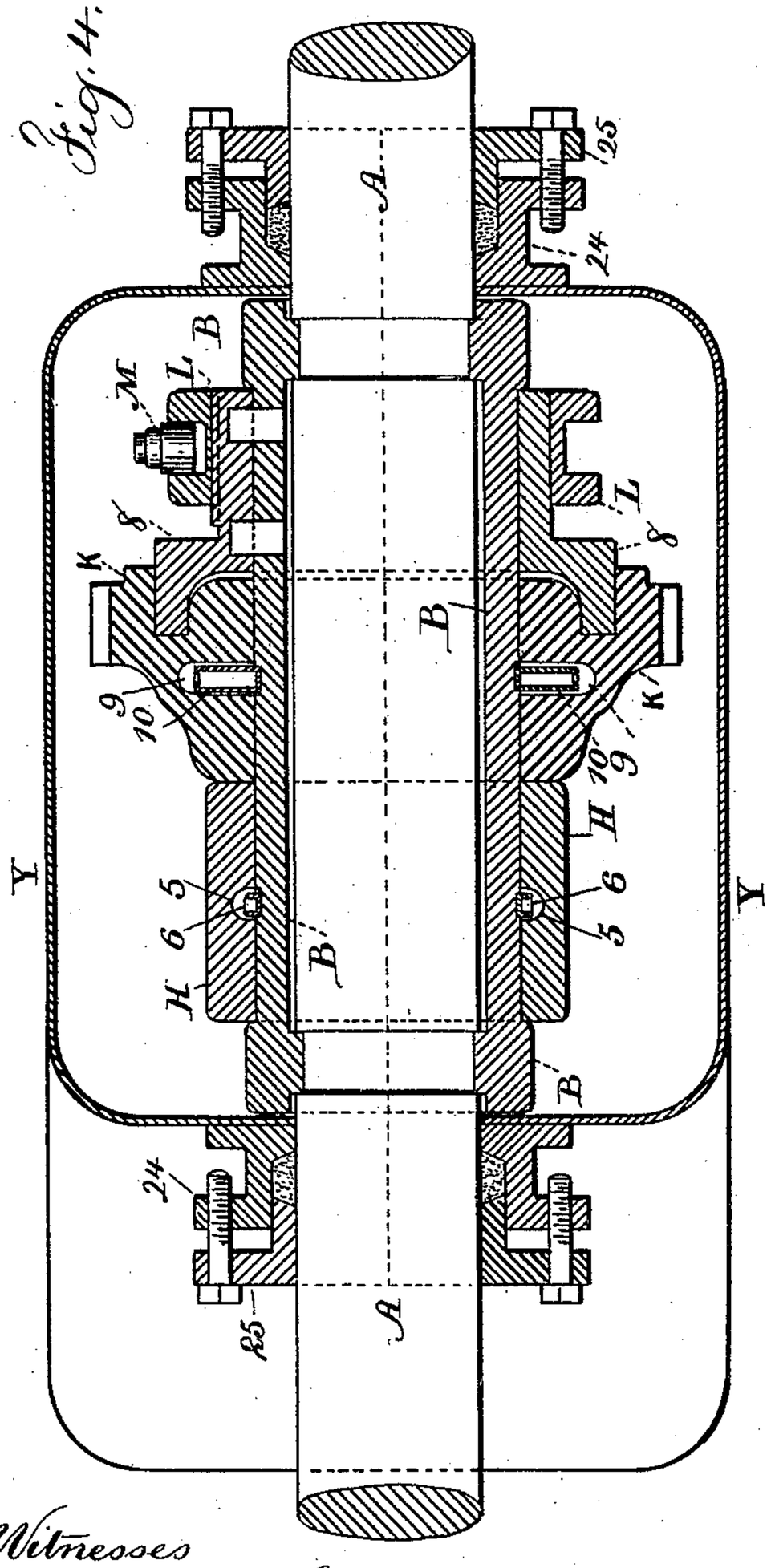
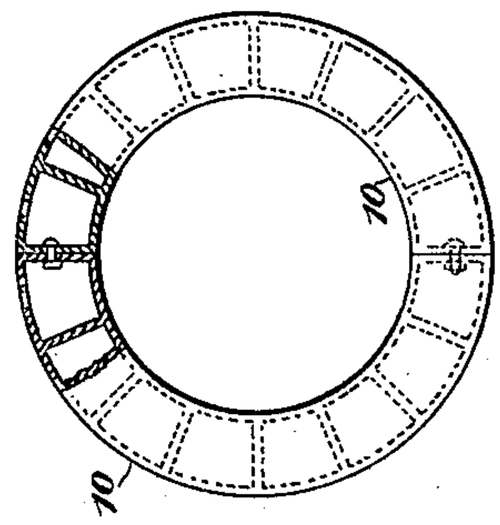


Fig. 5



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UNITED STATES PATENT OFFICE.

WILLIAM BIDDLE AND PATRICK KENNEDY, OF BROOKLYN, ASSIGNORS TO THE AMERICAN RAILWAY ELECTRIC LIGHT COMPANY, OF NEW YORK, N. Y.

ELECTRIC CAR-LIGHTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 517,998, dated April 10, 1894.

Application filed April 20, 1893. Renewed December 27, 1893. Serial No. 494,828. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM BIDDLE and PATRICK KENNEDY, citizens of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented an Improvement in Electric Lighting for Railway-Cars, of which the following is a specification.

Before our invention a dynamo had been driven by the rotation of the car wheels and the electric energy passed through a secondary or storage battery from which the current was taken to the incandescent lamps.

Our present improvements relate to the manner of supporting and actuating the dynamo and to automatic devices for changing the circuit connections when the direction of rotation of the dynamo is varied by the change of direction of the car and also for preventing the storage battery from discharging through the dynamo when the rotation of the dynamo is slowed down or stops.

In the drawings, Figure 1 is an elevation of the dynamo and section of the car wheel axle. Fig. 2 is a plan view partially in section showing the supporting devices for the dynamo. Fig. 3 is a diagram of the circuits and of the automatic circuit changing devices. Fig. 4 is a section longitudinally of the axis and the parts therewith connected, and Fig. 5 is a section of the oil lifting ring around the sleeve.

Upon the axle A of the car a sleeve B is screwed by bolts 2 which pass through the lugs near the respective ends of the sleeve, such sleeve being made in halves so as to be applied upon the car axle, and the bolts clamp the half sleeves firmly to the axle and such sleeves are fitted to receive the respective parts at one end of the dynamo. The frame of the dynamo consists of the poles C and D connected by the core of the electro-magnet E, and extending across from one pole to the other are frames F that support the armature shaft G, which armature shaft, armature and electro-magnet are of any desired character and the field magnet is to contain two coils, one of which is in a shunt and the other in series, as hereinafter described. The poles of the dynamo are connected by the bolts 3 and 4 to a divided ring H which surrounds the sleeve B near one end thereof, and this divided ring H is recessed at 5 for the reception of oil or other lubricating material for lubricating the surface of the sleeve B that revolves within the divided ring H, and in this recess 5 and connected with the sleeve it is advantageous to employ an oiling ring 6, which, extending down into the oil holding recess, serves to lift up the oil and cause it to flow and distribute upon the surface of the sleeve and within the divided ring H to effect a perfect lubrication.

Upon the armature shaft G is a pinion I which gears with a wheel K upon the sleeve B and adjacent to the divided ring H; and this wheel K is loose upon the sleeve, and adjacent to it there is a suitable coupling as at L for connecting and disconnecting the gear K and sleeve B. This coupling L is preferably upon a feather projecting from the sleeve and provided with a neck for the reception of the fork of the clutch lever M by which the coupling L is slipped toward or from the gear wheel K; and we find it advantageous to employ the wedges 7 connected with the coupling ring L and acting upon the divided friction ring 8 to grasp or to liberate the gear wheel K and either actuate the dynamo or allow the same to remain quiescent. The lever M may be actuated in any suitable manner, either from the car while in motion, or by hand when the train is stationary.

It is advantageous to make the gear wheel K hollow to form an oil receptacle 9 within which is an oiling ring 10 clamped upon the sleeve and adapted to rotate within the oil receptacle and raise the lubricating material and lubricate the surfaces of the sleeve and gear wheel that are in contact, so that the axle and sleeve may be revolved freely when the dynamo is at rest.

At the opposite end of the dynamo frame to the divided ring H we provide one or more projections 11 to which are connected the link or links N and which links pass through a bar or frame O upon the truck frame, the upper end of the link N being rounding, so that the truck frame, as it rises or falls by the action of the weight of the car upon the

car springs, may raise or lower this end of the dynamo freely, thus suspending the dynamo at its outer end and allowing it to accommodate itself to the movement of the truck frame in relation to the axle without there being any undue strain or torsion upon the dynamo or any portion thereof.

We prefer to make use of radial brushes P for the commutator Q, such radial brushes being pressed toward the commutator by the springs 12; and it is to be understood that the respective parts are insulated in any well known manner.

We make use of a three-point switch R for changing the direction of the current, and this switch is actuated by a rocking lever S intervening between the switch and the armature shaft G, and upon this armature shaft G is a cam or eccentric G′, so that when the armature is revolving in one direction, the rocking lever S will be moved to one side and the circuits closed in one direction, or when the armature lever is rotating in the opposite direction the rocking lever S will be moved into the other position to reverse the circuit connections so as to cause the current to flow in the same direction through the external circuit, no matter which way the car may be running.

Referring now to Fig. 3, it is to be understood that the external circuit contains the conductors 13 and 14 passing through the car and the incandescent lamps 15 are in multiple arc, and the secondary or storage battery T is also in multiple arc, and in consequence of the three-point switch R being automatically changed according to the direction of rotation of the dynamo and of the car axle, the current set up in the dynamo passes through the external circuit and through the storage battery in the same direction and when the dynamo is not in operation the current from the storage battery is adapted to actuating the lamps, and when the dynamo is in operation the lamps will be actuated by the current therefrom and the current will also pass through and energize the storage battery according to the respective resistances and the saturation of the storage battery.

We make use of an electro-magnet or solenoid U, the armature of which is connected with the switch V that is moved between the contacts 18 and 19 according to the magnetism in the electro-magnet U, and the switch V remains in contact with the plate from the binding post 20, and there is a rheostat or resistance W in the circuit between 18 and 19. From one of the commutator brushes P the circuit passes to the switch R and a branch from the same commutator brush passes through the shunt winding of the field magnet and also through the helix of the magnet U, and thence back to the other commutator brush; and there is a connection between the binding post 20 and the switch R, and the series winding of the field magnet is in the circuit from one of the commutator brushes through such field helices to the contact 18, and when the switch V is upon the contact 18 the circuit passes through such switch V to the binding post 20 and thence to the switch R, thus placing one of the field helices in series to the external circuit. If now the speed of the dynamo armature slows up or stops, the current through the electro-magnet U is lessened or ceases, and the spring of the switch V draws the same back, closing contact at 19 so as to throw the rheostat W into the external circuit, and this rheostat is of sufficiently high resistance to prevent the storage battery discharging through the dynamo, but as soon as the speed of the dynamo armature is sufficient to energize the electro-magnet U the switch V is again attracted and the resistance W cut out by the armature closing the circuit upon the contact 18, thereby the entire current is passed through the external circuit containing the series wound helices of the field magnet.

By this improvement we are enabled to provide for lighting separate cars with incandescent electric lamps, and the circuit connections are so changed automatically that the lamps will either be energized by the storage battery or by the storage battery and dynamo jointly, and there is but little loss of energy when the dynamo is out of action.

It is advantageous to surround the dynamo and the gearing with a case which will exclude dust and moisture from the respective parts. With this object in view we prefer to make the case Y in two parts and of sheet metal, the two parts of the case having edge bars 21, 22 fastened upon the adjacent edges of the case and bolted together, there being a strip of rubber 23 to make a tight joint, and where the shaft or axle passes through the case we provide glands or stuffing boxes formed of the rings 24 permanently fastened to the case and the followers 25 with the intermediate fibrous material closely surrounding the axle A to which the parts are connected, and where the link N passes out through the case it is preferable to introduce a rubber washer 26 so as to exclude dust and moisture as far as possible.

We have represented a portion of the case in Fig. 1, and in Fig. 4 the case is represented with the glands around the axle, the axle sleeve and the connected parts being in section.

The case may rest upon the top of the pole piece or there may be lugs or washers intervening between the case and the top pole piece, as indicated at 30.

We claim as our invention—

1. The combination with the external circuit containing the electric lamps and secondary battery in multiple arc, of a pole changing switch, a dynamo and a connection for driving the same from the car axle, and a revolving cam and lever for moving the pole changing switch according to the direction of rotation of the armature shaft and car axle, substantially as set forth.

2. The combination with a car axle and a dynamo, of a divided sleeve bolted upon the car axle, a divided ring around the sleeve and bolts for connecting the same to the dynamo frame, and a link between the dynamo frame and the truck frame for suspending the dynamo, substantially as set forth.

3. The combination with the car axle and truck frame, of a dynamo, a divided sleeve and bolts for securing the same to the car axle, a ring around the sleeve and bolts for connecting the same to the dynamo, a suspending link from the dynamo to the car truck, a divided gear wheel around the sleeve, and a pinion upon the armature shaft, and a coupling or clutch for connecting and disconnecting the gear wheel and sleeve, substantially as set forth.

4. The combination with the car axle and truck frame, of a dynamo, a divided sleeve and bolts for securing the same to the car axle, a ring around the sleeve and bolts for connecting the same to the dynamo, a suspending link from the dynamo to the car truck, a divided gear wheel around the sleeve, a pinion upon the armature shaft, a coupling or clutch for connecting and disconnecting the gear wheel and sleeve, there being recesses in the divided gear and in the ring of the armature frame for containing lubricating material, and rings around the sleeve and within the recesses for supplying the lubricating material to the surfaces of the sleeve, substantially as set forth.

5. The combination with the external circuit and incandescent lamps and storage battery in multiple arc and within a railway car, of a dynamo, a pole changing switch and an automatic means for moving the same for maintaining uniformity in the direction of the current in the external circuit, regardless of the direction of rotation of the armature of the dynamo; a magnet and armature controlled by the magnet and acting as a switch, a resistance thrown into the external circuit by the movement of the armature when the rotation of the dynamo armature is lessened or stops, one helix of the armature field being in a shunt and the other in series with the external circuit, substantially as set forth.

6. The combination, with the dynamo, of the axle, a sleeve upon the axle, a supporting ring around the sleeve and connected with the dynamo, a gear surrounding the sleeve, a clutch for connecting and disconnecting the sleeve and the gear, and a pinion upon the axle of the armature, a two-part case with edge bars for supporting the meeting edges of the case, and an elastic intervening packing, and packing glands around the axle and connected with the case for excluding dust and moisture from the dynamo and gearing, substantially as set forth.

Signed by us this 17th day of April, 1893.

WILLIAM BIDDLE.
PATRICK KENNEDY.

Witnesses:
GEO. T. PINCKNEY,
A. M. OLIVER.