(No Model.)

J. H. GUEST.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

No. 537,415. Patented Apr. 9, 1895.

Fig. 1.

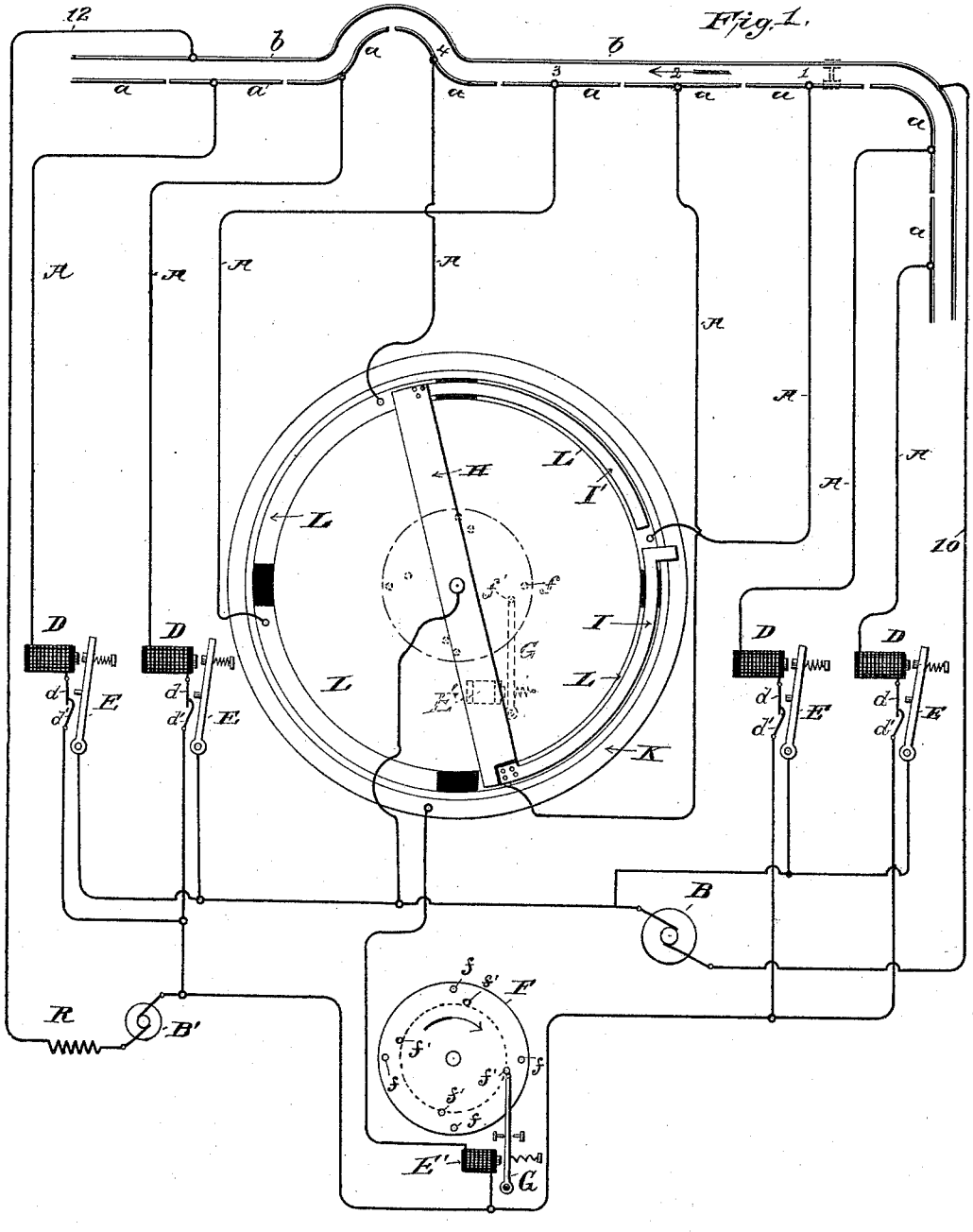
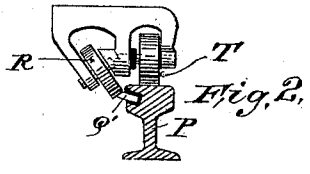


Fig. 2.



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SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 537,415, dated April 9, 1895.

Application filed July 6, 1893. Serial No. 479,742. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. GUEST, a citizen of the United States, and a resident of Boston, in the county of Suffolk and Commonwealth of Massachusetts, have invented a certain new and useful Improved Electric Railway, of which the following is a specification.

My invention relates to those electric railway systems wherein the working circuit or conductor from which the motor takes the electric power is divided into a number of sections which are successively put into and out of connection with the general source of electric power automatically as the car moves over the track.

My present invention consists of a series of insulated terminals to be connected up with the contacts or sections along the line, in combination with a wheel carrying a contact to make connection with the said terminals, means for turning the said wheel and an electro-magnetic device whose circuit is controlled from the traveling car for automatically operating said wheel step-by-step and locking it in both positions of the armature of said device to insure the proper contact being made in the switch to accord with the position of the car upon the line contacts or sections.

My invention consists also in the combination of a number of sections of working conductor, a sectional switch; sections of which are individually connected to the sections of working conductor, a step-by-step escapement mechanism for operating said switch, a controlling electro-magnet common to the sections of working conductor, means for connecting said magnet to the sections in succession as the switch moves step-by-step, and means for automatically locking the switch in both positions of the magnet's armature.

In the preferred form of my invention I so organize the switch contacts of the rotary switch that there shall be no interruption of power current, the first step forward of the rotary switch in shifting from one feeder to another being made to leave the power contact arm upon the feeder and the next step being caused to throw it from said segment to the next segment of the switch.

My invention consists further in special combinations of apparatus as hereinafter more particularly described and claimed.

A further feature of my invention relates to the construction and mounting of the collecting or movable contact carried by the vehicle.

In the accompanying drawings:—Figure 1, is a general diagram and plan of an apparatus embodying my invention. Fig. 2, is an end view of a current collecting or contact device carried by the car.

In the drawings is shown the working conductor from which the car motor takes current as divided into eight sections indicated by the letter *a*, the return from such sections being by the conductor *b*. As well understood in the art the sections *a*, may be of any desired character, and the return connection *b*, may be a rail of the track on which the car moves but as the manner of completing circuit as the car moves along the track between the sections or divided portions of the working conductor and its return form no part of my invention, I do not herein show or describe them more fully in detail.

A, indicates the feeder wires which connect the several sections *a*, with the source of power current for driving the vehicle, here indicated at B, as the armature of a dynamo electric machine. The connections of the feeders with said power source are controlled by the switches to be presently described. The return circuit wire or connection for the generator B, is indicated by the numeral 10. The return wire or connection of the controlling circuit which governs the operation of said switches is indicated by the numeral 12, and a source of electric energy for operating the devices in said controlling circuit is indicated by the letter B′. As before stated this controlling circuit and the power circuit may be independent of one another to a greater or less extent as desired. As shown in the diagram the return circuits are independent but they have a common circuit over the feeders A, A, &c.

The controlling devices, the switches and the generators are preferably located at a common point from which the feeders A, A, &c., lead and the sections *a*, may be of greater or less length as convenience may dictate.

In the return wire or circuit 12, of the generator B, I prefer to place an artificial resistance R, to prevent the main or power current from feeding back through the latter generator. The energy of the controlling circuit or apparatus may obviously be very much less than that used for power purposes.

Of the eight sections indicated the two outer at each end of the portion of track shown are controlled by individual magnets and switches while the four intermediate ones which may be upon a section of track which it is desired to block against the entrance of a succeeding car while a car is running over it are connected to the rotary switch.

D, D, D, indicate the magnets of the individual controlling switches. Each operates upon an armature which is used as a circuit closing lever being for that purpose connected with one pole of the source B. The magnets D, are individually in the feeders A, and their circuits are normally completed at the station or point where they are located by means of a normally closed switch comprising two contacts *d*, *d'*, in one or both of which there is a bias tending to hold them in connection with one another. A contact carried by the armature lever E, of each switch by engaging with the arm or contact *d*, completes connection between the feeder and the source B, and at the same time separates said contact from the contact *d'*, which is in the controlling circuit leading from the generator B', as clearly indicated in the drawings.

As will be obvious the controlling circuit for each feeder is normally complete through the magnet D, the contacts *d*, *d'*, generator B', and feed wire 12, and ready for being closed when the car reaches a section *a*, by the device to be hereinafter described or by any other suitable means. When the magnet D, is energized by the closure of connection from *a* to *b*, the armature E, is drawn up thereby switching the power generator B, onto the feeder by contact of the armature lever with the spring or contact *d*. At the same time the controlling circuit over 12, and through generator B', is broken and the power current now flows through the magnet D, holding it up to its work for the purpose of keeping the power upon the particular feeder in question. When the power circuit is interrupted by the passage of a car off the section and the retractor used restores the switch E, to normal position thereby disconnecting the power generator from the feeder so that the particular section *a*, of the track will be dead.

It will be seen that in this system so long as a car is on the section the controlling circuit of generator B', over return wire 12, will be broken at the contact *d*, *d'*.

The rotary switch device which may be of any suitable mechanical construction adapted to make the changes of connection herein described is controlled in its operation by a magnet E', which operates upon a suitable escapement here typified as a disk F, carrying the two sets of escapements or stop pins *f*, *f'*. These pins engage with the end of the armature lever G, the inner ring of pins *f'*, serving to stop the movable arm H, of the switch device in the position shown in the drawings while the outer circle of pins *f*, serve to stop it temporarily in an intermediate position between full connection with the feeder of one section *a*, and the feeder of a succeeding section. The disk F, is rotated in the direction of the arrow by any suitable mechanical power, as is common with escapement mechanisms, and is properly secured to the shaft of the switch arm H, as clearly indicated in the plan view in dotted lines. The switch arm H, carries two springs or contacts one of which I, is properly insulated from said arm and is adapted to bridge the space between a continuous ring X, and the four contact segments L, to which the feeders A, are individually connected as shown. The other switch spring carried by the arm H, is indicated at I', and bears solely upon the segments L. The latter spring is that over which the power currents flow to the several feeders and sections *a*, while the spring I, is the one which governs the controlling circuits by which the magnet E', is operated to produce the proper movement of the switch so as to shift the power current from one feeder to another. The arm H, or any other part in connection with spring I', is connected with one pole of the power generator B, as indicated.

The switch springs I, I', are shown in the position which they occupy while current is being taken from section No. 1, of the four sections connected to the rotary switch. By following the circuits it will be seen that while connection is made from said section *a*, to the return *b*, there is a circuit for the switch controlling magnet E', by the ring K, spring I, and the segment connected to the feeder of said section, thence from *a*, to *b*, and by return wire 12, to the generator B', for the controlling current and back to the magnet E'. The armature of the latter is thereby held in position to be engaged with the pin *f'*, of the escapement. When by the passage of a car from section No. 1, the connection from *a* to *b*, is broken, the first effect is to de-magnetize magnet E', whose armature thereupon falls back into position to engage the next pin *f*, of the outer row of escapement mechanism. The effect of this is to allow the arm H, to rotate a short step sufficient only to shift spring I, to the next segment L, connected to No. 2, section *a*. The parts are so proportioned also that the spring I', is still left upon the segment L, of No. 1 section, so that during the momentary pause following the movement just described there will still be a circuit or connection to the No. 1 section *a*.

It should be here stated that the spring I', is preferably so constructed as to be capable of bridging the insulating spaces between the

several segments L, so that there may be no interruption of circuit in passing from one to the other.

So soon as the devices moving with the car complete connection with the No. 2, section *a*, and the return *b*, it will be obvious that the magnet E′, will be immediately re-energized thereby allowing the disk F, to rotate to the next pin *f′*, of the inner row thus bringing the arm I′, full over onto the next segment L, or into position corresponding to that indicated in the drawings but with the arm H, advanced ninety degrees. This completes the shifting from one sectin to the next of the sections *a*, and is not attended by any interruption of the power circuit in the switch from momentary pausing of the spring I′, at the half stop upon insulation.

The several sections *a*, of the power circuit are preferably composed as indicated in Fig. 2, of sections of rail Q′, which may be set in the side of the main rail P, but are normally insulated therefrom. As will be seen the rails Q′, are located so as not to be subject to accidental connection with objects upon the street's level. The contact device which bears upon the sections Q′, thereby completing the proper circuit upon the car from *a* to *b*, is preferably constructed as shown in this figure. R, is a rolling contact wheel corresponding to an ordinary trolley wheel but having its axle set at an angle to the horizontal axis of a support wheel T, which rides upon the main rail P, and carries a frame in which the roller R, is supported. The wheel T, riding on the main rail serves to preserve the proper relation of wheel R, to the contact rail Q′, and wheel R, being properly mounted and insulated there can be, as will be obvious, no opportunity for diversion of the current from rail Q′, to the main rail. Connection from the wheel R, is taken through the circuits on the vehicle in any desired manner.

It will be seen from the foregoing that the rotary switch described establishes a block of the power current so far as concerns the four intermediate sections *a*, so that after a car enters upon the portion of road containing said sections *a*, a succeeding car cannot draw a power current on said portion until the car ahead, as by passing off the last section, rotated the switch around to position for making connection with the first of the sections of working conductor.

As illustrating a use of the rotary switch the sections of working conductor that are connected to the same are here shown as located at a curved portion of the railway.

It will be readily understood by electricians that the mechanical details of my invention may be greatly varied without departing from the principle thereof.

What I claim as my invention is—

1. The combination, substantially as described, in a railway system, of a sectional working or contact conductor, feeders connected individually with said sections, a step-by-step switch having connections to said feeders, a controlling electro-magnet provided with means for locking the switch in both positions of the magnet's armature, and a power circuit arm and feeder contacts therefor adjusted as described to allow the arm to remain on the contact after the first step forward in the shifting operation.

2. The combination, substantially as described, with the several sections of working conductor, of a rotary switch for connecting the same in succession with the power generator, a step-by-step mechanism taking two steps in each operation thereof, a controlling magnet therefor whose armature locks the switch at each of said steps, and switch contacts and connections adjusted as described to preserve the connection with a section in the first step forward of the switch, as and for the purpose set forth.

3. The combination of a number of sections of working conductor, a sectional switch, sections of which are individually connected to the sections of working conductor, an electro-magnetic step-by-step escapement mechanism for locking said switch in both positions of the magnet's armature, and means for connecting said magnet to the sections in succession as the switch moves step-by-step.

4. The combination, substantially as described, in an electric railway, of a sectional contact or working conductor, feeders connected individually with said sections, a step-by-step switch having connections to a number of said feeders and provided with insulating and conducting contacts for breaking and making connection on said feeders in succession, a controlling electro-magnet for said switch in series with the motor and the feeders, and a traveling contact for connecting the said magnet in succession to said feeders.

5. The combination in an electric railway system, of a sectional working or contact conductor, feeder wires connected respectively therewith, a rotary electric switch for connecting said feeders in succession to the power generator, a governing electro-magnet in a circuit common to said feeders, and means for locking the switch in both positions of the magnet's armature, as and for the purpose described.

6. The combination, substantially as described, in an electric railway system, of a sectional working conductor and the several feed wires connecting with said sections, with a rotary electro-magnetic switch, a step-by-step mechanism therefor, a controlling magnet for operating the said step-by-step mechanism, and located in a circuit in series with the car motor and a traveling contact connected to said switch for completing the connection of the controlling magnet in succession with the feeders and the car motor and arranged as described to connect with the

feeder segment to which the switch moves when it operates and to break the connection of the preceding feeder segment for the purpose set forth.

7. In an electric railway, the combination with a sectional working conductor, of a rotary switch provided with insulated contacts individually connected respectively with the sections of said conductor, an electro-magnetic step-by-step mechanism for operating said switch the magnet thereof being in a circuit common to said sections, and a continuous contact for said switch located in said common circuit, said switch being also provided with an arm in the main circuit carrying a brush for engaging the sectional contacts and a brush for engaging both the sectional contacts and said continuous contact a contact in the said common circuit.

8. In an electric railway provided with a sectional working conductor, a step-by-step switch, for successively connecting the sections of the working conductor to the source of current, consisting of a series of insulated contacts, a continuous contact, an arm carrying a brush engaging with the insulated contacts and also a brush engaging with the insulated contacts and with the continuous contact, and a magnet for controlling the operation of said arm.

9. The combination, substantially as described, of a main rail, a special contact rail Q′, insulated from the former, a support wheel T, carried on the main rail, and a contact roller R, supported by the wheel T, and having its axis of rotation at an angle to the horizontal axis of the support wheel.

Signed at Boston, in the county of Suffolk and State of Massachusetts, this 1st day of July, A. D. 1893.

JOHN H. GUEST.

Witnesses:
HOMER ALBERS,
CHAS. O. ENGSTROM.