(No Model.) 2 Sheets—Sheet 1.

H. C. REAGAN, Jr.

ELECTRIC RAILWAY.

No. 556,210. Patented Mar. 10, 1896.

Fig. 2.

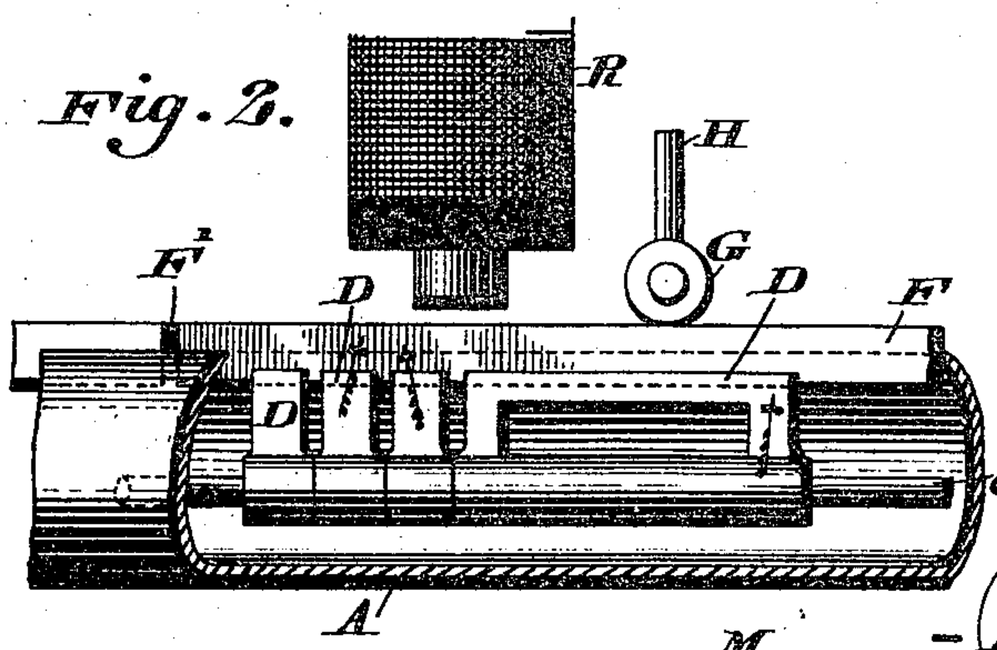


Fig. 6.

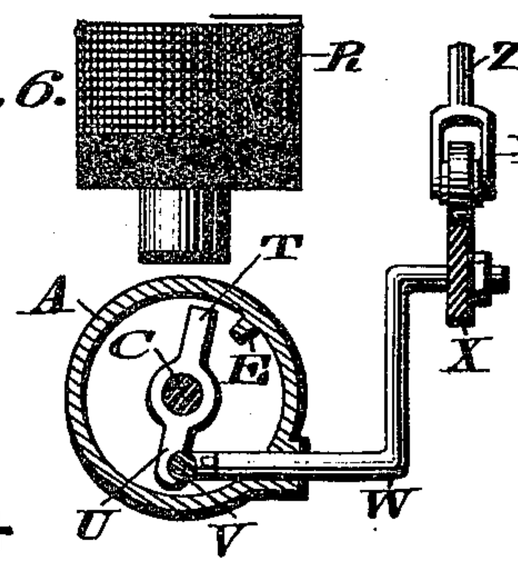


Fig. 1.

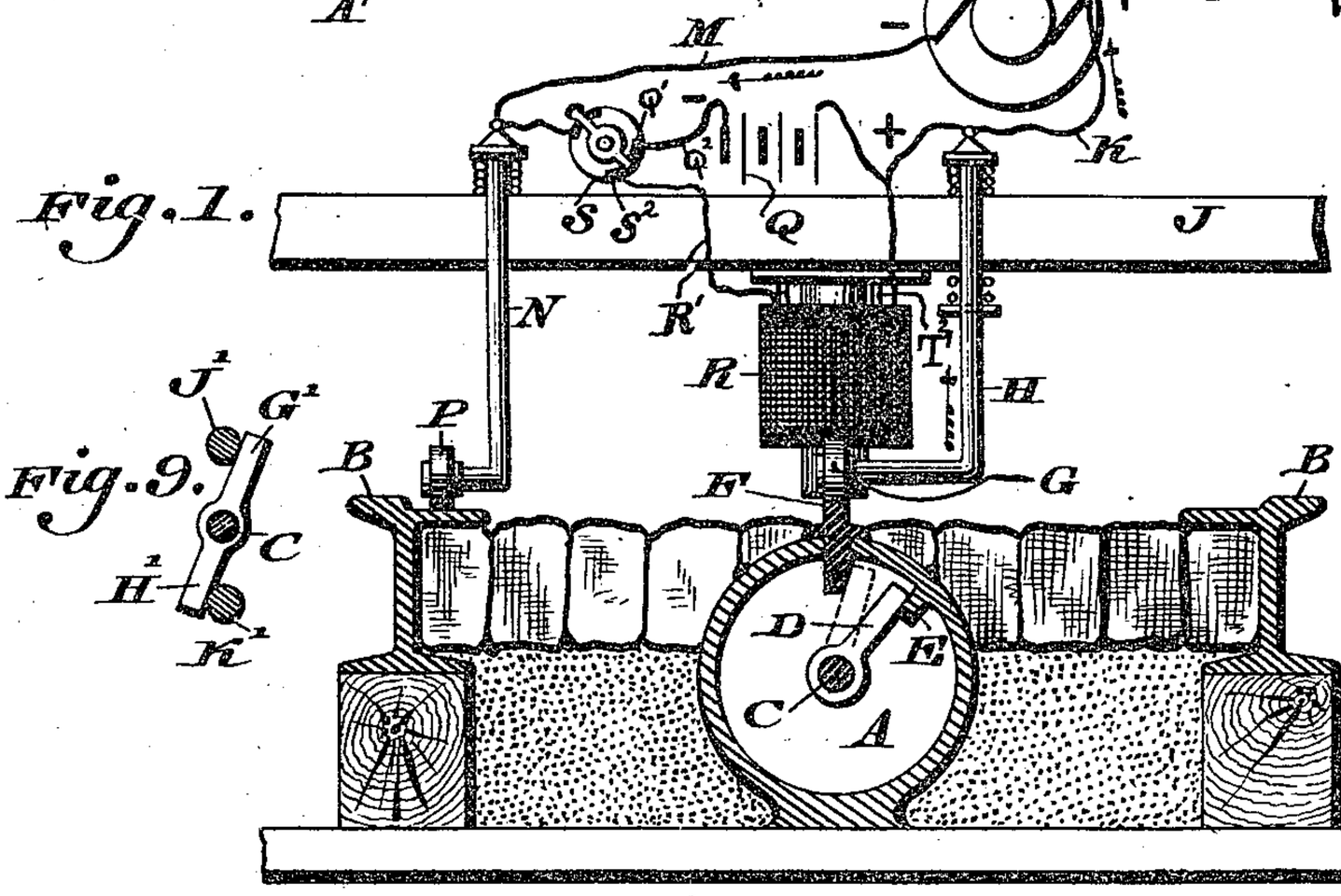


Fig. 9.

Fig. 4.

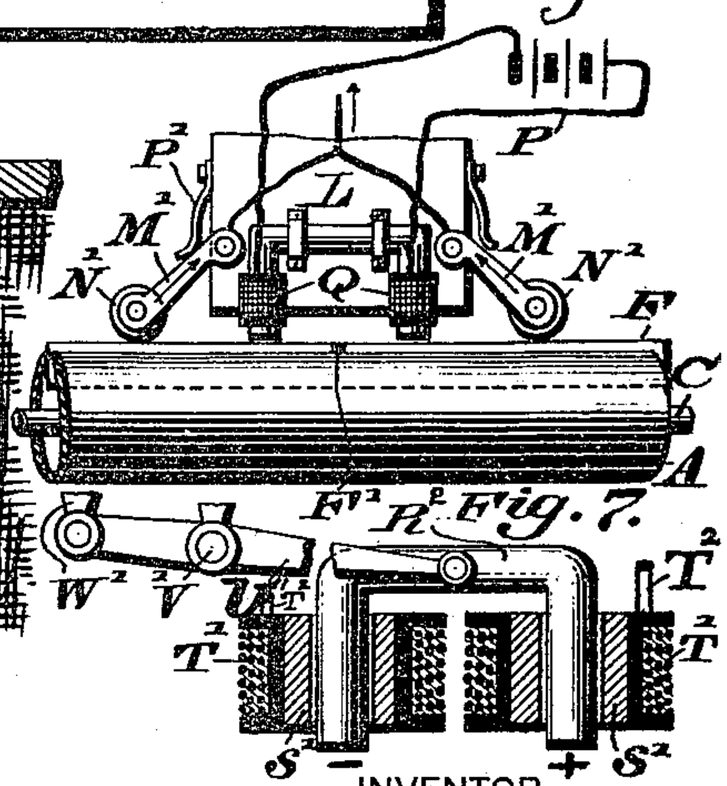


Fig. 5.

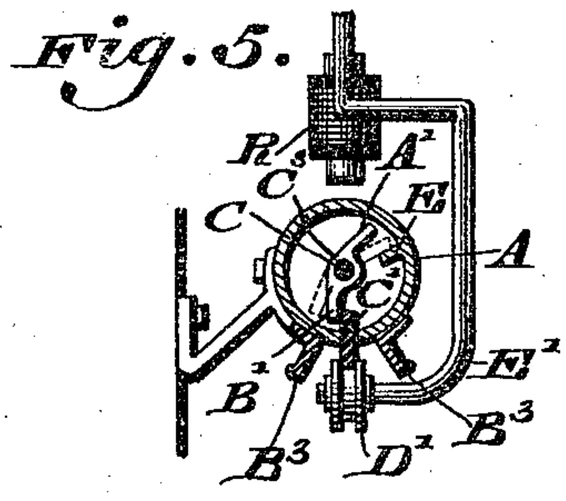


Fig. 7.

Fig. 8.

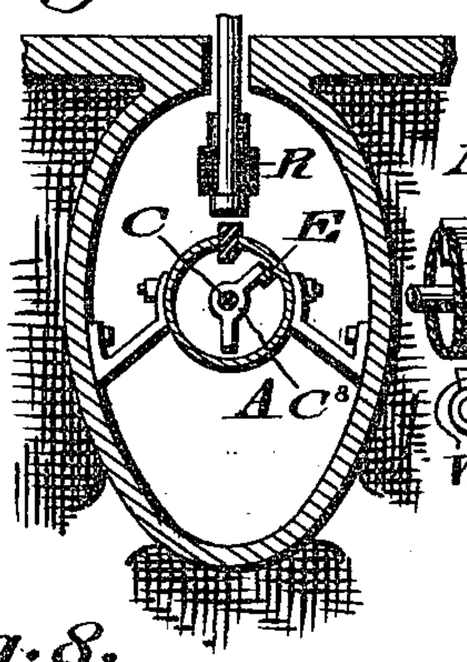
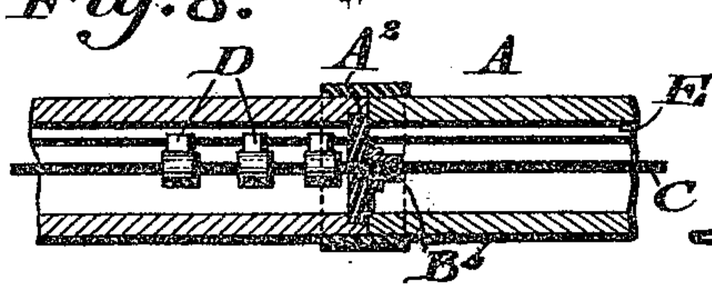


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

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ELECTRIC RAILWAY.

No. 556,210. Patented Mar. 10, 1896.

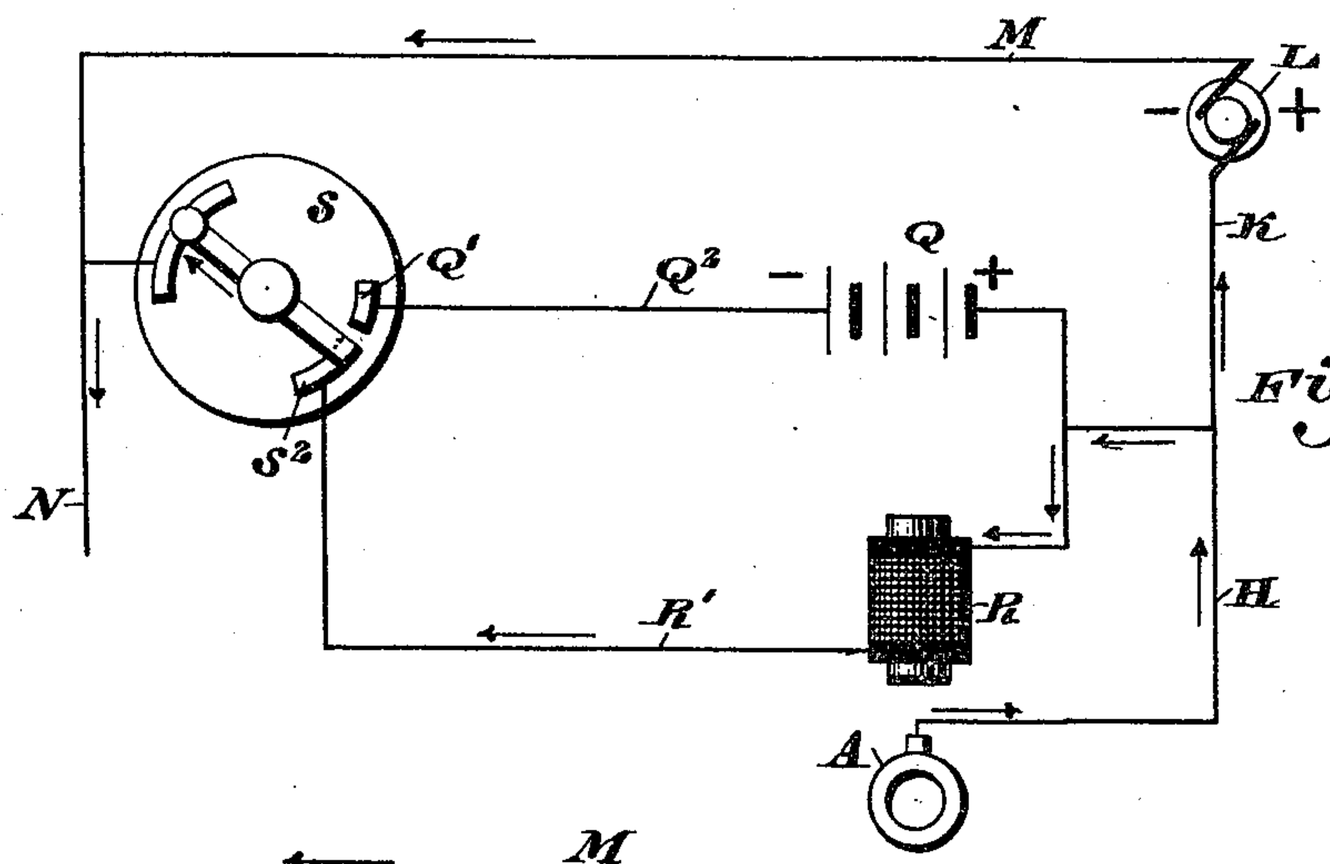

Fig. 10.

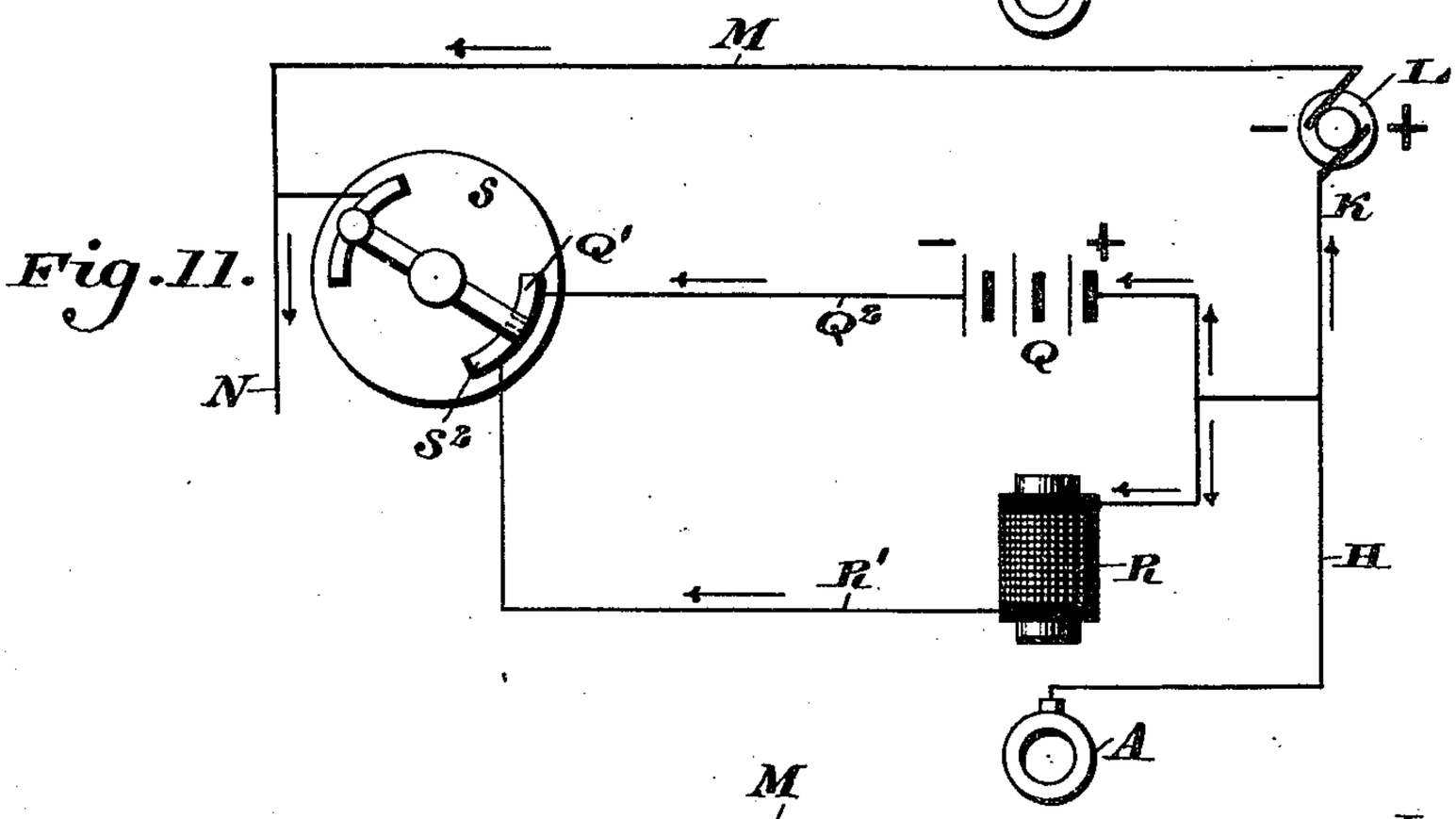

Fig. 11.

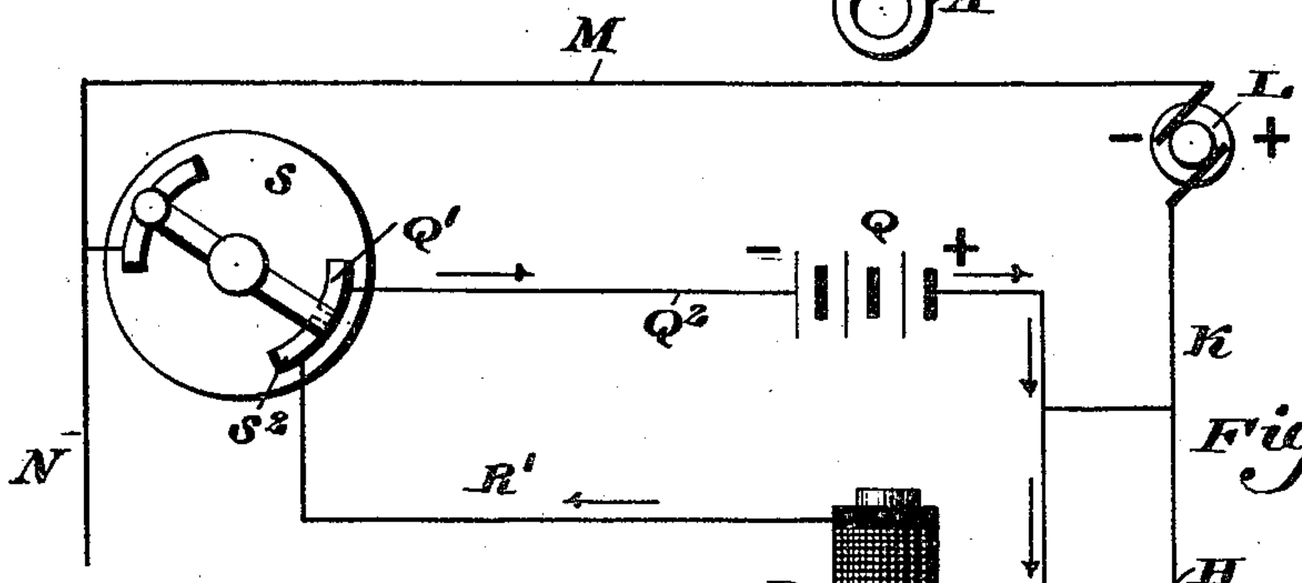

Fig. 12.

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ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 556,210, dated March 10, 1896.

Application filed September 6, 1895. Serial No. 561,619. (No model.)

To all whom it may concern:

Be it known that I, HARRY C. REAGAN, Jr., a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Electric Railways, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of a novel construction of electric railway in which the feed-wire is inclosed in a suitable underground conduit, connections being had therefrom to the motor upon the car in the novel manner hereinafter set forth and specifically pointed out in the claims.

Figure 1 represents a diagrammatic view, taken partly in transverse section, showing an electric railway embodying my invention. Fig. 2 represents a side elevation of the same, a portion of the conduit being shown in section. Fig. 3 represents a vertical transverse section of a cable-conduit of the usual construction after the same has been adapted to my invention. Fig. 4 represents a side elevation of a cable-conduit adapted to my invention. Fig. 5 represents a vertical sectional view of another form of cable-conduit adapted to my invention. Fig. 6 represents a vertical transverse section showing a different embodiment of the principle of my invention. Fig. 7 represents a partial sectional view showing a permanent magnet and its adjuncts employed, to be hereinafter referred to. Fig. 8 represents a partial sectional view of a conduit or casing, showing the preferred means employed for keeping the feed-wire taut. Fig. 9 represents a detail view showing another form of my invention. Fig. 10 represents a diagrammatic view similar to Fig. 1, showing the preferred manner of connecting the battery and magnet to the switch, the magnet being in shunt with the main circuit and the battery cut-out, the current being in circuit to the motor. Fig. 11 represents a diagrammatic view showing the current in circuit to the motor and the battery and magnet in parallel or multiple. Fig. 12 represents a diagrammatic view showing the battery and magnet in series, there being no current in the motor-circuit, but the magnet in the act of being charged by the battery.

Similar letters of reference indicate corresponding parts in the several figures.

In the drawings, referring first to Fig. 1, A designates a suitable conduit, which is composed of non-conducting material and is supported in any convenient manner between the tracks B.

C designates a feed-wire mounted in said conduit, said feed-wire having supported thereon the contact devices D, which may have insulating material between each and be constructed as shown at the right or left of Fig. 2, and which are adapted to rotate freely on said feed-wire, their extent of movement being limited by the longitudinally-extending ridge E and the contact strips or devices F, both of which extend within the conduit A, said contact devices being made in sections and having the insulation F′ interposed between the same.

G designates a roller or collector-wheel, which is adapted to contact with said strip F, which it is understood is to be of iron, copper, or other suitable conducting material, the said wheel G being mounted on the arm H, which is supported upon the body of the car J.

K designates a conductor leading from said arm H to the motor L, which may be of any well-known construction.

M designates a conductor leading from said motor to the arm N, on which is journaled the trail-wheel P, which contacts with one of the rails.

Q designates a storage-battery, which is supported in any convenient manner.

R designates an electric magnet which is in circuit with said storage-battery and also with the motor-circuit, as will be understood from Fig. 1, it being noted that said magnet acts as a shunt across the motor-circuit, and that a switch S, which is preferably located as indicated in Fig. 1, is employed to open this shunt when desired, a connection being made from the battery Q to the battery-point Q′ on said switch by means of the conductor Q^2, while a connection is made from the magnet R to the magnet-point S^2 on the switch by means of the conductor R′, which leads directly from the magnet to said magnet-point, and it will further be apparent that when the

motor is cut out the magnet-circuit should always be closed, so as to have the magnet in operation when starting before there is any current from the feed-wire C, the function of the battery being to energize the magnet R.

In the diagrammatic views in Figs. 1 and 10 to 12, inclusive, I have shown the preferred manner of making the connections between the switch, battery, and magnet, a connection being made from the battery Q to the battery-point Q′ on said switch by means of the conductor Q^2, while a connection is made from the magnet R to the magnet-point S^2 on the switch G by means of the conductor R′, which leads directly from the magnet to the said magnet-point, the proper connections being made between the feed-wire, the motor, the switch and the ground, as has been already described.

In Fig. 10 the switch is shown as being on the magnet-point, the current being in circuit to the motor, while the magnet is in shunt with the main circuit and the battery cut-out.

In Fig. 11 the switch is shown on both the magnet and battery-points, the current being in circuit to the motor and the battery and magnet in parallel or multiple.

In Fig. 12 the switch is shown on both the battery-point and magnet-point, the battery and magnet being in series. The battery is now performing its especial function, there being no current in the motor-circuit and the battery being in the act of charging the magnet, as indicated by the arrows.

In Fig. 6 I have shown the contact device mounted upon the feed-wire C provided with the two arms T and U, which extend in substantially a straight line, the lower arm, U, when the upper arm is attracted by the magnet being adapted to contact with the wire or conductor V, from which the current is conducted by the connections W to the contact device X, and thence by the collector-wheel Y and conductor Z to the motor, the principle being the same as in Fig. 1, it being understood that the arm T is sufficiently heavy to fall against the ledge E after the car has passed, and so move the arm U out of contact with the conductor V.

In Fig. 5 I have shown an adaptation of my invention to cable-roads, the conduit A being suitably supported, as before. The contact device mounted upon the feed-wire C in this latter case is provided with arms A′ B′, which are mounted on a hub or collar C^3 and extend at substantially an obtuse angle to each other, the lower arm, B′, being adapted to contact with the strip C′, on which latter travels the collector-wheel D′, the electricity being conducted to the motor through the conductor E′, as is evident, the arrangement of the battery, magnet, &c., being substantially the same as already described with reference to Fig. 1.

In Fig. 9, C designates the feed-wire, as before, and the contact device mounted thereon has its arms G′ H′ extending, as in Fig. 6, in substantially a straight line, the said contact device being, however, rigidly attached to the feed-wire C and the said arms G′ H′ drawn toward the conductors K′ J′ by the attraction of a magnet, as before, but after the magnet has moved away therefrom the said arms are moved away from said conductors by reason of the torsion of the wire C when the magnet leaves them, as is evident.

In Fig. 4 I have shown my invention adapted to cable-conduits of usual construction, L designating the cable-grip, upon the lower portion of which are mounted the arms M′, in which are journaled the collector-wheels N′, which contact with the strip F, communication being had between the latter and the feed-wire C by means of the devices shown in Figs. 1 and 2. P′ designates springs for causing said collector-wheels N′ to contact with said strip F. Q designates magnets, as before, which are suitably supported and serve to throw into operation the contact device D in the same manner as already described with reference to the other figures of the drawings.

In Fig. 7 I have shown a supplemental attachment for insuring the attraction of the contact devices, the construction of the same being as follows: R^2 designates a permanent steel magnet, bent in the present instance into the form of a horseshoe, upon the limbs or poles of which are mounted the soft-iron spools S′, upon which latter are wound spools of wire T′, which are supported by any suitable means, as the posts T^2, (seen in Fig. 7,) the above forming a combination-magnet, which after the current has passed through the spools of wire becomes an electromagnet, but in case there is no current passing through the spools the permanent magnet will act to attract the contacts D or their equivalents, as has been stated, it being understood that the spools are wound so as to act with the permanent magnet in such a way as to form the same polarity.

Under certain conditions it may be desired to raise or lower the permanent magnet R′, so as to bring it close to the top of the conduit when it is desired to use said magnet, and any suitable means may be employed for this purpose, as in the present instance the lever U′, which is fulcrumed at V′ and has one end pivotally attached to the said permanent magnet R′, the other end of said lever having an arm or other connection W′ extending upwardly and adapted to be actuated by the motorman according to requirements, it being understood that the limbs of said permanent magnet pass freely through the spools S′, so as to be readily adjustable relative thereto.

The operation is as follows: When it is desired to start the car, the battery is connected with the magnet R, and the latter being thereby magnetized it will attract the small contacts D, which are strung along the feeder C, and draw them up into contact with the strip F, and the electricity will be taken from

there to the collector-wheel G, and thence by the intermediate connections to the motor, a part of the current passing through the magnet R, whereby the battery Q will be charged at the same time, as is evident. Now as the car progresses the said magnet R will attract the contacts in the manner explained to the strips F, and as the magnets leave the contacts, due to the advance of the car, said small contacts will fall, by reason of gravity, away from said strip F, against the longitudinal ledge E, thereby cutting out the current from said strip F, it being evident, since the latter is made in sections which are insulated from each other by the insulation F′, that there will be no current ahead or back of the car.

The operation in Fig. 5 is the same as already described, the function of the magnet R being to attract the arm A′ of the contact device, thereby bringing the arm E′ into contact with the strip C, from which the electricity is conducted to the motor through the intermediate connections.

The operation is substantially the same in Fig. 6, the attraction of the magnet causing the arms U and T of the contact device to assume the position seen in said figure, the electricity being taken from the feeder C to the strip X, and thence by the collector-wheel Y and conductor Z to the motor.

The operation of the construction seen in Fig. 3 will, it is thought, be apparent, and the operation of Fig. 9 has already been described.

It will be evident that changes may be made in mounting and assembling the above parts which will come within the scope of my invention, and I do not, therefore, desire to be limited in every instance to the exact constructions shown and described.

The feed-wire C may be kept taut in any suitable manner—as, for instance, as shown in Fig. 8—said wire passing through the plate A^2, which is fixed in the conduit, said wire being held taut relatively thereto by means of the nut B^2, which is internally threaded and engages said wire, and is screwed into contact with said plate A^2.

In the preferred embodiment of my invention I attach to the under side of the conduit A the wings B^3, as best seen in Fig. 5, the function of said wings in said figure being to catch all moisture, &c., and so prevent the same from reaching the conductor C′, said moisture dropping off of said wings before it can reach said conductor, as is evident.

It will also be apparent in the construction shown in Fig. 9 that either of the conductors J′ or K′ may be the feeder, if desired.

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

1. In an electric railway, a feed-wire, and contacts rotatably mounted thereon, said feed-wire forming an axis for said contacts, substantially as described.

2. In an electric railway, the combination with a cable-grip having an electromagnet and contact devices mounted thereon, of a feed-wire, a suitable conduit therefor, and contacts rotatably mounted on said feed-wire, the latter forming an axis for said contacts, substantially as described.

3. In an electric railway, a feed-wire, an insulated conduit therefor, a sectional conductor mounted in said conduit, contacts rigidly fastened to said feed-wire, and adapted to be drawn to said sectional conductor by a magnet, the torsion of said wire serving to withdraw said contacts after the progression of the magnet, substantially as described.

4. In an electric railway, a closed insulated conduit having a feed-wire, rotatable contacts thereon, a sectional strip supported in said conduit, extending within and without the same, said contacts being adapted to be moved into connection with said strip by the action of an electric magnet on a car, substantially as described.

5. In an electric railway, a storage-battery, a motor, a feed-wire and a magnet, conductors therefor, said magnet being connected by the shunt across the circuit, and a switch for one branch of said magnet, substantially as described.

6. In an electric railway, a conduit, a feed-wire supported therein, and a conductor supported in said conduit, and having its ends projecting therethrough, and in connection with a sectional conductor or strip outside of said conduit, in combination with rotatable contacts mounted on said feed-wire, and adapted to contact with said conductor, substantially as described.

7. In an electric railway, a permanent magnet, coils of wire forming an electromagnet surrounding the limbs of said permanent magnet, and suitably supported, a lever, and a fulcrum therefor, said lever having one end attached to said permanent magnet, while its other end is adapted to be operated by an attendant, whereby said permanent magnet is capable of adjustment relative to said electromagnet, substantially as described.

8. In an electric railway, a conduit, a feed-wire supported therein, and contacts rotatably mounted on said feed-wire, the latter forming an axis for said contacts and the plane of rotation of the latter being substantially a right angle to the longitudinal axis of said feed-wire, substantially as described.

9. In an electric railway, the combination with a feed-wire and contacts rotatably mounted thereupon, of means for limiting the movement of the latter, substantially as described.

10. In an electric railway, a conduit, a feed-wire therein, a plate supported in said conduit, through which said feed-wire passes, a portion of said wire being threaded, and an internally-threaded nut adapted to engage said feed-wire, and contact with said plate, substantially as described.

11. In an electric railway, a feed-wire, a conduit therefor, a contact-strip, and a contact device, rotatably mounted upon said feed-wire, substantially as described.

12. In an electrical railway, the combination with a motor, magnet, storage-battery and a switch suitably mounted on a car, of a conductor leading from said motor to said switch, and a conductor leading from said motor to the battery, magnet and feed-wire, in combination with a conductor leading from said battery to the battery-point of said switch, and another conductor leading from the magnet to the magnet-point of said switch, substantially as described.

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Witnesses:
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E. H. FAIRBANKS.