

(No Model.)

2 Sheets—Sheet 1.

W. GRUNOW, Jr.

ELECTROMAGNETIC THIRD RAIL SYSTEM.

No. 586,845.

Patented July 20, 1897.

Fig. 1.

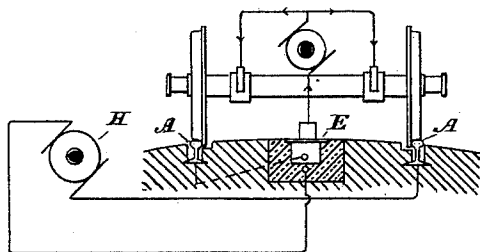


Fig. 2.

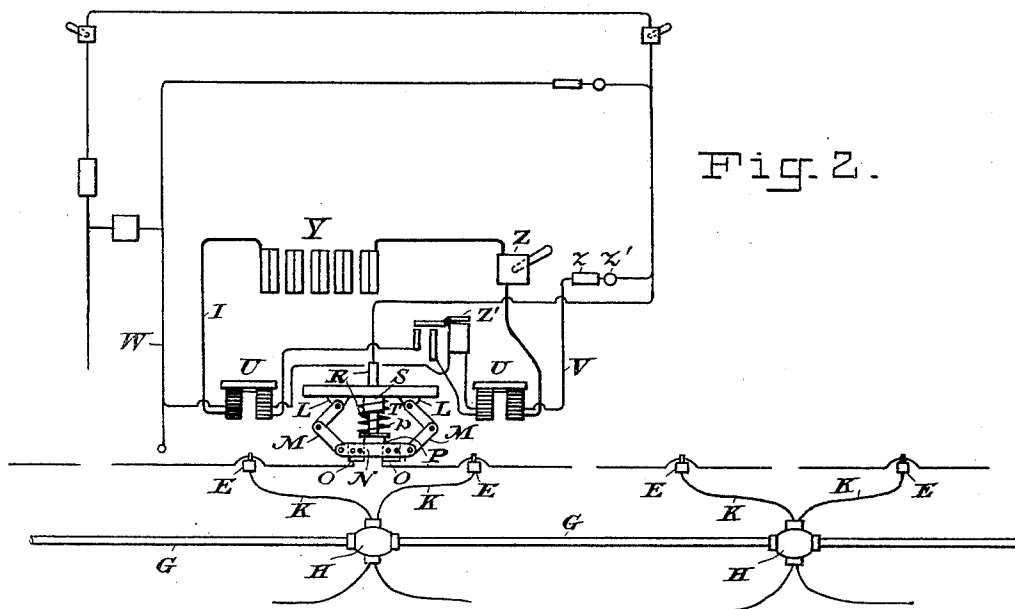
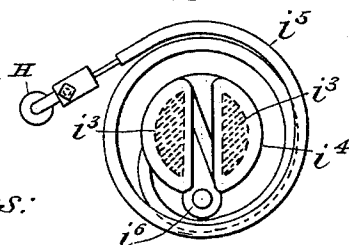


Fig. 6.



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Fig. 3.

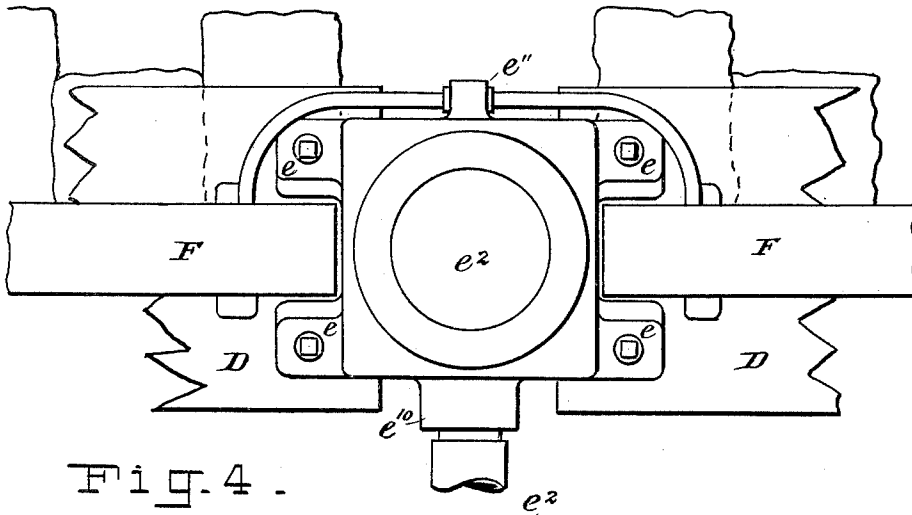


Fig. 4.

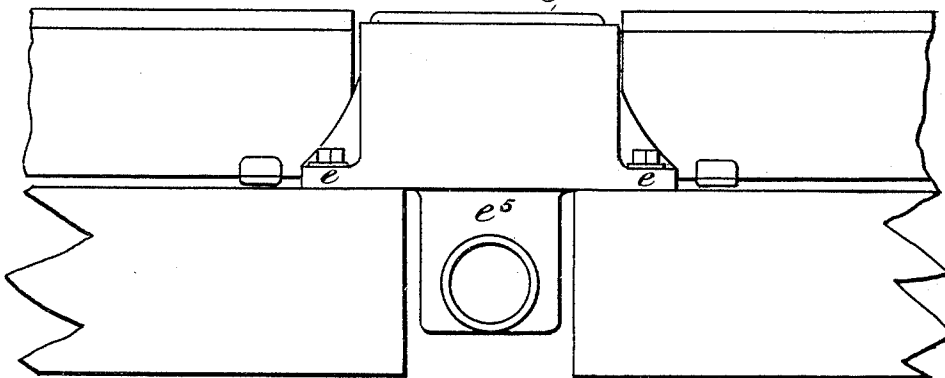
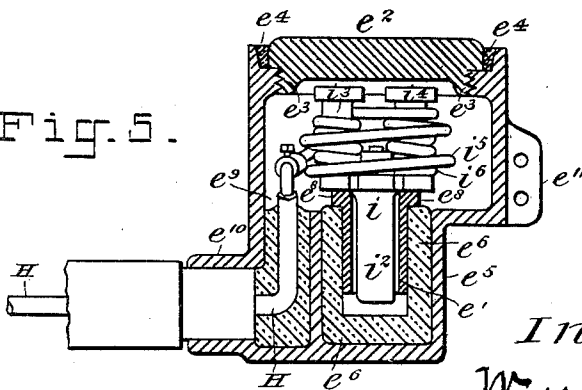


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELECTROMAGNETIC THIRD-RAIL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 586,845, dated July 20, 1897.

Application filed August 26, 1896. Serial No. 604,020. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM GRUNOW, JR., a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Electromagnetic Contact Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to electromagnetic contact systems for street or other railways in which a buried feeder-cable is employed instead of the overhead trolley; and the object thereof is to provide a system of this character which is simple and cheap in construction, at the same time being effective in operation, and which can be employed in connection with tracks which have been in use, also that the material employed, with the exception of the contact receptacles or boxes, may be of ordinary construction and can be readily obtained without being specially designed for the purpose; and with these and other objects in view the invention consists in the construction, combination, and arrangement of parts hereinafter more fully described in the specification and illustrated in the accompanying drawings, in which—

Figure 1 is a cross-section of the track, showing the flow of the current through the motor. Fig. 2 is a diagrammatic view of the electrical circuits in the car-motor, showing connections between the several parts. Fig. 3 is a top plan view of one of the contact receptacles or boxes, showing positions of the third-rail sections and the bond-wire connection. Fig. 4 is a side elevation of one of the contact receptacles or boxes, illustrating the stringer and the third-rail sections. Fig. 5 is a vertical section through one of the contact receptacles or boxes, showing the interior construction of the same, together with the contact device and electrical connections; and Fig. 6 is a top view of the contact device.

Similar characters of reference designate like parts throughout the several views.

Referring to the drawings and particularly to Fig. 1, the letters A and B designate the rails of a track, which may be of any desired

construction, either for street or other railways, and upon the cross-ties C, upon which these rails are secured, is fastened a stringer or timber D, of pine or any suitable material which has been previously treated with creosote or other insulating material, and these stringers are preferably formed into sections of predetermined lengths, as required.

Between the ends of the sections of the stringer D is formed a space or interval designed to receive the contact receptacles or boxes E, preferably of cast-iron, and provided with lugs or projections *e*, having openings therein, by means of which the contact receptacles or boxes E are bolted or otherwise secured to the sections of the stringer D.

Secured upon the sections of the stringer D in any desired manner are the sections of the third rail F, which are preferably of the same length as the stringer-sections, and the ends of these rail-sections abut against the contact receptacles or boxes, as clearly shown in Figs. 3 and 4 of the drawings, and it will be understood that the stringer-sections and the third rail F will be formed or bent to correspond with the rails A and B of the track at switches and curves, so that they will always be midway of said rails.

When a double track is employed, the buried feeder-cable G is preferably located between the up and down tracks, but it may be located in the most desirable manner, and this feeder-cable G is of the usual construction and is inclosed in the ordinary casing or conduit-piping, which is provided at suitable intervals with junction-boxes H, as shown in Fig. 1, and these junction-boxes are of the construction usually employed in such cases. Electrical connection is made between the junction-boxes H and the contact receptacles or boxes E by means of a lead-covered feeder-cable K, which is suitably connected therewith.

The space between the stringer D and the rails A and B of the track is preferably filled in with concrete to any desired height, and preferably paving-blocks or cobble-stones are placed along each side of the third rail F and around the contact receptacles or boxes E to prevent the formation of wagon-ruts, and the intervening space may be filled in with as-

phaltum or other paving material, and the concrete filling may be hollowed out to receive the contact receptacles or boxes E, so that the asphaltum may be brought around both the contact receptacles or boxes E and the third rail F, and, if desired, the paving-blocks may be embedded in the asphaltum. However, if desirable, in practice I may entirely dispense with the third-rail sections F and the stringer D and locate the contact-receptacles close together and provide a long contact-shoe for the car or motor which will extend from one contact-receptacle to the other and thereby form a circuit between said receptacles, and at curves the number of contact-receptacles can be increased, so as to provide perfect contact at such points.

I may, if desired, coat the lower portion of the third rail F and the contact receptacles or boxes E with insulating-paint or other material.

In Fig. 2 I have shown by means of a diagram the feeder-cable G provided with suitable junction-boxes H, connected by means of lead-covered feeder cables or wires K with the contact receptacles or boxes E, located between the ends of the sections of the third rail F.

Secured upon the underside or floor of the car or to the car-truck in any desirable manner are hangers L, of any preferred construction, to which are pivotally connected double inter-pivoted or toggle levers M, the free ends of which double levers are pivotally connected to a base-plate N, to which are suitably secured detachable contact-shoes O, which may be of any desired construction, and secured to or formed on the upper side of the base or plate N is a cylindrical extension P, having an annular outwardly-directed flange p, and from the center of said extension P projects a round rod R, which passes outwardly through a tubular sleeve S, suitably mounted upon the under side of the hanger-frame L, and surrounding said rod R is a strong spiral spring T, the upper end of which bears upon the under side of the car and the lower end rests upon the flange p, and the action of this spring T is to force the contact-shoes O upon the third rail F.

The contact-shoes O may be modified from the construction herein shown and described, and one long or continuous shoe may be employed which will extend about the length of the car, and by placing the contact-receptacles near together this long shoe will extend from one contact-receptacle to the other, and thus form contact, thereby dispensing entirely with the third rail herein shown and described.

Mounted upon the under side of the car or the car-truck in any preferred manner are two electromagnets U, which are wound with fine wire V, to which the ground-wire W and the wire from the contact-shoes O are connected and which are normally employed when the car is in general use, and these elec-

tromagnets are also wound with heavy wire I, which is connected with a storage battery Y and with the storage-battery switch Z and automatic cut-off Z'. It will be understood, however, that this storage battery, switch, and cut-off form no part of my invention, and the same are of the usual construction and are therefore merely indicated on the drawings, and I only employ the same to energize the electromagnets U when the current has been cut off at the power-station, and when the electromagnets U have been thus energized by the storage battery they will lift the contact device, as hereinafter described, and circuit will then be closed and the car started.

After the car has been started by means of charging one of the third-rail sections the battery will be thrown out by the automatic cut-off and the car will proceed in the manner hereinafter described.

Normally the contact-shoes O take the current from the third rail, and it passes to the electromagnets U, which are wound with coarse and fine wire I and V, respectively, thence to the electromagnets forming a part of the automatic cut-off or circuit-breaker, and when thus energized these magnets will attract the spring-retracted switch-arm, thereby breaking the circuit through the storage battery (the normal effect) and closing the circuit from the electromagnets of the automatic switch, the other electromagnets U, to the controller and ground-wire. The fine wire V upon the electromagnets is connected at its one end with the ground-wire W, while its other end, passing through its fuse-box z and the switch-box z', is connected to the conductor leading from the contact-shoes O to the controllers and motors. It will thus be evident that the magnets U will always remain energized whether or not the current be cut off from the motors by the controller.

The conductor leading from the one electromagnet to the other and making connections with the fine wire of the same is connected with the automatic cut-off or electromagnetic circuit-breaker Z', of the usual construction, for the purpose that, after the magnets U have been energized by the storage battery Y and the circuit is completed from the thus "enlivened" contact-box and rail-sections, the current thus obtained will pass through the fine wire of the electromagnets and automatically cut off the current from the storage batteries.

The lamp-wire connections are made in the usual manner.

The construction of the contact receptacles or boxes will be readily understood from the illustration thereof in Figs. 3 to 6 of the drawings. These contact receptacles or boxes E are preferably square and are provided with lugs or projections e, by means of which they are secured to the ends of the stringer-sections by bolts or otherwise, and the contact receptacles or boxes are each provided with

a cap or cover e^2 , made smooth on its under and inner surface and having a depending flange e^3 , exteriorly screw-threaded, whereby the cap e^2 can be securely and tightly fastened in position, and around the edges of the cap e^2 is preferably formed an annular recess e^4 , adapted to be filled in with asphaltum or similar material to make the receptacle or box water-tight, as shown in Fig. 5, and formed on the bottom of the contact receptacle or box E is a tubular extension e^5 , Figs. 4 and 5, which is lined or filled with insulating material e^6 , in which is placed a metallic sleeve e^7 , having an annular outwardly-directed flange e^8 , by which the same is supported.

Between the tubular extension e^5 and the side of the contact receptacle or box is formed a chamber or passage e^9 to be filled with asphaltum and which communicates with a tube e^{10} , which projects at right angles to the extension e^5 , and into this tube e^{10} is forced a creosoted (wooden) or insulated plug having a central bore, through which passes the feeder-cable K, which connects the main feeder-cable G with the contact receptacles or boxes E, and this feeder-cable K also passes through the asphaltum in the chamber e^9 into the upper portion of the contact receptacle or box. The form or construction of these contact-receptacles may be varied in actual practice, and the receptacle may be made continuous or of great length, and the contact devices may be located therein in any desired manner at predetermined intervals, said contact devices being freely or independently mounted in such receptacle, so that they may be attracted by the electromagnets upon the car or trucks to close the circuit, as hereinbefore described, and as soon as the electromagnets shall have passed over the contact devices they will drop back into the receptacle by the action of gravity, as before described.

The contact device I is preferably formed of a head i , from which depends a cylindrical shank i^2 , adapted to enter the sleeve e^7 and to be vertically movable therein, and upon the upper side of the said head i are formed or secured projections i^3 , segmental in cross-section and provided with smoothed or planished enlargements or heads i^4 , also segmental in cross-section and projecting beyond the same, said heads i^4 being adapted to contact with the smoothed surface of the cap e^2 , and these smoothed contact-surfaces may be copper-plated to prevent corrosion and residual magnetism, or the points of contact may be provided with carbon to prevent arcing, or any other means may be employed to avoid arcing between the points of contact, and wound around these projections i^3 is a suitable conductor i^5 , one end of which is secured to the end of the feeder-cable K and the other being connected with the head i by means of a binding-post i^6 , and it will be understood that the conductor i^5 is wound around the

projections i^3 several times after being wound thereon and before the end thereof is connected to the feeder-cable K, so as to allow for the free or independent movement of the contact device within the receptacle or box E.

The contact device is in no manner secured to or connected with the contact-receptacle and is separate and independent therefrom, being entirely free and independent and being made to reciprocate within the contact-receptacle during the operation of making and breaking the supply-current by the action of a separate electromagnet and gravitation.

The contact receptacle or box E is also provided with a projection e^2 , with which the bond-wires, secured to the ends of the third rail-sections, are connected.

The operation will be readily understood from the foregoing description when taken in connection with the accompanying drawings.

The main feeder-cable receives the current from the generator, and this current is conveyed through the junction-boxes and the feeder-cable K to the contact device I, and the return-current is in the tracks.

To start the car, the storage battery Y is employed, as before described, to lift the contact device, thus closing the circuit between the ground or tracks and the feed-wire charging the third-rail section which is taken up by the contact-shoes O and cuts off the battery by the automatic switch Z'.

The electromagnets U are placed at a predetermined distance from the contact-shoes O, so that before the shoes have left a rail-section the forward magnets will have energized the contact device in the next rail-section ahead and thereby charge that rail-section before the contact-shoes have entered upon it, and by means of the projections i^4 of the contact device being wound with a conductor i^5 they become electromagnets and will not fall as long as the contact-shoes O are on the rail-section, thereby keeping such section charged until the shoes O leave the same, whereupon the contact device will fall by gravity.

I do not desire to confine myself to the peculiar construction and arrangement of the parts herein set forth, and I therefore reserve the right to make all such alterations in and modifications of the same as fairly come within the scope of my invention.

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

1. An electrical contact system, consisting of a free or independent reciprocating electromagnetic contact, operated by the alternate action of a separate electromagnet and gravitation.

2. In combination, a contact-receptacle for electrical railways, a supply-conductor passing into said receptacle and means for closing the circuit between the contact-receptacle and supply-conductor, consisting of a free or

independent reciprocating electromagnet carrying contact-surfaces.

3. In combination, a contact-receptacle for electrical railways, a supply-conductor passing into said receptacle and means for closing the circuit between the contact-receptacle and supply-conductor, consisting of a free or independent reciprocating electromagnet carrying contact-surfaces and insulated from said receptacle.

4. In combination, a contact-receptacle for electrical railways, a supply-conductor passing into said receptacle and means for closing the circuit between the contact-receptacle and supply-conductor, consisting of a free or independent reciprocating electromagnet, the poles of which form contact-surfaces located in same horizontal plane.

5. In combination, a contact-receptacle for electrical railways, a supply-conductor passing into said receptacle and means for closing the circuit between the contact-receptacle and supply-conductor, consisting of a free or independent reciprocating electromagnet carrying contact-surfaces and provided with elastic supporting connections.

6. In combination, a contact-receptacle for electrical railways, provided with a tubular

extension, a supply-conductor passing into said receptacle through the extension and means for closing the circuit between the top of the contact-receptacle and supply-conductor consisting of a free or independent reciprocating electromagnet carrying contact-surfaces.

7. In an electrical railway system the combination with electromagnets upon the car or truck provided with suitable electric connections, means for operating said electromagnets, contact-shoes carried by toggle-levers connected with the car or truck, contact-receptacles located at predetermined points along the track and a supply-conductor passing into said contact-receptacles and means for closing the circuit between the contact-receptacles and supply-conductor, consisting of a free or independent reciprocating electromagnet carrying contact-surfaces and provided with elastic supporting connections.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM GRUNOW, JR.

Witnesses:

L. McCABE,

JAMES R. ROGERS.