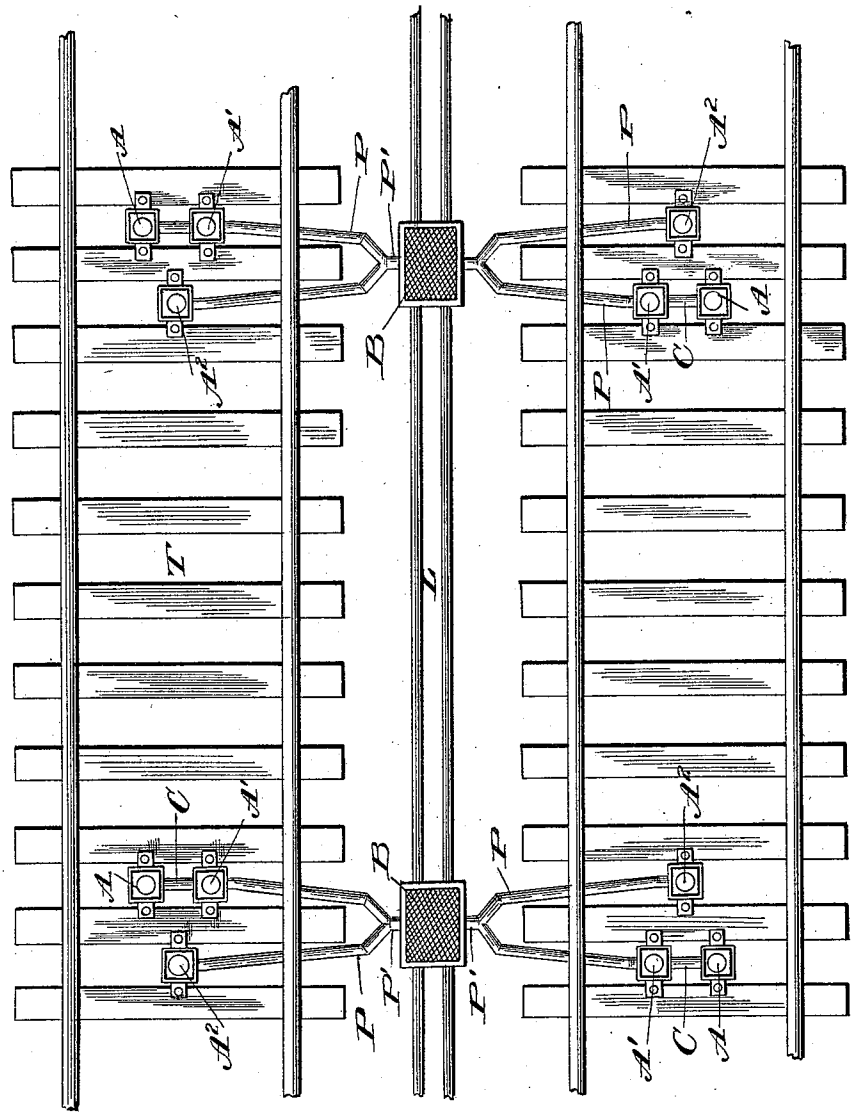
(No Model.) 5 Sheets—Sheet 1.

M. WHELESS.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

No. 534,238. Patented Feb. 12, 1895.

Fig. 1.



Witnesses
L. C. Hills
[illegible]

Inventor:
Malone Wheless,
by Marcellus Bailey
His Attorney

(No Model.) 5 Sheets—Sheet 2.

M. WHELESS.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

No. 534,238. Patented Feb. 12, 1895.

Fig. 2.

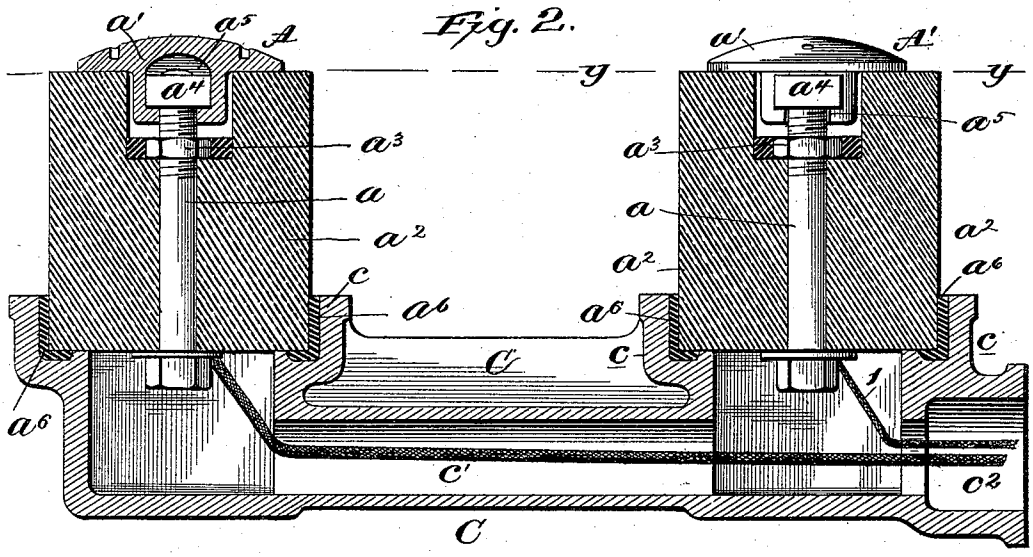
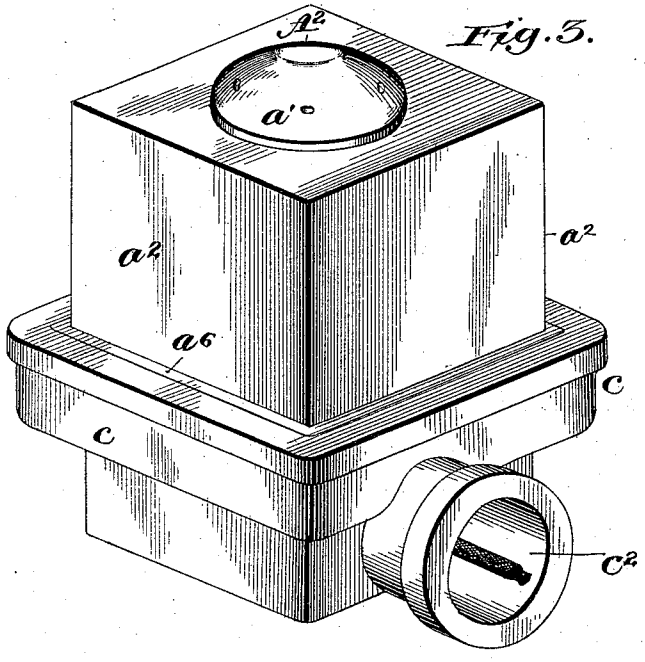


Fig. 3.



Witnesses
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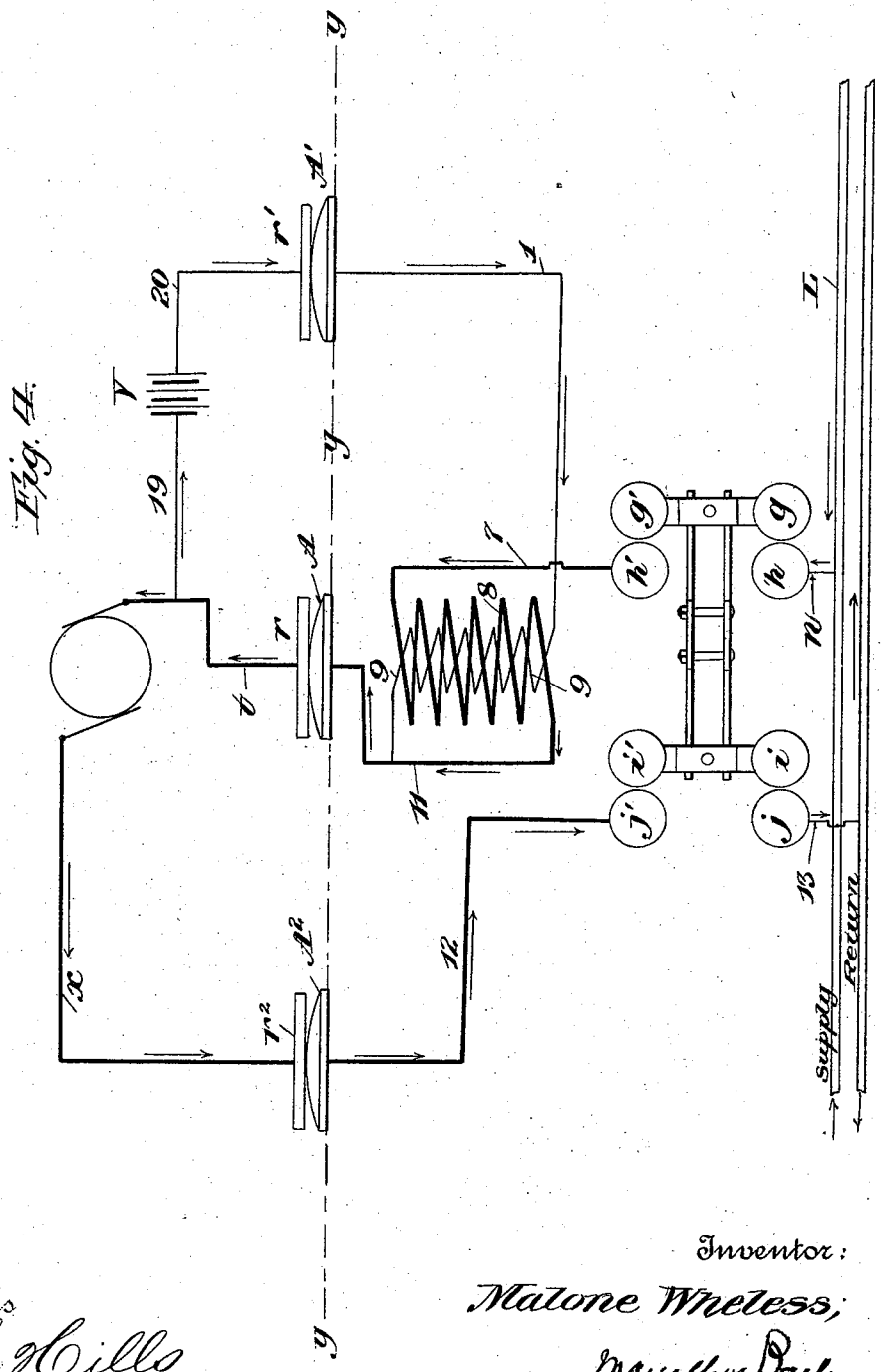
(No Model.) 5 Sheets—Sheet 3.

M. WHELESS.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

No. 534,238. Patented Feb. 12, 1895.

Fig. 4.



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(No Model.) 5 Sheets—Sheet 4.

M. WHELESS.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

No. 534,238. Patented Feb. 12, 1895.

Fig. 7.

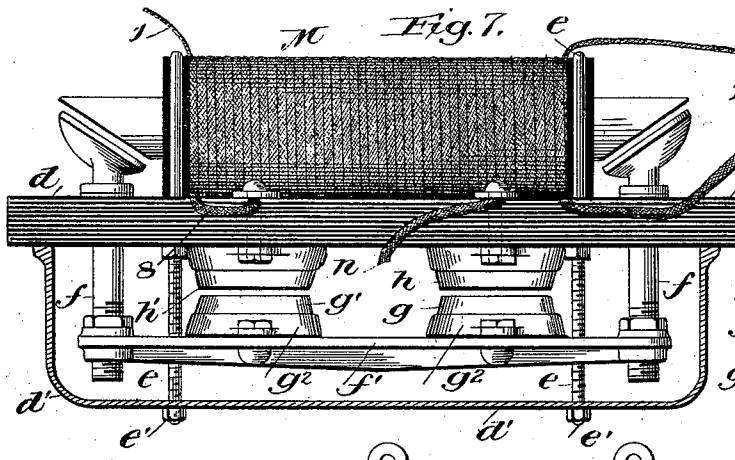


Fig. 8.

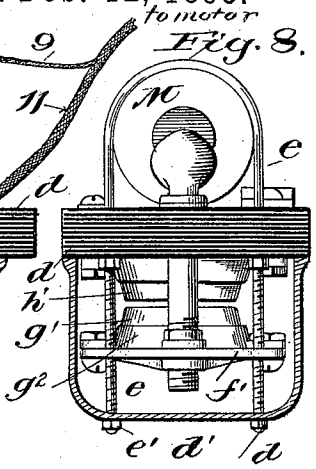


Fig. 9.

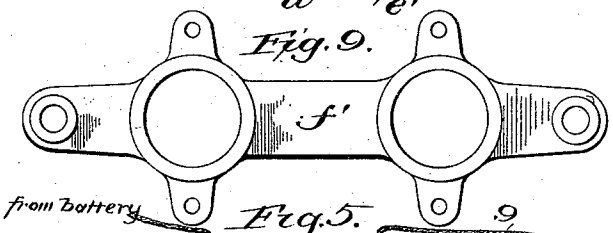


Fig. 5.

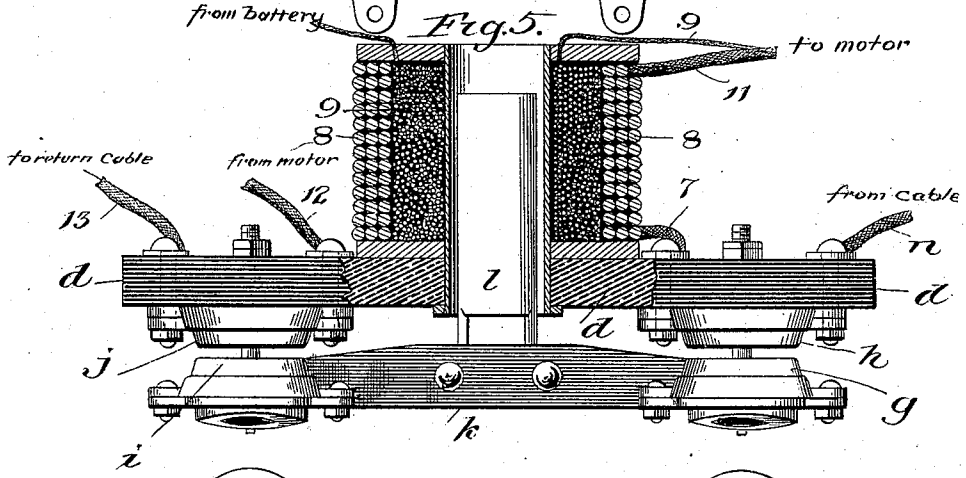
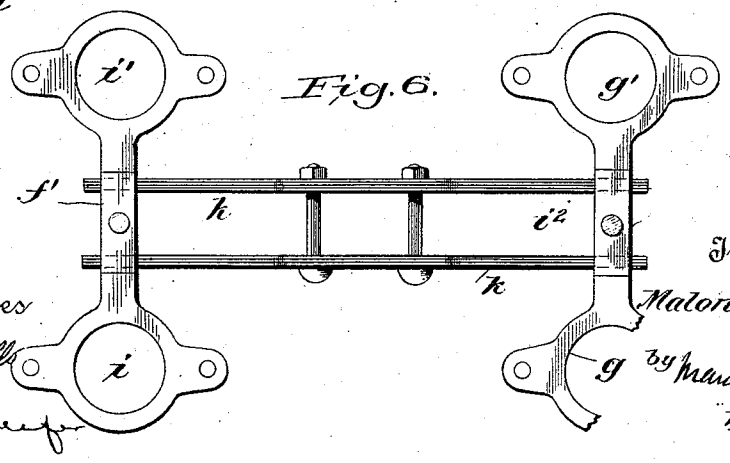


Fig. 6.



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(No Model.) 5 Sheets—Sheet 5.

M. WHELESS.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

No. 534,238. Patented Feb. 12, 1895.

Fig. 10.

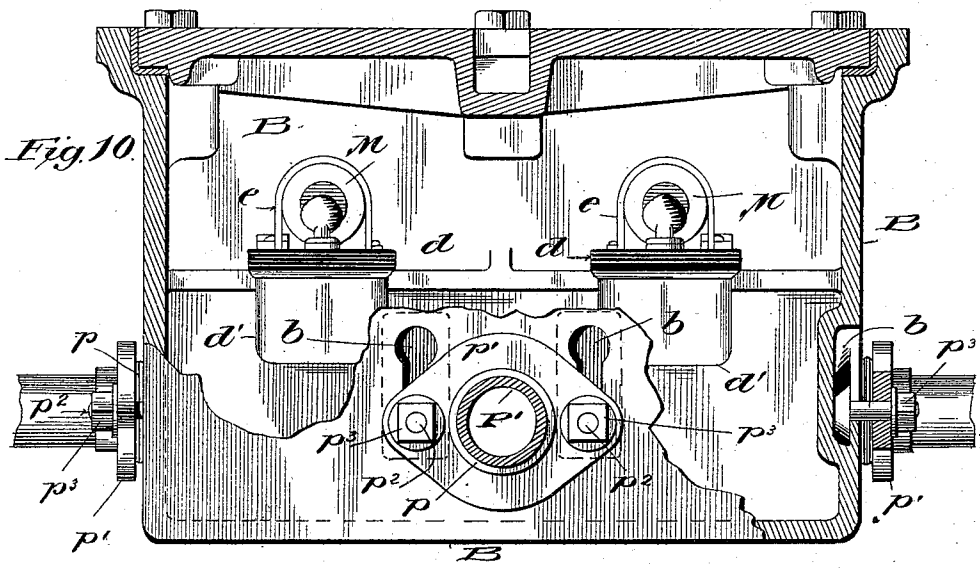
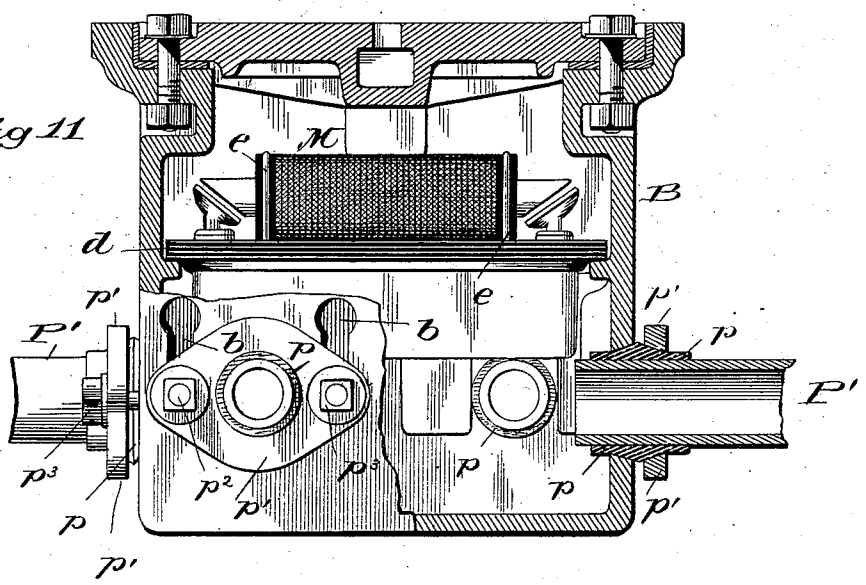


Fig. 11



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UNITED STATES PATENT OFFICE.

MALONE WHELESS, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE ELECTRO-MAGNETIC TRACTION COMPANY, OF SAME PLACE.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 534,238, dated February 12, 1895.

Application filed December 3, 1894. Serial No. 530,736. (No model.)

To all whom it may concern:

Be it known that I, MALONE WHELESS, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electric-Railway Systems, of which the following is a specification.

My invention relates to an electric railway system of the kind which is the subject of my Patent No. 524,773, of August 21, 1894. In that patent I have described and claimed a system comprising a car provided with a pair of shoes insulated from each other and from the body of the car, a source of electrical supply having its opposite poles connected to said shoes respectively and a motor connected by one of its poles to one of said shoes only, and having its opposite pole connected to one of the track rails, in combination with track terminal pins in pairs held in boxes at such intervals apart that the contact shoes on the car will reach one pair before they leave the other, a cable and feeders therefrom connected to those track terminals through which the motor circuit is completed, normally open contacts in each feeder connection, an armature for closing said contacts, a pick-up magnet for each armature having its energizing coil connected to its appropriate pair of track terminals, and circuit connections whereby when the car shoes meet a pair of track terminals, a circuit including the pick up magnet of those terminals and the source of electrical supply on the car will be closed, with the result of energizing the pick up magnet and thus closing the normally open contacts in the feeder connection appropriate to the track terminals on which the car shoes rest.

My present invention resides in improvements upon this system whereby, instead of using the track rails as a return for the motor circuit, I make use of an all metal insulated circuit independent of the track rails. I have also improved the construction of the boxes, as well as the construction and arrangement of the track terminals; and have devised a simple and efficient arrangement by which I am enabled to use one set of boxes for a double track road.

The nature of my improvements and the manner in which the same are or may be carried into effect can best be explained and understood by reference to the accompanying drawings, in which—

Figure 1 is a plan view of a short section of a double track railroad equipped with my invention. In this figure no details are attempted; simply the general scheme is outlined, showing two boxes located between the tracks and each connected to two sets of track terminals, with three terminals in each set. Fig. 2 is a vertical section of two of the track terminals of a set. Fig. 3 is a perspective view of the third track terminal of the same set. Fig. 4 is a diagram of the circuit connections. Fig. 5 is a sectional elevation of the pick-up suction magnet or solenoid and set of contacts controlled by it, which enter into the diagram of Fig. 4. Fig. 6 is a plan of the contact carrying frame connected to the armature core of the solenoid in Fig. 5. Fig. 7 is a side elevation partly in section of a modification. Fig. 8 is an end elevation partly in section of the same. Fig. 9 is a plan of the movable contact carrying frame connected to the armature of the magnet in Fig. 8. Figs. 10 and 11 are vertical cross sections at right angles to each other of one of the pick up magnet boxes and its immediate connections.

In the general view (Fig. 1) the double track road is shown at T T. For each track there are groups of track terminals A A′ A^2, three in each group, these groups being at such distance apart that the contact shoes (of which there are three, one for each track terminal) on the car will reach their appropriate terminals of the group in advance before they quit those of the group next in rear. The terminals are held in boxes which (as shown in Fig. 1) may be provided with ears resting on and bolted to the cross ties of the road; or as shown in Figs. 2 and 3, these ears may be dispensed with, in which case the terminal boxes can be set in cement or concrete in their appropriate places between the track rails. In each group, the terminals A A′ correspond to the like lettered terminals in my Patent No. 524,773. The third terminal A^2 of the group is that through which the motor is put in communication with the return side of the service cable.

Between the two tracks are placed the feeder boxes B—each box serving two groups of track terminals, one for each track. The connecting cables or wires between the feeder boxes and the track terminals are carried through piping P of any suitable kind, leading from the track terminal boxes into the feeder boxes. The service line L which supplies the current taken from the power house is a continuous insulated cable laid between the tracks and forming an all metal circuit wholly independent of the track rails.

The box for two of the track terminals A and A′ is a single hollow casting C, having sockets c, a connecting tube or pipe c' between the same, and an outlet c^2 to receive the pipe P which leads to the feeder box.

Each track terminal consists of an iron bolt a which is inserted from below up into a block a^2 of granite, cement or other suitable durable non-conducting material, perforated for the passage of the stem of the bolt. The bolt is drawn up against the bottom of the block by screwing through a nut a^3 held immovably in a socket in the top of the block, and upon its upper projecting end is held the terminal cap a' which is detachably secured to the bolt so that it may be removed and renewed whenever desired. It is thus secured in the present instance by means of a square nut a^4 fitting and held in a corresponding recess a^5 formed in the neck of the cap a', this recess being open on the side to admit the nut, and having in its bottom a hole for the free passage of the screw-threaded end of the bolt. The wire connection for the bolt is held between the head of the bolt and the bottom of the block a^2. In applying the terminal to its box, the block with its bolt and wire connection fitted to it is first seated in cement a^6 in its socket c, the wire connection being inserted into and through the pipe or passage in the bottom of the box; and then the cap (which I prefer to make of steel) is screwed upon the projecting upper end of the bolt—all as clearly indicated in Fig. 2. The terminal A^2 is mounted in a similar way in its box—which, as shown in Fig. 3, is a single socket box. The horizontal broken line y in Fig. 2 represents the level of the paving or filling between the track rails.

The two pipes P from each group of track terminals join in a Y, the tubular shank P′ of which enters its appropriate feeder box B. This box is shown in detail in Figs. 10 and 11. It is made preferably of cast iron, having a body formed of a single casting with a removable top held to it by bolts with a packed water-tight joint of any preferred kind between the two. The box is set in the ground with its top level with the paving or other road way between the tracks.

The shank P′ enters an opening formed for it in the side of the box, this opening being slightly larger than the pipe so as to receive the inner end of a packing sleeve p of soft rubber or other suitable insulating material, this sleeve having a reversely beveled exterior (as seen on the right of Fig. 11) and the opening in the box having a bevel to correspond to that bevel on the sleeve which it meets. Upon the outer bevel of the sleeve is fitted a metallic yoke p' provided at each end with a hole for the passage of a retaining bolt p^2. For each bolt there is formed in the exterior of the side wall of box B a pocket b to receive the head of the bolt. The two bolts for each yoke are fitted by their heads to these pockets, and then the yoke is pushed up toward them until their screw-threaded outer ends pass through the holes in the yoke. Then nuts p^3 are screwed upon these projecting ends and the yoke is by them drawn up as close as possible toward the side of the box. By this operation, the bulge upon the packing sleeve will be squeezed and compressed into the opening in the box through which the shank P′ passes thus making a very perfect water tight joint between them and at the same time effectually insulating the shank from the box. The same connection is provided for the service cable at the points where it passes through the box.

Each box (as seen in Fig. 10) contains two electro-magnetic pick-ups M, one serving a group of track terminals in one track, the other serving the corresponding group of terminals in the other track. They are mounted upon slate or other insulating slabs d supported upon ribs b' on the interior of the box. In construction and arrangement they are identical so that a description of one will answer for both.

The electro-magnetic pick-up shown in Figs. 7 to 11 is in a general way the same as that represented in my Patent No. 524,773, the differences being mainly in detail. The magnet spool is horizontal and placed upon top of the slate slab d and is held in position by wire yokes e which pass over the opposite ends of the spool, and have their screw-threaded ends extended down through the slab d as well as through the bottom of a housing d', which is applied to the under side of the slab and surrounds and protects the contacts controlled by the magnet. Upon the ends of the yokes which project through the bottom of the housing are screwed nuts e' by the action of which both the housing and the magnet are held in place. The armatures of the magnet are attached to or form part of stems f which extend down through guide holes in the slab d, and are attached to the metallic conducting bridge piece f' which carries and puts in electrical communication the pair of carbon contacts $g\,g'$ (each held to the bridge piece by an iron socket g^2). Opposed to these movable contacts are the contacts $h\,h'$ which are insulated one from the other and are fixed to the under side of the slab d. Contact h is connected by a feeder n to the supply side of the service cable. Contact h' is connected to the windlng 8 on the magnet spool, this winding leading from the spool to the track ter-

minal A by connection 11. The spool as in my Patent No. 524,773, has also another and separate insulated winding 9 which by connection 1 (Figs. 7 and 2) is connected to track terminal A′, and at its other end communicates with wire 11, as seen in Fig. 7, this being a portion of the energizing circuit of the pick-up magnet. The arrangement electrically considered is the same as that in my aforesaid patent, and is intended for the same purpose.

The magnetic pick-up in Figs. 7 to 11 contemplates a direct and maintained unbroken connection between there turn side of the service cable and the truck terminal A^2; but it may be found desirable to break the connection on this side as well as on the supply side, and in such event, I can substitute the arrangement shown in Figs. 5 and 6,—in which I have represented the pick-up magnet as a solenoid; although of course the type of magnet shown in the figures already described is equally available for the purpose. In this arrangement instead of one set there are two sets of movable contacts. Contacts g g' correspond in function to the like lettered ones in Fig. 7 and like the latter are connected electrically by a metallic bridge f'. The other pair i i', are similarly connected by a bridge i^2. The two sets are mechanically connected but electrically separated by cross bars k of vulcanized fiber or other insulating material, which are connected to and move with the core l of the solenoid. There is a set of fixed contacts h h' insulated from one another to operate in connection with the contacts g g'; and there is a second set of fixed contacts j j' insulated from one another to operate in connection with the two contacts i i'. Contact j is connected to the return side of the cable, and contact j' is connected to the track terminal A^2. Thus when the magnet is de-energized and the armature drops there will be a break both upon the return and the feeder side of the cable in the connections between them and their respective track terminals.

The last described arrangement is that which I have embodied in the diagram Fig. 4, which I shall now proceed to describe in order to make plain the electrical conditions.

The horizontal broken line y is the level of the paving or road way. All above the track terminals A A′ A^2 belongs to and is carried by the car which is supposed to be upon the track. The three shoes with which the car is provided are indicated at r r' r^2 one for each track terminal. They are insulated from one another and from the body of the car, and are of such length that each one will reach its next track terminal by the time it quits the one it may then be on.

Shoe r which co-operates with track terminal A is connected by wire t with one terminal of the motor on the car. The other terminal of the motor is connected by wire x to the shoe r^2 which co-operates with track terminal A^2. The shoe r' which co-operates with track terminal A′, is connected by wire 20 to one pole of a source of electrical supply on the car, such as a primary or storage battery V, the other pole of which is connected by wire 19 to shoe r.

The contacts controlled by each pick-up magnet are of course normally open.

Whenever and as soon as the shoes on the car meet their respective track terminals then, as indicated in Fig. 4, an energizing circuit from battery V through the coil 9 of the pick up magnet will be closed—this circuit being from one pole of battery wire 20, shoe r', track terminal A′, wire 1, coil 9, wire 11, track terminal A, shoe, r, wires t, 19 to the other pole of battery. This energizes the pick up magnet, which by attracting its armature closes the contacts controlled by it, thus closing the motor circuit—this circuit being from the supply side of cable, feeder n, contacts h, g, g', h', wire 7, coil 8, wire 11, track terminal A, shoe r, wire t, motor, wire x, shoe r^2 track terminal A^2, wire 12, contacts j' i', i, j, wire 13 to return side of cable.

In case of the employment of but one set of contacts as contemplated in the pick up arrangement of Figs. 7 to 11 thus dispensing with the contacts i i', j j', then the track terminal A^2 would be connected directly to the return side of the cable.

The arrangement of service boxes between the two tracks of a double track road with leaders therefrom to track terminals located between the track rails of the respective track is advantageous on many accounts. It is most compact and inexpensive, admitting of the use of a single box for both sets of track terminals in opposite tracks, with the shortest practicable length of leader. Moreover, only the track terminals are located between the rails of the tracks, the boxes being removed therefrom and located in a position where they can be readily got at for adjustment or repair without interfering with or impeding traffic. The arrangement is applicable to a double track road in which the rails are used as a return conductor as in my hereinbefore mentioned patent, but for many reasons, I much prefer to dispense with the rails for this purpose and to use an all metal supply and return circuit wholly independent of the rails. In this way I am enabled to thoroughly insulate the service circuit, and to prevent that leakage and consequent injury to water sewer and other service pipes which under many existing methods is so objectionably noticeable. The whole installation moreover is both efficient and durable and well calculated to withstand the wear and tear to which it necessarily is subjected.

Having described my improvements and the best way now known to me of carrying the same into effect, what I claim herein as new, and desire to secure by Letters Patent, is—

1. An electric railway system comprising a car provided with three contact shoes insulated from one another and from the body of

the car, a source of electrical supply having its opposite poles connected to two of said shoes respectively, and a motor having one of its poles connected to one of said last named shoes only, and its opposite pole connected to the third shoe, in combination with track terminals in groups of three, one for each shoe, set at such intervals apart that the contact shoes on the car will reach one group before they leave the other, an all metal service circuit, a feeder from the supply side and a return wire from the return side of said service circuit connected to the two track terminals of each group, through which the motor circuit is completed, normally open contacts in each feeder connection an armature for closing said contacts, a pick up magnet for each armature having its energizing coil connected to the appropriate two of each group of track terminals, and circuit connections whereby when the car shoes meet a group of track terminals, the energizing circuit of the pick up magnet will be closed, substantially as and for the purposes hereinbefore set forth.

2. An electric railway system comprising a car provided with three contact shoes insulated from one another and from the body of the car, a source of electrical supply having its opposite poles connected to two of said shoes respectively, and a motor having one of its poles connected to one of said last named shoes only, and its opposite pole connected to the third shoe, in combination with track terminals in groups of three, one for each shoe, set at such intervals apart that the contact shoes on the car will reach one group before they leave the other, an all metal service circuit, a feeder from the supply side and a return wire from the return side of said service circuit connected to the two track terminals of each group through which the motor circuit is completed, normally open contacts in each feeder and return connections an armature for closing both sets of said contacts, a pick up magnet for each armature having its energizing coil connected to the appropriate two of each group of track terminals, and circuit connections whereby when the car shoes meet a group of track terminals, the energizing circuit of the pick up magnet will be closed, substantially as and for the purposes hereinbefore set forth.

3. A track terminal holder comprising a socketed receptacle formed with a passage below the socket for the connecting wiring of the terminal in combination with a non-conducting block seated and held in said socket, a track terminal pin passing up through said block, and a contact cap seated on said block and detachably connected to and covering the upper end of the terminal pin, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 1st day of December, 1894.

MALONE WHELESS.

Witnesses:
F. B. KEEFER,
M. BAILEY.