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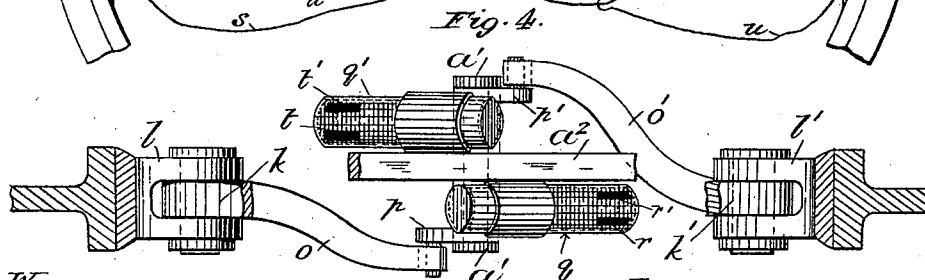
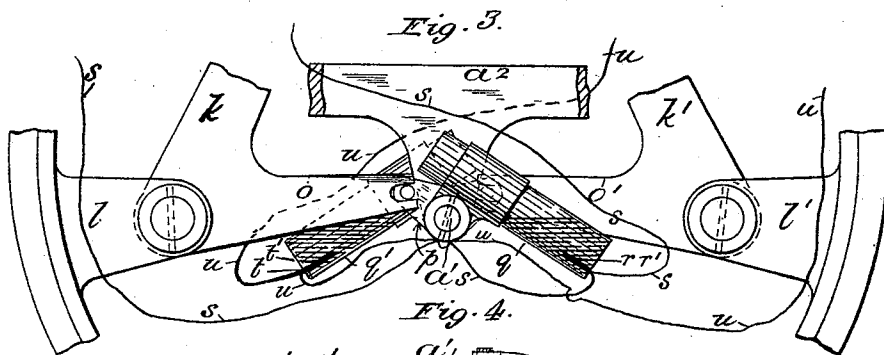
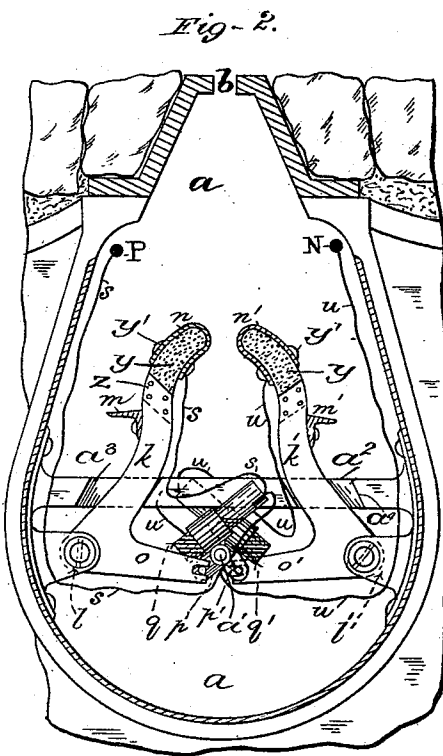
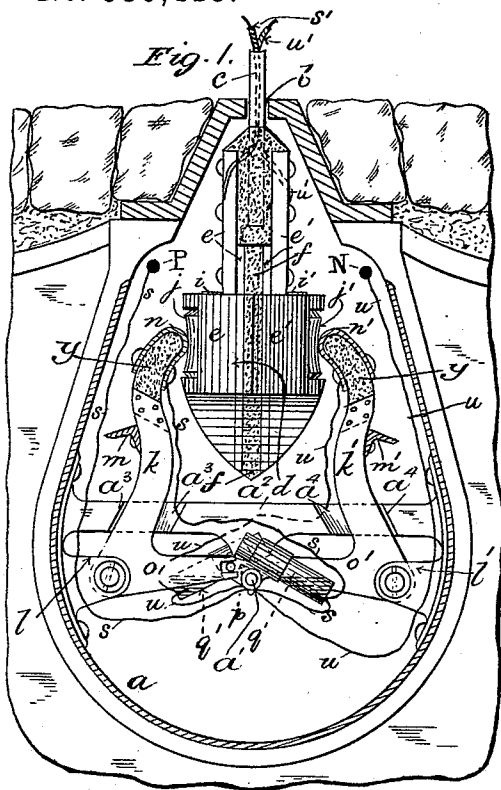
3 Sheets—Sheet 1:

W. H. COTTON.

CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

No. 539,418.

Patented May 21, 1895.



WITNESSES
Edward T Jett
Eugene Marsh

INVENTOR
Wilson H. Cotton
By Edward W. Currell
His Attorney

(No Model.)

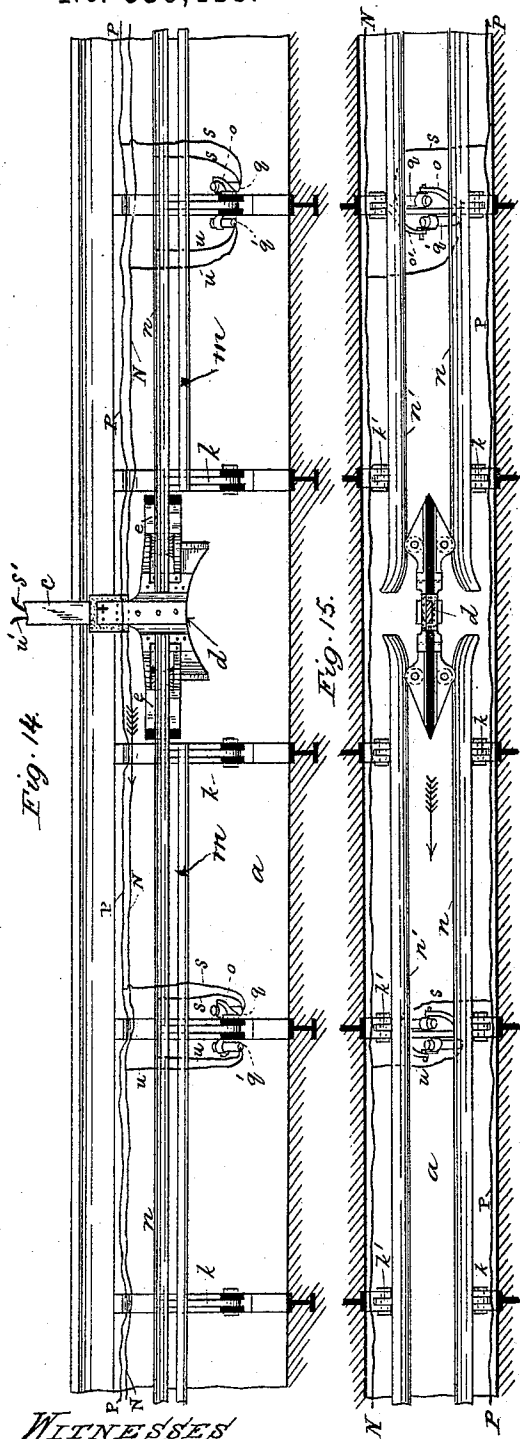
3 Sheets—Sheet 3.

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UNITED STATES PATENT OFFICE.

WILSON H. COTTON, OF ST. LOUIS, MISSOURI.

CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 539,418, dated May 21, 1895.

Application filed August 25, 1894. Serial No. 521,342. (No model.)

To all whom it may concern:

Be it known that I, WILSON H. COTTON, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a new and useful Improved Conduit System for Electric Railways, of which the following is a specification.

This invention relates to an improved conduit system of apparatus for operating electric railways, and has for its object to prevent loss of current by leakage, short circuiting, or induction; to obtain a positive and practically continuous circuit between the current generator and the motor on the car, and to provide improved contact devices whereby the current is transmitted to and from the motor on the car without the direct engagement of the current gatherer with the main conductors.

The invention consists in features of novelty as hereinafter described and claimed, reference being had to the accompanying drawings, forming part of this specification, whereon—

Figure 1 represents a conduit in cross-section containing a preferable arrangement of my improved contact mechanism and current-gatherer for operating the electric motor of a railway-car. (Not shown.) Fig. 2 is a similar view to Fig. 1, with the current-gatherer removed. Fig. 3 is a detail view, to an enlarged scale, of the circuit closing and opening devices forming parts of Figs. 1 and 2; and Fig. 4, a plan thereof. Fig. 5 is a side elevation, to an enlarged scale, of the current-gatherer seen endwise in Fig. 1; and Fig. 6 a sectional plan of the same on line 6 6 in Fig. 5. Fig. 7 is a similar view to Fig. 6, showing a modified construction of the gatherer. Fig. 8 is a cross-section through the gatherer taken on line 8 8 in Fig. 5. Figs. 9 and 10 are respectively plan and side views of an end section, and Figs. 11 and 12 are similar views of the middle section forming parts of the current-gatherer and seen in Figs. 5 and 6. Fig. 13 is a detail edge or rear view, to enlarged scale, of the insulator used between the contact-bars and hinged arms forming parts of my invention and seen in side elevation in Figs. 1 and 2. Fig. 14 is a general longitudinal view, to a reduced scale, of the current-gatherer and contact devices ar-

anged within the conduit. Fig. 15 is a plan of the same.

Like letters of reference denote like parts in the respective figures.

Referring to the figures *a* represents an electric railway conduit having the upper continuous slot *b*, and otherwise adapted for containing the various parts of my invention as applied to a double circuit operation. Through the slot *b* passes the bar *c* which is attached to, or otherwise carried by, the railway car (not shown) in any suitable manner usual with this class of railway. Attached at right angles to, but insulated from, the lower free end of the bar *c*, within the conduit *a*, is a current gatherer or trolley shoe *d*, which is preferably made flexible laterally, and may be of any desired length.

The shoe *d* is composed preferably, of metallic side plates, which are divided respectively into sections in the present case into two end sections *e*, (*e'*) and a middle section *e^b*, (*e^c*) which are arranged longitudinally in alignment with each other, and attached by insulated rivets *e²*, and screws *e³*, (or otherwise) to the opposite sides of an interposed central, longitudinally and vertically arranged, web or plate *f*, composed of rubber, or other insulating material, which is laterally flexible at, and adjacent to, the abutting ends of the sections *e*, *e^b*, *e'*, *e^c*. These ends are formed with ears or lugs *g*, (*g'*) which interlock hinge-wise, but are unconnected to each other. The vertical surfaces *V* of the interlocking lugs *g*, (*g'*) are slightly apart, the upper and lower lugs being splayed outward on their inner faces *z*, from the flexible part of the web *f*, so as to permit of the lateral yielding of the web thereat, while their horizontal interlocking surfaces *w* are in contact and operate as holders for maintaining the horizontal alignment of the sections *e*, *e^b*, *e'*, *e^c*, and the vertical stability of the shoe *d* throughout its entire length; or the shoe *d'* (see Fig. 7) may be rigidly constructed, in which case the side plates *e⁴*, *e⁵*, in lieu of being divided into sections as described for the flexible shoe, are made respectively in one piece secured to the central insulating web *f'* by screws *e³* and insulated rivets *f²*, or in any other suitable manner.

From the side faces of the shoe *d* near each end, project opposite upper, and lower, lugs

or brackets h, h' , which with the end side plates e, e' , and insulating web f taper from near the extreme width or overhang of the brackets h, h' , to nothing at the ends of the shoe d , as shown particularly in Fig. 6. In the brackets h, h' are mounted the ends of spindles i, i' carrying, between the said brackets, vertically arranged rollers j, j' which are respectively aligned to each other or equidistant from the longitudinal center line of the shoe d .

The rivets e^2 before mentioned, for securing the various parts of the shoe d together, pass transversely through the opposite metallic sides e, e^6 , and e', e'^6 , and the central web f , and are insulated, preferably by sleeves e^3 of insulating material, which surround the rivets e^2 for their entire length, combined with insulating strips or washers e^9 which are placed between the heads of the rivets e^2 and the outer faces of the said sides. The screws e^3 , are inserted through the end sections e, e' , respectively, and part-way into the central web f , previously to placing the rollers j, j' with their spindles i, i' , in position, for which purpose sufficient clearance is afforded within the pockets formed by the outwardly tapering end wall (indicated by the dotted lines in Figs. 6 and 9) of the shoe d .

k, k' , represent oppositely inclined arms which are hinged at their lower outer ends (equidistant from the vertical plane of the slot b) to brackets l, l' , respectively, fixed at intervals along the conduit a . Any desired number of the arms k , or k' , may be secured together by angle irons m, m' , or other suitable bracing, so as to form a series of successive hinged frames of suitable length, and distance apart, throughout the entire extent of the conduit a .

Attached to, but insulated from, the upper free ends of the arms k, k' , constituting each pivoted frame, is a contact bar n, n' made of copper, or other conductive material and arranged longitudinally along the path of the shoe d . The bars n, n' are opposite, and parallel to each other, at a suitable distance apart, and are adapted for bearing against the rollers j, j' , respectively, of the shoe d , as seen in Figs. 1, 14, and 15.

Any suitable means may be used for insulating the contact bars n, n' , from the arms k, k' , such as that shown, consisting of a block y (see particularly Fig. 13) of insulating material which is inserted between the jaws z formed at the free end of the arm k , the block y being fixed thereto by rivets z' (screws or otherwise). The contact bar n , which is preferably of an inverted U-shape in cross section, is passed on to the free end of the block y and secured thereto by rivets y' , or otherwise, as found most suitable.

Each contact bar n , or n' , corresponds in length, or thereabout, to that of the hinged frame to which it is attached, and terminates at a suitable distance from the adjacent end of the succeeding bar of the series through-

out the conduit a . The ends of the bars n, n' , are preferably outwardly curved, as shown in Fig. 15, for insuring the free passage of the shoe d from section to section, as hereinafter referred to.

Projecting from one, (or more) of the arms k of each pivoted frame k, m , at or near the fulcrum l , is an arm or lever o , which preferably engages at its free end, with one arm of a pivoted bell-crank lever p , which is pivoted at its fulcrum to a pin a' projecting from a fixed bar a^2 (hereinafter more particularly referred to). The other arm of the lever p carries a sealed box or vessel q , inclosing the separated contact points r, r' , of the feed wire s , which leads from the main conductor P to the contact bar n . Within the vessel q is a quantity of quicksilver (shown by dark broken lines) sufficient for submerging, and thereby closing circuit between, the contact points r, r' , in a certain position of the vessel q , as hereinafter more particularly referred to. In like manner the arm k' of the opposite hinged frame k', m' , is provided with a lever o' , bell-crank lever p' pivot pin a' and box or vessel q' , containing quicksilver, and inclosing the separated contact points t, t' , of the feed wire u , which leads from the main conductor N to the contact bar n' .

In operation, assuming the various parts of the contact mechanism to be in the position seen in Fig. 2, and the current gatherer, or shoe d , traveling in the direction indicated by the arrow in Figs. 14 and 15, on the tapered end of the current gatherer, or shoe d , entering at the flared ends, and passing between the contact bars n, n' , which bear against the rollers j, j' , the contact bars n, n' are thereby spread outward or separated, and move the hinged frames k, m, k', m' , correspondingly outward on their hinges l, l' , so as to throw upward the levers o, o', p, p' , and thereby tilt the vessels q, q' , into the position seen in Figs. 1, 3, and 4, which causes the quicksilver therein to flow by gravitation toward, and submerge the separated contact points r, r', t, t' , of the wires s, u , thereby closing circuit thereat, and allowing the current from the main conductor P to flow through wire s to the contact bar n , and thence through the rollers j and adjacent side e of the current gatherer or shoe d , by the wire s' to the motor on the car, whence the current returns through the wire u' , and opposite side e' of the shoe d , rollers j' , contact bar n' , feed wire u , and main conductor N to the generator. In the case of a single circuit operation, the levers o', p' , box q' and main conductor N may be dispensed with, the return current passing from the contact bar n' , and through the wire u directly to the ground conductor; or the current may be returned through the wheels and rails in the usual manner. On the passage of the current gatherer or shoe d from between the contact bars n, n' , into a succeeding section thereof, the said bars and their hinged frames k, m, k', m' , are returned, preferably by gravita-

tion, to their original position seen in Fig. 2, which tilts the vessels q, q' , in the opposite direction, and thereby causes the quicksilver to flow from, or break contact between the points r, r', t, t' , of the wires s, u , which renders the section inactive until it is again operated by a succeeding car.

The vessel q (or q') is preferably made of glass or other insulating material, and may be of a cylindrical, oval, rectangular, or any other desired form in cross section, the inclosed contact points r, r' being composed of aluminum, copper, or other non-amalgamating metal permanently fixed in the wall of the vessel and protected on the outside of the latter, at their junction with the feed wire s , by proper insulation. The vessels q, q' are preferably exhausted of air and hermetically sealed so that the contained quicksilver will be rendered sensitive and positive in movement and unaffected by evaporation. If found necessary to prevent arcing of the contact points, the quicksilver may be covered with oil, or other non-conducting fluid.

If desired, any other suitable circuit breaking and closing device, capable of being operated by the vibration of the lever o (or o'), may be substituted for the vessel q (or q') and its contained quicksilver.

I do not confine myself to the exact location of the main conductors P, N , as shown in the drawings, nor to the arrangement of the feed wires s, u , as in practice these will be varied according to circumstances, and with due provision for the flexibility of the feed wires s, u , at their junctions with the tilting vessels q, q' .

The bar a^2 which carries the pivot pins a' of the levers p, p' is arranged across the conduit immediately against, or in close proximity to, one side of the opposite arms k, k' , which are thereby prevented from lateral canting during the progress of the trolley shoe d , in either direction. a^3, a^4 , are stops on the face of the bar a^2 , for limiting the throw of the arms k, k' , in each direction respectively, the stops a^3, a^4 being arranged to maintain the contact bars n, n' , when at rest as seen in Fig. 2, at a certain distance apart for insuring the entrance of the trolley shoe d , at each end of the section.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a conduit system for electric railways, the combination with the motor on the car, of a current gatherer depending from the car, and having positive and negative contact surfaces electrically connected with the motor, the said surfaces being adapted to rotate, and insulated from each other; opposite arms or frames hinged to supports within the conduit, a contact bar attached to each frame

and insulated therefrom, the said contact bars lying along the path of the current gatherer at a suitable distance apart, a lever projecting from each of the said frames, and actuating a preferably, pivoted box or vessel containing quicksilver, and hermetically closed, the said vessels inclosing the contact points of the feed wires leading from the main conductors to the said contact bars, substantially as shown and described.

2. In a conduit system for electric railways, the combination with the motor on the car of a current gatherer or trolley shoe, composed of an insulating web or partition carrying metallic sides, which are electrically connected separately, with the motor and provided with upright contact rollers; opposite arms or frames hinged to supports within the conduit, a contact bar attached to end frame, and insulated therefrom, the said contact bars lying along the path of the current gatherer at a suitable distance apart, a lever projecting from each of the said frames, and actuating a preferably pivoted box or vessel containing quicksilver and hermetically closed, the said vessels inclosing the contact points of the feed wires leading from the main conductors to the said contact bars, substantially as shown and described.

3. In a conduit system for electric railways, the combination with the motor on the car of a current gatherer or contact shoe, composed of a flexible insulating web or partition carrying metallic sides, which are electrically connected, separately, with the motor, the said sides being provided with upright contact rollers and divided into sections having interlocking supporting devices; opposite arms or frames hinged to supports within the conduit, a contact bar attached to each frame, and insulated therefrom, the said contact bars lying along the path of the current gatherer at a suitable distance apart, a lever projecting from each of the said frames, and actuating a preferably pivoted box or vessel containing quicksilver and hermetically closed, the said vessels inclosing the contact points of the feed wires leading from the main conductors to the said contact bars, substantially as shown and described.

4. A contact shoe for electric railways, consisting of a flexible central insulating web or partition, and metallic sides attached thereto, the said sides being provided with upright contact rollers, and divided into sections having interlocking ears or lugs, substantially as shown and described.

WILSON H. COTTON.

Witnesses:

WM. KINKEL,
T. U. CHAPMAN.