No Model.)

3 Sheets—Sheet 1.

E. HAZELTON.

CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

No. 493,716. Patented Mar. 21, 1893.

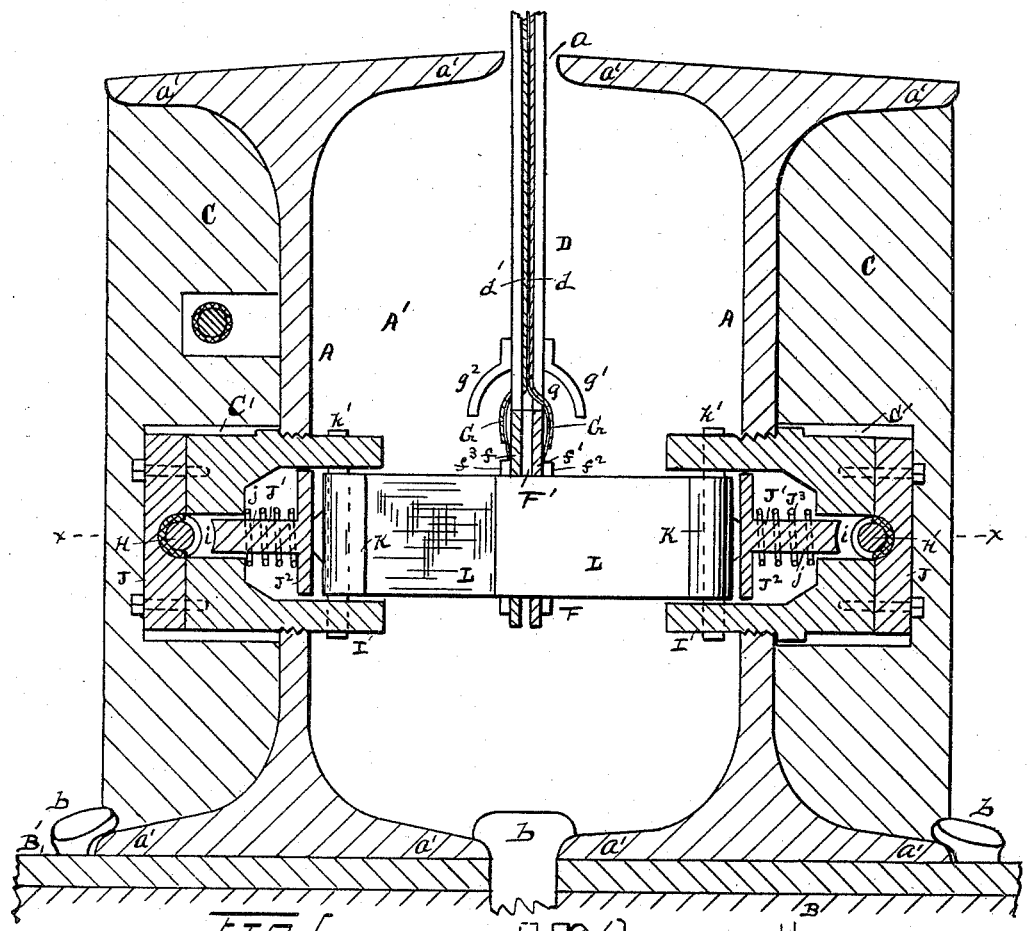

FIG. 1.

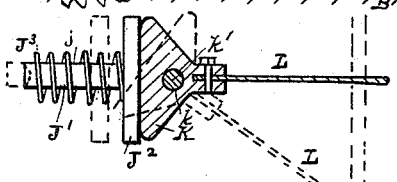

FIG. 3.

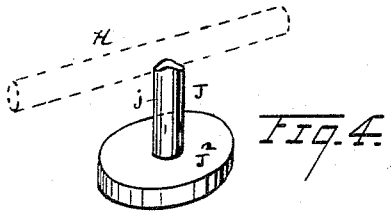

FIG. 4.

Witnesses
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John F. Miller.

Inventor
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(No Model.) 3 Sheets—Sheet 2.

E. HAZELTON.

CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

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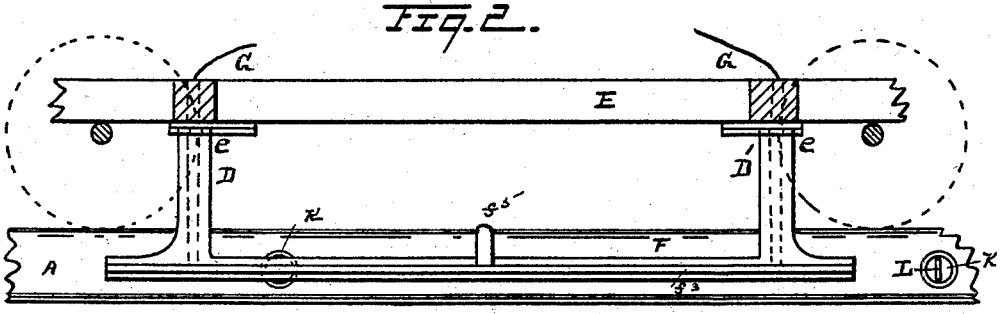
Fig. 2.



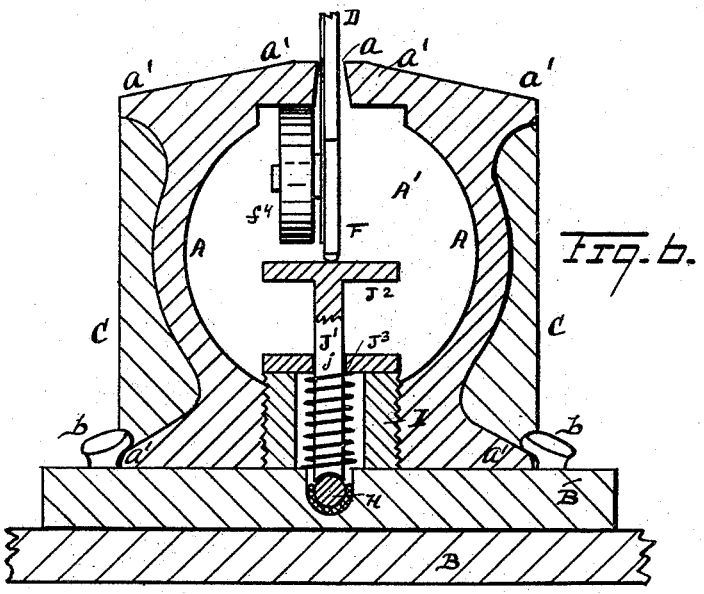


Fig. 6.

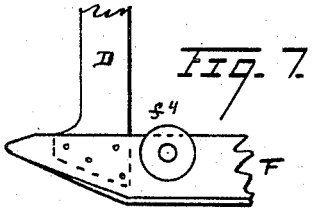


Fig. 7.

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(No Model.) 3 Sheets—Sheet 3.

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CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

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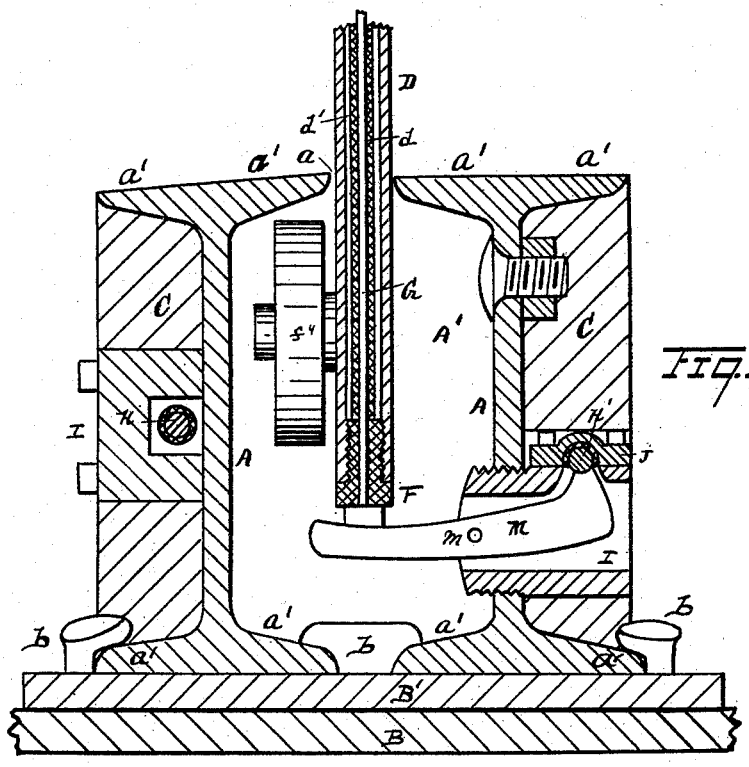

Fig. 5.

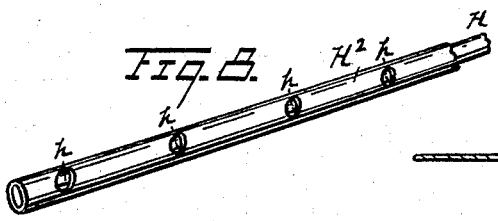

Fig. 8.

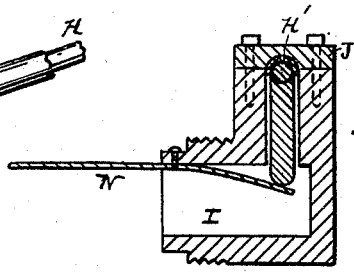

Fig. 4.

Witnesses
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John F. Miller.

Inventor
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By His Attorney
Newell S. Wright

UNITED STATES PATENT OFFICE.

ELIAS HAZELTON, OF LANSING, MICHIGAN, ASSIGNOR OF ONE-HALF TO HARLEY INGERSOLL, OF SAME PLACE.

CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 493,716, dated March 21, 1893.

Application filed February 15, 1892. Serial No. 421,508. (No model.)

To all whom it may concern:

Be it known that I, ELIAS HAZELTON, a subject of the Queen of Great Britain, residing at Lansing, county of Ingham, State of Michigan, have invented a certain new and useful Improvement in Underground Electrical Systems of Street-Car Propulsion; and I 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, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to certain new and useful improvements in an underground electric system of street car propulsion, and it consists of the devices and appliances their combinations and arrangements hereinafter specified and claimed and illustrated in the accompanying drawings, in which—

Figure 1 is a vertical cross section embodying features of my invention. Fig. 2 is a longitudinal section through a car and showing one side of the underground conduit. Fig. 3 is a sectional view on the line *x*—*x* Fig. 1. Fig. 4 is a detail view of one of the contact plungers. Fig. 5 is a vertical cross section showing a modification of certain features of the invention. Fig. 6 is a similar view illustrating still another modification. Fig. 7 is a detail view in side elevation of a portion of the shoe shown in Fig. 6. Fig. 8 is a separate view of a portion of an electric line wire. Fig. 9 is a view in detail showing another modification of the means of making contact between the line wire and moving parts of the car.

The object of my invention is to provide an electric system of street car propulsion, which shall be simple and efficient in construction and operation, and whereby the electric conductor may be completely insulated, except when in contact with moving parts of the car.

I carry out my invention as follows:

A A represent two rails or plates preferably of metal forming the sides of a conduit A′ within which certain features of my invention are located, the upper extremities of said rails or plates extending adjacent to each other forming a channel therebetween as indicated at "*a*." These rails may be engaged at their base upon an underlying tie B, as by spikes "*b*." The rails are preferably constructed with flanges "*a′*" at the top and base extending laterally on both sides of the rail, as shown, forming an interior conduit and also exterior chambers or conduits between the flanges. I do not, however, confine myself to this specific form of the rails. When so constructed, I employ a suitable filling C of wood or other suitable material located in said exterior conduits or chambers on the outer faces of said rails respectively and which may be secured thereto. These fillings C may or may not be employed. A plate B′ preferably of metal intervenes between the rails and the underlying tie, said plate conveniently serving to hold the rails a suitable distance apart, one of the spikes "*b*" being driven into the tie between the lower adjacent edges of the rail. This will set the rails the proper distance apart at their upper adjacent edges, forming the channel "*a*." The rails or plates A A are continuous on each side of said conduit.

It will be seen that the rails A A extend upward to the surface of the car track or road bed, and downward therefrom to the underlying ties of the car track.

D D′ denote bracket arms depending from the car frame E, and preferably hinged thereto, as shown at "*e*," said arms extending downward into the conduit A′. Said bracket arms are engaged at their lower extremities with a connecting shoe F located and movable in the conduit and extending longitudinally therewith. The shoe is preferably constructed with a metallic center strip F′ insulated upon both sides as shown at "*f*" "*f′*," and is provided at its lower edge with electrical conducting strips "f^2" "f^3." The bracket arms are made hollow or chambered, to allow conductors G to pass therethrough, said conductors being insulated from the bracket arm as indicated at the lines marked "*d*" "*d′*." The upper extremities of the conductors G lead one to the motor, and the other from the motor to complete the circuit. The conductors G preferably consist of an insulated metallic ribbon or strip. At its lower extremity said conductors form contact with the conducting strips "f^2" "f^3." To this end one of said conductors may be extended through the lower end of the bracket arm as shown at "*g*" into

contact with the corresponding conducting strip "f^2" forming the conductor to the motor. The other conductor G leading from the motor may pass through the other bracket and on the other side thereof and into contact with the strip "f^3." I prefer to provide the lower extremities of the bracket arms with laterally extended flanges "g'" "g^2" to carry off any moisture that might descend through the channel "a" and away from the lower end of the strip G to protect the circuit at that point.

H and H′ denote the electric line wires carrying the current. I do not limit myself to any particular manner, solely, of locating the line wires in place, but as shown in Fig. 1, said wires may be located in one of the conduits or chambers exterior to the rails, or in suitable recesses in the filling pieces C. It will be seen that the rails and their laterally extended flanges form a protection to devices which are located in or project into the exterior chambers. At suitable intervals along the sides of the conduit I locate a desired number of casings "I," as of rubber or other suitable material, provided with an orifice "i" at the outer end thereof affording connection therethrough with the adjacent line wire. A cap J is engaged over the line wire which is insulated from both the cap and from the case, as well as from the filling and from the side plates of the conduit. It will be seen that the casings I and their caps J thus serve to suspend the main line conductor. The line wire has its insulation H^2 perforated as shown at h at intervals on its side adjacent to said orifices. Within each of said cases may be located a movable metallic spring plunger J′, which may be constructed with a plunger head J^2 and stem "j" projecting into the orifice "i."

J^3 is a spring surrounding the stem to hold the stem normally out of contact with the line wire, but permitting to the plunger a yielding movement to bring the end of the stem into contact with the line wire.

K denotes an oscillatory wedge shaped metallic block constructed with an orifice as at "k," through which a pin "k'" passes, the pin also passing through the inner end of the case "I," and engaging the block pivotally therewith. L denotes a metallic spring arm engaged with said block and extending inward within the conduit normally across the path of the shoe. As the shoe moves longitudinally in the conduit on the movement of the car, and comes into contact with the spring arm, the latter will be moved thereby, as shown in dotted lines Fig. 3, and consequently oscillating the block K and forcing back the plunger to bring its stem into contact with the line wire. The casings "I" with their connected springs and plungers are located along the sides of the conduit at such intervals preferably as to permit one end of the shoe coming into contact with one spring arm before the shoe leaves the spring arm at the opposite end. In this manner current is always led from the line wire through one of the plungers and the adjacent spring arm to the conductor of the shoe leading to or from the motor. When the shoe is past any given spring arm, the spring about the stem of the plunger will restore the plunger and spring arm to normal position. These casings and plungers and their spring arms may be located at intervals along both sides of the conduit to afford a complete circuit through the line wires H H′ and from the motor of the car. I do not however, limit myself to locating the spring plungers on both sides of the conduit nor even on the sides of the conduit simply, nor to the use of the spring plungers and spring arms alone to form contact with the shoe, as my invention contemplates any suitable means of forming electrical contact of the shoe with the line wire. Accordingly as shown in Fig. 6, the line wire is located at the base of the conduit. A single line wire might be used, one of the rails forming a portion of the electric circuit. Where it is desired to locate the line wire at the base of the conduit, the casings "I" with their spring plungers may be located below the path of the shoe, but projecting upward into said path, the stem of the plunger projecting through the upper portion of the case, and bearing the plunger head above the case, as shown in Fig. 6, the shoe forming contact therewith in its passage. In this method of construction the shoe may be beveled at its ends as shown in Fig. 7, and provided with a roller "f^4" bearing upon the under surface of one of the upper flanges of one of the rails to hold the shoe firmly upon the plungers below. Or as shown in Fig. 5 the line wires may be led along the upper portion of the outer end of the casings "I," and a lower arm M be employed fulcrumed to the casing as shown at "m." The inner end of said lever arm projects inward into the conduit into the path of the shoe, so that as the shoe moves onward it will strike the inner end of the lever and force the opposite end thereof up into contact with the line wire. The shoe may, in this plan of arrangement, be also provided with the roller "f^4."

The filling pieces are recessed on their inner faces to allow the passage of the line wires and to receive the inner ends of the casings I, if the wires are located at the side, as shown at C′. The shoe is preferably provided intermediate its ends with a strip of metal "f^5" extending above the rail, through the channel "a." The shoe is preferably made flexible, and the strip "f^5" holds the shoe in proper position in passing about a curve.

The casings "I" may have a screw threaded engagement with the rails. The distance at which the casings are placed apart depends upon the length of the shoe. The casings on the right hand and the left, if used on both sides, may be arranged alternately.

As shown in Fig. 9 a spring N may be used

having a permanent connection with the line wire at one end, the other end projecting into the path of the shoe to form electrical contact therewith, as it passes thereby. I prefer, however, to have the means of electrical connection between the line wire and shoe normally out of contact with the line wire, although I do not limit myself thereto.

The operation of the device is as follows: In the movement of the car the shoe projecting into the conduit strikes against the spring, plunger head, or lever, as the case may be, forming electrical contact with the line wire. An electrical circuit is thus formed leading to the motor on the one side the current passing from the motor on the side of the conduit in reverse direction.

I do not limit myself to the specific construction and arrangement of the shoe, its bracket arms and the electrical conductors carried thereby hereinbefore explained, as various modifications are contemplated within the scope of my invention, one modification being shown for example in Fig. 5.

What I claim as my invention is—

1. In an electrical system of street car propulsion, an underground conduit, a main line electrical conductor, casings engaged in the wall of the conduit, through which electrical contact is made with said conductor, and a contact device engaged with said casing for making electrical contact with the conductor, each of said casings provided with a cap engaged over said conductor, substantially as described.

2. In an electrical system of street car propulsion, a conduit having side rails or plates constructed with flanges at top and bottom, extending laterally on both sides of the rail and approaching one another on the inside of the rail, forming an interior and exterior chamber, and in combination therewith a main electrical line wire, located in one of the exterior chambers, a series of casings engaged at intervals with one of said side rails, a shoe movable in said conduit carrying an electrical conductor, and means engaged with said casings, and operated by said shoe, whereby electrical connection may be formed between the line wire and said conductor, substantially as described.

3. In an electrical system of street car propulsion, an underground conduit constructed with perforated flanged side rails or plates, having T-shaped heads and bases, and in combination therewith exterior fillings, located between the flanges of the rail outside the conduit and adjacent to the external body of the rail, and a main line electrical conductor carried in said filling, substantially as described.

4. In an electrical system of street car propulsion, an underground conduit, a shoe depending from the car into said conduit, a main line electrical conductor, a spring plunger to make electrical contact with said conductor, normally out of contact therewith, and a metallic spring arm L connected with said plunger normally extending across the path of the shoe, substantially as described.

5. In an electrical system of street car propulsion, an underground conduit, a shoe depending from the car into said conduit, a main line electrical conductor, a spring plunger to make electrical contact with said conductor, normally out of contact therewith, an oscillatory metallic block K engaging said plunger, said block provided with a metallic spring arm normally extending across the path of the shoe, substantially as described.

6. In an electrical system of street car propulsion, an underground conduit, formed of two rails flanged on each side thereof at the top and bottom, forming an interior chamber therebetween and exterior chambers at either side thereof, said rails separated at their upper ends to form a channel into the interior chamber, said conduit having in combination therewith a main line electrical conductor located in one of said exterior chambers, the adjacent rail perforated to permit electrical contact therewith, substantially as described.

7. In an electrical system of street car propulsion an underground conduit formed of two rails or plates each constructed in a single integral piece provided with flanges at the top and bottom extending laterally on both sides thereof, a main line electric insulated conductor bared at intervals located exterior to said conduit, and a series of contact devices projected through the adjacent rail to make electrical contact with the conductor, substantially as described.

8. In an electrical system of street car propulsion, an underground conduit formed of two flanged side rails, forming an interior and an exterior conduit, a main line insulated electrical conductor bared at intervals, located in said exterior conduit, and a series of electrical contact devices located adjacent to the bared portions of the conductor arranged to project through the adjacent rail, to make electrical contact with said conductor, substantially as described.

9. In an electrical system of street car propulsion, an underground conduit formed by two rails each flanged on both sides, at the top and bottom said rails resting on underlying ties of the car track and extending upward to the surface of the car track, and provided with a channel therebetween at the top, a main line electrical conductor located exterior to said rails, and contact devices projected through said rails for making electrical contact with said conductor, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

ELIAS HAZELTON.

Witnesses:
N. S. WRIGHT,
JOHN F. MILLER.