

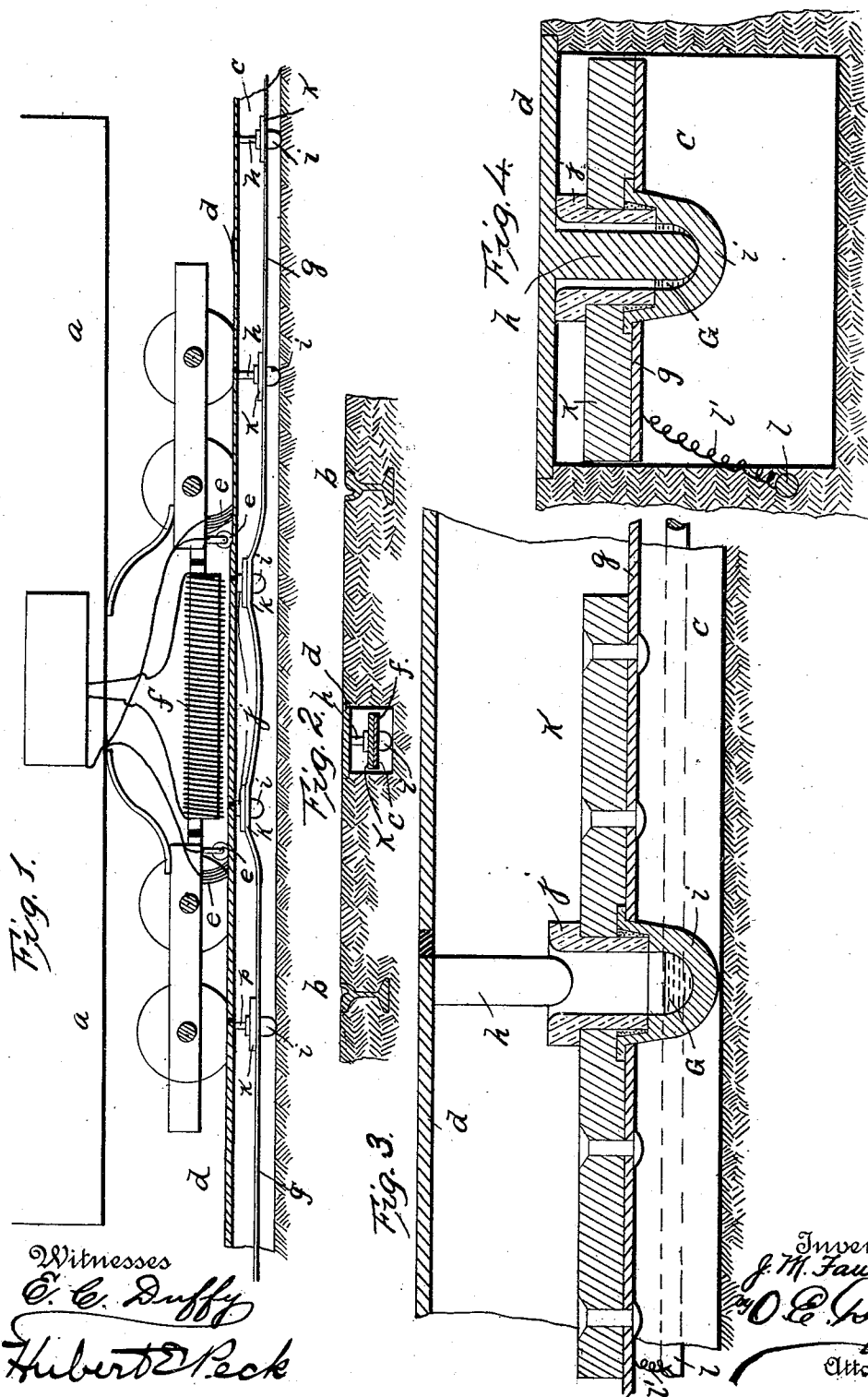
(No Model.)

2 Sheets—Sheet 1.

J. M. FAULKNER.
ELECTRIC RAILWAY SYSTEM.

No. 538,158.

Patented Apr. 23, 1895.



Witnesses
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(No Model.)

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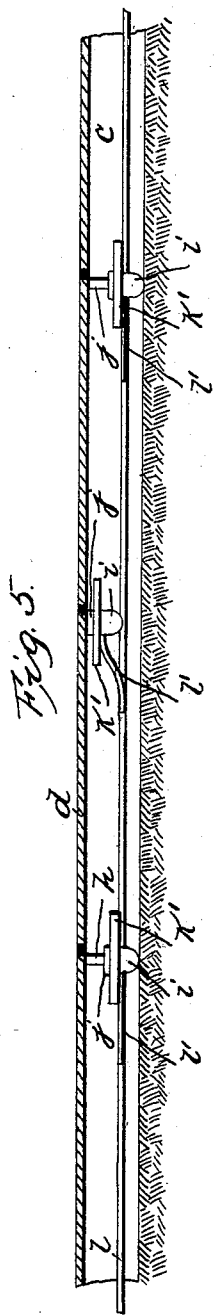


Fig. 7.

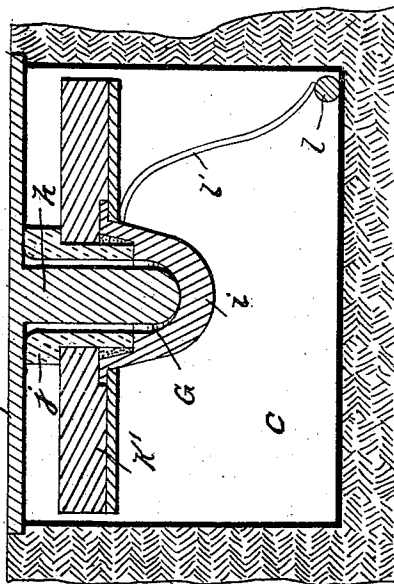
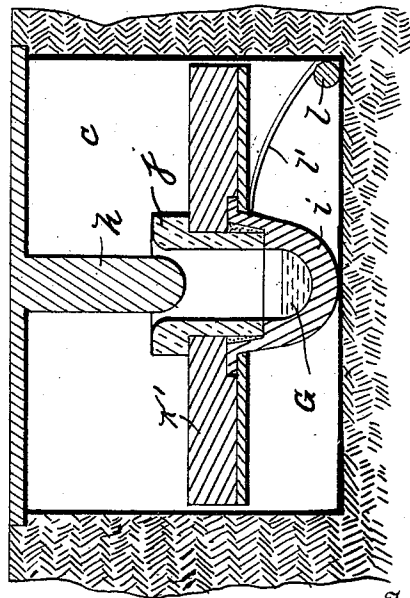


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES M. FAULKNER, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRIC-RAILWAY SYSTEM:

SPECIFICATION forming part of Letters Patent No. 538,158, dated April 23, 1895.

Application filed January 12, 1895. Serial No. 534,682. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. FAULKNER, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric-Railway Systems; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to certain improvements in electric railway systems.

The object of the invention is to provide an improved electric railway system having a closed conduit for the line conductor and wherein connection with the vehicle motor is automatically effected by sure, positive, and effective means so that the electrical connection between the line conductor and vehicle will be accomplished without material leakage and without danger, and the line conductor can be inclosed so as to avoid leakage or danger.

The invention consists in certain novel features of construction and in combinations of parts more fully described hereinafter and particularly pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a longitudinal section of a conduit showing a vehicle thereon. Fig. 2 is a transverse section. Fig. 3 is an enlarged longitudinal section showing the flexible carrier in the conduit provided with the mercury pocket and insulated guide for the exposed conductor contact, and showing the insulated line conductor connected with the section of flexible carrier, said carrier and cup shown in their normal positions. Fig. 4 is a cross section of Fig. 3 showing the cup in the position it assumes when drawn up by the magnet of the car. Fig. 5 is a longitudinal section through the conduit showing the insulated line conductor connected electrically with vertically movable magnetizable contacts having the mercury to receive the exposed conductor points, and without the employment of the flexible carrier. Figs. 6 and 7 are enlarged cross sections showing the ver-

tically movable armatures for the vehicle magnet forming contacts, in their normal and raised positions, respectively.

In the drawings, *a*, is a vehicle.

b, is the track.

c, is the closed conduit suitably constructed and properly internally insulated, and closed at the top by the conducting exposed contact plates *d*, forming the exposed conductor and normally cut out of the electrical circuit and formed in insulated sections usually shorter than one half the length of the vehicle traveling on the track which has trolleys or electrical collectors or brushes *e*, traveling on said stationary exposed contact plates to maintain the circuit through the vehicle motor. The return can be established in any suitable manner.

f, is a strong magnet carried by the vehicle and arranged directly over and close to, but out of contact with the said exposed contacts.

g, is a flexible conducting carrier or ribbon loosely and longitudinally arranged in the conduit immediately beneath, but out of contact with said contact plates. This ribbon is preferably formed of suitable conducting metal so as to have the desired durability and flexibility, and if desired of such material as to form an armature for the magnet and to be very susceptible to the magnetic influence thereof, although I do not wish to thus limit myself, as I prefer to secure magnetizable material on the flexible ribbon at the contact points to attain the object in view.

Each section of the exposed contact has one or more downwardly projecting stationary contacts *h*, on its under side directly over the flexible ribbon. Beneath each such contact *h*, the ribbon has a cup or depression *i*, containing mercury *G*, in constant electrical connection with the ribbon if that constitutes the underground live line wire or with the line wire if one be employed in addition to the ribbon. These cups are so formed in relation to contacts *h*, that the contacts are always located in the cups and hence the parts are always held in the proper relative positions and guided by the cups. The upper portion of each cup is insulated, preferably by porcelain or insulated extensions *j*, while

the small quantity of mercury *G* is located in the bottom of the cup normally out of contact with the point *h*. At or around each cup the ribbon is preferably provided with iron, or other suitable metal, plates *k*, to add weight to the ribbon at such points and to form the armatures for the vehicle magnet so that the ribbon will quickly respond to the magnet of the vehicle as hereinafter described.

The ribbon can be continuous and constitute the line conductor, or a separate live conductor *l*, can be employed connected with and feeding the ribbon which can be in sections, by means of flexible feeders *l'* permitting free vertical movement of the armature contacts *k*, and feeding each ribbon section from the line wire. Thus it will be seen that when the vehicle moves along the track with its collectors on the exposed sectional conductor, the energized magnet will attract the armatures and draw them successively up to the said exposed conductor and the points *h*, will enter the mercury in the cups and thereby establish a most perfect and thorough electrical connection with the said exposed conductor so that the car motor is supplied with a minimum amount of waste and leakage.

The exposed conductor sections beneath the car are always the only ones in circuit and alive, all the others being electrically dead and hence there is no danger to pedestrians or animals. As the car moves along the flexible carrier drops behind the car as the magnetic field moves beyond it and the carrier is being constantly raised along with the car as the magnetic field moves along the same. Before one exposed conductor section is cut out of the circuit the one immediately in advance is thrown into the circuit. It will be observed that a most perfect connection is thus made between the line wire and each exposed conductor section, thereby avoiding the leakage which is so detrimental and expensive in the ordinary underground system, and also insuring a perfect electrical contact, which is very uncertain where hard metal surfaces come together and are subject to oxidation.

The mercury cup in each movable contact in the conduit is preferably formed by the shallow metal cup *i*, secured in the armature block or carrier closing the bottom of a vertical opening therein. This cup has an internal annular shoulder on which the cylinder of insulating material *j*, rests, and is secured by cement or otherwise. This insulating cylinder extends upwardly in continuation of the cup through the body of the carrier a distance above the same and always surrounds its exposed conductor contact point and normally insulates the same. This insulated extension of the cup in which the contact *h*, is always located, holds the vertically movable carrier in the proper position so that the contacts *h*, will always enter the mercury when the carriers are drawn up when the magnetic field

reaches them. It should be observed that the metal cups are in electrical contact or connection with their carriers forming the armatures and that the mercury is in electrical contact with each cup. Instead of electrically connecting several of the vertically movable contacts by the flexible connection or ribbon, each contact or carrier forming an armature can be independently electrically connected with the insulated line wire as shown in Figs. 5, 6, and 7.

Each vertically movable contact carrier *k'* is suitably guided in its vertical movements to and from its contact *h*, preferably by the sides of the conduit and the contact *h*, which in connection with walls of the conduit hold the vertically movable carriers in their proper positions.

An essential feature of this invention is to maintain the exposed conductor "dead" except beneath the car, the contacts being so arranged as to be brought together as the car moves along and separated as the car passes, and one of the contacts having a body of mercury and the other contact arranged to enter the mercury.

It is evident that various slight changes might be made in the forms, constructions and arrangements of the parts described without departing from the spirit and scope of my invention. Hence I do not wish to limit myself to the exact construction herein set forth, but consider myself entitled to all such changes as fall within the spirit and scope of my invention.

What I claim is—

1. In an underground electric railroad system, an exposed sectional conductor, in combination with a flexible carrier arranged loosely and longitudinally in a conduit, one of said elements having contact points and the other depressions containing mercury arranged so that the contact points can enter the same, substantially as described.

2. An electric railroad system comprising a conduit having exposed conductor sections having depending contact points, a flexible carrier beneath said conductor having depressions therein containing mercury so that the points enter the mercury when the carrier is moved up, substantially as described.

3. An electric railway system comprising a conductor to receive the vehicle trolley and subject to the action of a magnet on the vehicle, a flexible ribbon opposite said conductor and so formed as to be susceptible to the influence of said magnet and drawn thereby toward the conductor, one of said elements, conductor or ribbon, having contact points and the other cups containing mercury, substantially as described.

4. In a closed conduit electric railroad system the combination of a sectional exposed conductor over the conduit having contact points, a flexible loose ribbon beneath the same having the cups into which said points are located, the upper guiding portions of the cups being insulated, mercury in the bottom

of the cups, the ribbon having magnetizable material thereon, substantially as described.

5 In a closed conduit electric railway system, a series of vertically movable contacts constituting armatures and electrically connected by a flexible connector and each having a body of mercury, and stationary contact points in electrical connection with the exposed conductor and arranged opposite the
10 bodies of mercury, substantially as described.

6. An exposed conductor having contacts, a conduit, vertically movable contacts therein electrically connected with the live line, and each containing a body of mercury arranged
15 opposite said conductor contacts, substantially as described.

7. In an electric railway system having a closed conduit, an exposed sectional conductor having rigid depending contacts in the
20 conduit, vertically movable contacts therein, each connected with the live line, and each provided with a pocket containing mercury normally insulated from its respective conductor contact and having an upward guide
25 of insulating material engaging said contact and holding the movable contact in proper position and guiding it in its vertical movements, substantially as described.

8. In an underground electric railway system, an exposed conductor having rigid contact points in the conduit, vertically movable
30 bodies of magnetizable material in the conduit connected electrically with the live line, each body having a vertical opening, a cup set therein beneath the opposite conductor

contact and containing mercury and an upwardly extending insulating guide tube surrounding said contact, substantially as described.

9. In an underground electric railway, the
40 combination of a vehicle having a trolley, an exposed sectional conductor therefor having contacts extending into a conduit, the live line having corresponding opposite contacts
45 in the conduit, one contact of each set having a body of mercury into which the opposite contact dips when closing the circuit, and one contact of each set being movably controlled by means moving with the car, substantially
50 as described.

10. In an underground electric railway, the
50 combination of a vehicle having a current collector, a sectional exposed conductor on which the collector travels and having depending
55 contacts in the conduit, the live line having corresponding opposite movable contacts, means carried by the car controlling said
movable contacts, one set of contacts having
60 bodies of mercury in electrical engagement therewith into and out of which the opposite set of contacts is adapted to move, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JAMES M. FAULKNER.

Witnesses:

C. M. WERLE,
HUBERT E. PECK.