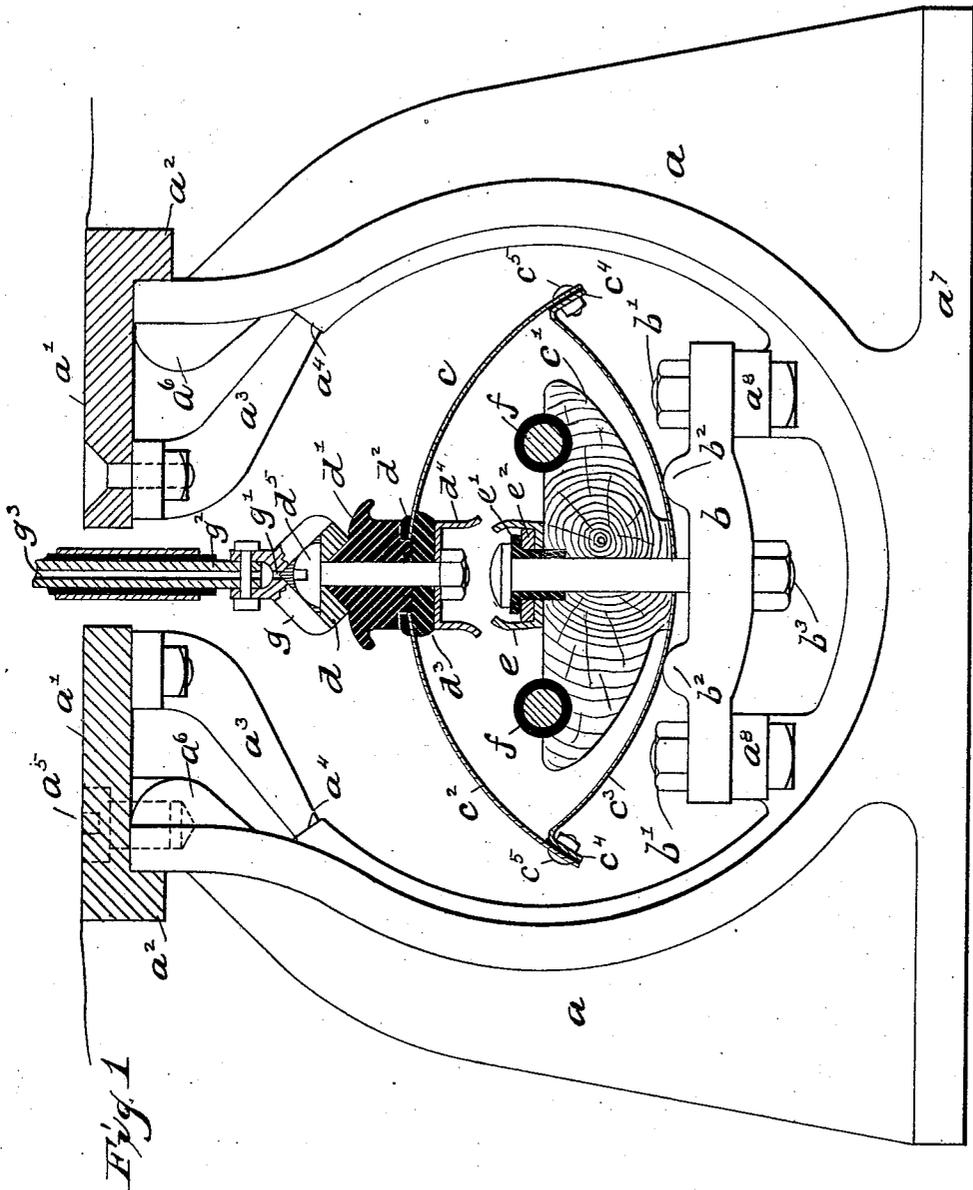


W. P. ALLEN & A. S. KROTZ.

UNDERGROUND SYSTEM FOR ELECTRIC RAILWAYS.

No. 554,104.

Patented Feb. 4, 1896.



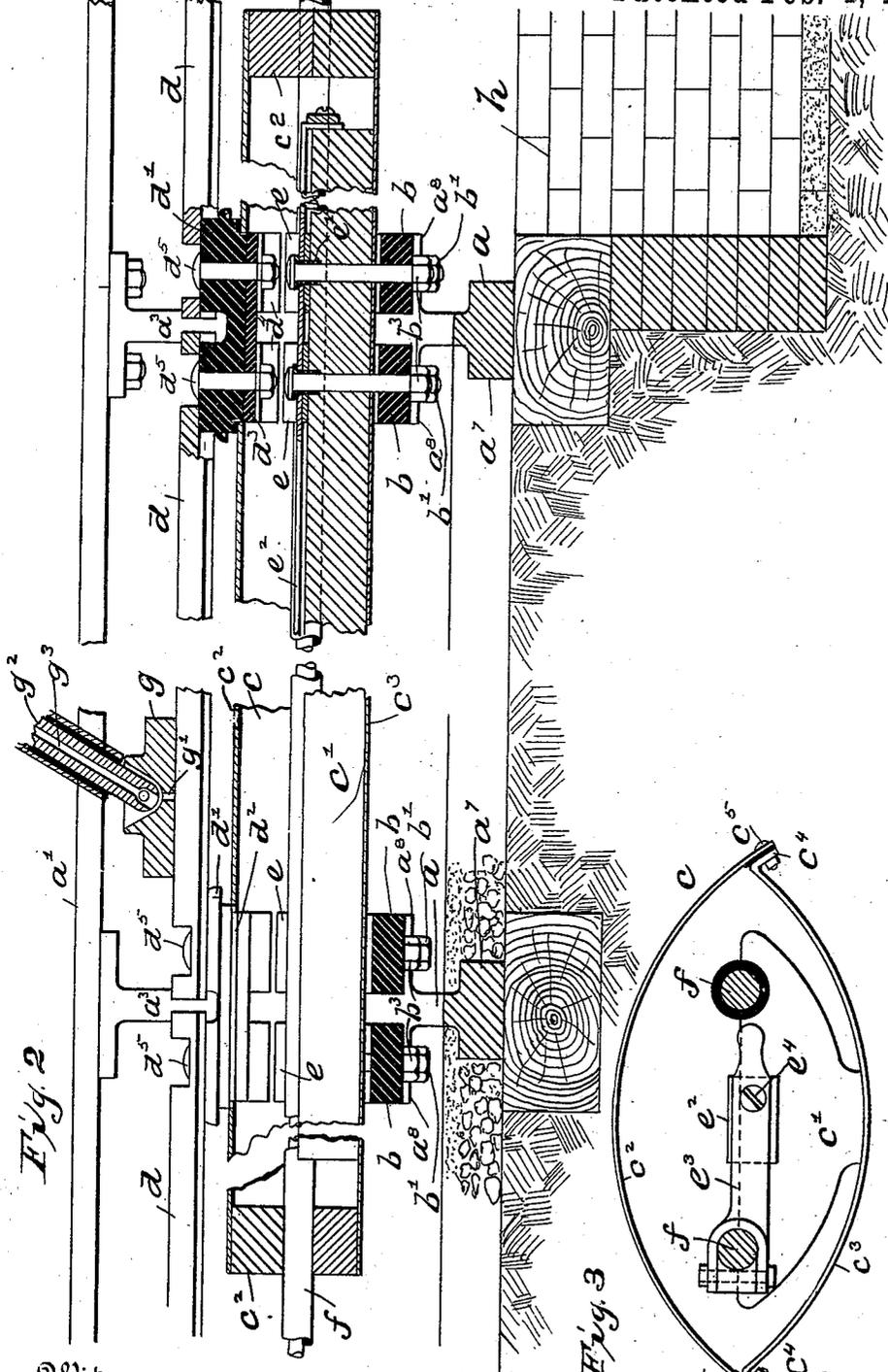
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UNITED STATES PATENT OFFICE.

WILLIAM P. ALLEN, OF CHICAGO, ILLINOIS, AND ALVARO S. KROTZ, OF
SPRINGFIELD, OHIO, ASSIGNORS OF ONE-THIRD TO OLIVER S. KELLY,
OF SPRINGFIELD, OHIO.

UNDERGROUND SYSTEM FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 554,104, dated February 4, 1896.

Application filed August 23, 1895. Serial No. 560,232. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM P. ALLEN, residing at Chicago, in the county of Cook and State of Illinois, and ALVARO S. KROTZ, residing at Springfield, in the county of Clark and State of Ohio, citizens of the United States, have invented certain new and useful Improvements in Underground Systems for Electric Railways, of which the following is a specification.

Our invention relates to improvements in underground systems for electric railways; and it consists in the various constructions and combinations of parts hereinafter described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a transverse sectional elevation of a device embodying our invention. Fig. 2 is a longitudinal sectional view of the same, and Fig. 3 an end view of one of the sectional conductor-casings and the conductors therein contained.

In the said drawings, *a a* represent supporting blocks or yokes, which are preferably of a general **U** shape, open at the top. These yokes are connected together and the tops thereof partially closed by means of plates or rails *a'*, which rails are each provided with a laterally-extending flange or projection *a²* to engage with the top of the yoke, the inner edges of said plates being supported by bars *a³*, which are bolted or otherwise connected to said plates and rest on a shoulder or projection *a⁴* on the inside of said yokes. As a further means of fastening, the plates may be secured to each of the yokes by bolts or screws *a⁵*, which extend into lugs or bosses *a⁶* on said yokes, the plates being thus removably secured and when removed form an opening at the top which will permit the conductors and other supporting and inclosing devices to be examined or removed when desired. The yokes may be connected at the sides and bottom by plates or masonry, or in any other desirable manner, to form a subway or conduit between the same, though it is not essential that it be of expensive construction more than is necessary to prevent dirt or street-foundation from coming in contact with the supporting and contacting devices, suit-

able drainage being provided at the bottom to permit the escape of water which may find its way through the slotted opening between the plates *a'*.

Each of the yokes is formed at the bottom with a base *a⁷*, which is adapted to rest on the usual cross-ties which support the track-rails, and is further provided with a **U**-shaped portion with supporting lugs or projections *a⁸*, preferably formed integral therewith, on which are supported insulating-chairs *b*. These insulating-chairs *b* are formed of any suitable insulating material, preferably hard rubber. They rest at each end on the lugs or projections *a⁸*, to which they are preferably connected by bolts or screws *b'*. Each of these insulating-chairs is further provided with projecting ribs *b²* on opposite sides of the center thereof and between the bolts *b'*. On these chairs and resting on the ribs *b²* is a flexible inclosing casing *c*, which is provided on the inside with an insulating-support *c'*, which extends from a point near one end to a point near the other end of said casing. This flexible casing *c* is made of thin resilient metal and the insulating-support rests on the bottom of said casing on the inside, the casing itself resting on the ribs *b²*. The insulating-support *c'* is supported wholly on the inside of said casing between the ribs *b²*, and a single connecting-bolt *b³* passes through the insulating-chair *b*, the bottom of said casing, and the support *c'*, so as to secure these parts together. This casing *c* is made in sections of any suitable length and the ends are closed, preferably by plugs *c²*, so that each section is water-tight. The main conductors or feed-wires *f* extend through these sectional casings and are preferably insulated throughout their length. They are adapted to pass through the plugs or covers *c²* at the ends of the sectional casings, a tight joint being formed around the conductors where they pass through the plugs or covers. At suitable points within these sectional flexible casings, preferably at each of the insulating-chairs *b*, there are placed **U**-shaped contacting devices *e*, each of which is perforated to receive an insulating-sleeve *e'*, through which the bolt *b³* passes. Between the insulating-sleeve and

the U-shaped contacting device is a conductor-strip e^2 , which extends along the supporting-block c' and is held in contact with each of the U-shaped contacting pieces e .

5 Arranged along the top and outside of the casing c is a sectional contacting-rail d , made up of sections of angle-iron, with the vertex of the angle central below the slotted opening of the plates a' . These sections are preferably made of a length to extend from one of the supporting-chairs b to another, and they are supported at each end on insulators d' . These insulators d' are shouldered down at the bottom to fit into an opening formed in the top of the flexible casing c , and a packing-strip d^2 , of soft rubber or other suitable material, is placed around the same and between the insulator and the flexible casing to form a tight joint and complete the insulation. Within the casing and resting against the top of the same is an insulating-washer d^3 , below which is a U-shaped contacting device d^4 , which stands vertically over the U-shaped contacting device e . An electrical connection is formed between the sectional rail and the contacting device d^4 by means of a bolt d^5 , which passes through the insulators and through the sectional rail and serves to hold the parts firmly together. The projecting ends of the respective U-shaped contacting devices are bent in opposite directions, as shown in Fig. 1—that is, one set is turned inwardly slightly and the other outwardly. They are preferably made of resilient metal, so as to yield slightly under pressure, and when brought in contact establish an electrical connection.

The flexible casing is preferably formed elliptical in shape and of two pieces $c^2 c^3$, the lower piece, c^3 , being flanged or turned outwardly, as shown at c^4 , and the upper piece, c^2 , being adapted to rest on the flanged portions, to which it is secured by means of bolts or rivets c^5 , suitable interposed packing material being placed therein if necessary to form a tight joint.

To provide for forming an electrical connection between the traveling motor and the contacting-rail d , we employ a sliding shoe g , formed in cross-section of an angle corresponding to that of the contacting-rail. This shoe g is perforated, as shown at g' , and to it is pivoted an arm g^2 , which is also perforated throughout its length, as shown at g^3 . The arm is insulated in the usual and proper manner, and the opening or conduit g^3 through the center of the arm serves the purpose of lubricating the shoe and rail, the said conduit or opening being for this purpose extended to a suitable point above the track and in convenient reach from the car.

At the end of each of the supports c' , and near the end of the casing which incloses the same, we provide a switch-lever e^3 , one end of which is in electrical connection with one of the conductors f , the other end being in contact with the conducting-strip e^2 , which

extends along said insulating-support. A screw e^4 , passing through said switch-lever, serves to hold the parts in contact. When the plug c^2 is removed from the end of the casing, the switch-lever may be thrown out of contact with the conducting-strip after removing the screw e^4 , and thus disconnecting all the conducting devices which are within said casing from the conductor.

In operation, the shoe g as it passes along the sectional rail is adapted to depress the same, the yielding casing permitting the contacting devices d^4 and e to be brought in contact, thus establishing an electrical connection from the inclosed conductors to the sectional rail which is depressed. As the shoe passes along, the resilience of the casing causes the parts to return to their normal positions in which the rail-sections are entirely disconnected electrically from the conductors.

By having the casing supported on the ribs b^2 of the insulating-chairs and the insulated support resting wholly between said ribs, it is possible, by tightening the bolts b^3 , to change the form of the elliptical casing by drawing the sides inwardly and thus affording more tension to the yielding portions.

It will be seen from the above construction that we provide contacting devices which are doubly insulated. The conductors and contacting devices are completely inclosed with water-tight compartments which are insulated from the yokes or supports. The contacting-rail is insulated from said inclosing casing, so that the loss of current by induction or leakage is practically impossible.

We preferably employ at suitable intervals, and between adjacent sections of the casing, manholes or wells h , in which an operator may descend for the purpose of examining or repairing any breaks or leakages which may occur. By having the plates a' removed, as described, an entire section of the casing and conductors may be removed or replaced.

Having thus described our invention, we claim—

1. The supporting-yokes, insulating-chairs therein, a flexible metallic casing supported on said chairs, an insulating-strip within said casing, conductors extending through said casing which is closed at the ends as described, contacting devices within said casing, and a connection from the conductors to said contacting devices, a sectional insulated rail supported on the outside of said casing, and electrically connected to one of said contacting devices, substantially as specified.

2. The combination with the supporting-yokes, insulators therein, the elliptical metallic casing having an insulated support for the conductors which extend through the same, said casing being closed at each end and having therein a number of contacting devices, an electrical connection, including a switch, from one of said conductors to said contacting devices, an insulated rail sup-

ported on said casing, and an electrical connection extending through said casing to a movable contact arranged adjacent to each of said contacting devices, and means, as described, for depressing said rail to establish an electrical connection between said contacting devices and thus with said rail, substantially as specified.

3. The combination with the yokes and the insulating-chairs having ribs or projections thereon, a flexible casing resting on said ribs, and a support within said casing wholly between said ribs, adjustable fastening devices extending through said support, casing and chairs, substantially as and for the purpose specified.

4. The combination with the yokes and the supporting-chairs, of a flexible casing closed at each end as described, said casing being formed of two pieces of resilient sheet metal, one of which is bent or flanged to receive the

other piece which is bolted or otherwise secured thereto, substantially as specified.

5. The combination with the flexible casing, and contacting devices within the same, of a contacting sectional rail supported at intervals on insulators on said flexible casing, and a shoe on said rail, said shoe having a perforation, and a pivoted arm having an opening through the same to communicate with the perforation in said shoe, substantially as specified.

In testimony whereof we have hereunto set our hands this 14th day of August, A. D. 1895.

WILLIAM P. ALLEN.

ALVARO S. KROTZ.

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