(No Model.)

D. D. BOOK.

BOND FOR ELECTRIC RAILWAYS.

No. 526,142. Patented Sept. 18, 1894.

Fig. 2,

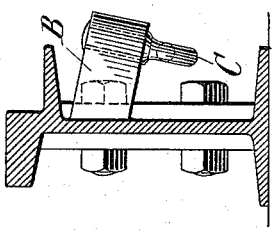


Fig. 1.

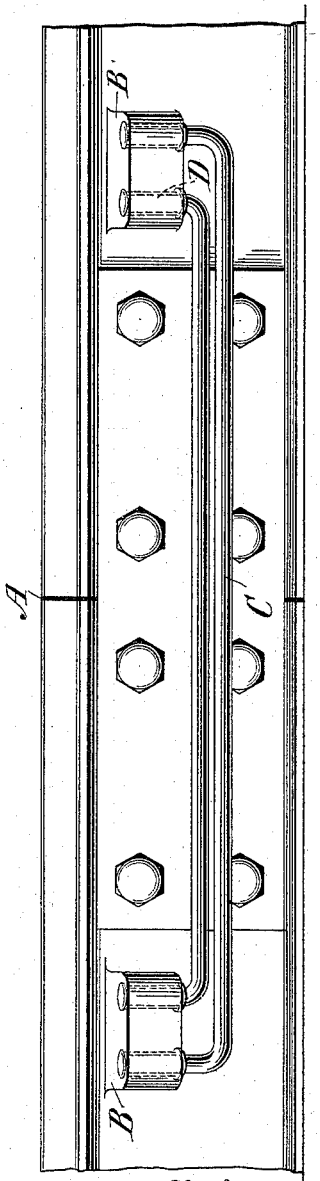
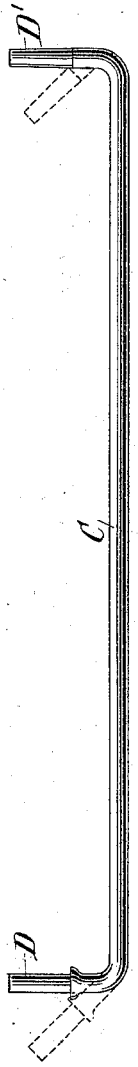


Fig. 3.



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BOND FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 526,142, dated September 18, 1894.

Application filed July 14, 1894. Serial No. 517,521. (No model.)

To all whom it may concern:

Be it known that I, DWIGHT D. BOOK, a citizen of the United States, residing in the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Bonds for Electric Railways, of which the following is a specification.

This invention relates to bonds for electrically connecting the rails in an electric railway system.

The object of the invention is to improve the contact at the junction between the bond-conductor and the rails, and to prevent disconnection or variation of resistance by loosening during service.

Various methods have heretofore been devised for improving the conductivity of the rail or rails which constitute one side of the electric circuit supplying motors of electrically propelled cars or vehicles. In the methods commonly employed, there are two great difficulties which detract from the efficiency of the bonds, one of which is that they are apt to work loose by the movement or vibration of the rail ends, due to the transit of the cars, and another is that by reason of the thinness of the rails, and especially those employed on street railways, it is difficult to give the joint the same current carrying capacity as the conductor bonding the rails or as the rails themselves; that is to say, by reason of the thinness of the rails the area of contact between the good conducting metal of which the bond-conductor is formed and the rail is utterly insufficient to make the conducting capacity of a joint as great as that of the rest of the circuit. For example, if the bond-conductor be made of copper, its resistance per unit of cross-sectional area will be approximately one-sixth as great as that of the rail. Therefore the superficial area of the joint should be six times as great as the cross section of the bond-conductor. Obviously, where the the conductor is directly inserted through the web of the rail, it is impossible to attain such a great area of contact. By my invention these difficulties are both overcome. First I so mount the bond that it is impossible for it to work loose however great the amount of vibration of the rail ends, and second I may increase the area of the joint to any desired extent so as to compensate for the difference of conductivity of the bond-conductor and rail.

In carrying out my invention I provide the rail ends with a metallic projection which I call a "bond-plate," the projection preferably being made electrically integral with the rail itself by welding, forging, thickening, or upsetting the rail. If the bond-plate be made of a comparatively poor conducting material, such as iron or steel, its cross-section should be sufficiently great to present a carrying capacity approximately equal to that of the rail itself, and its surface of junction with the rail should be approximately equal to the cross-section of the rail; but if made of a better conducting material, its body portion should be in area inversely proportional to the ratio of its conductivity to that of the rail. The same reasoning applied to the contact of the bond-plate with the rail can be applied to the contact of the bond-conductor with the bond plate. This latter contact or joint may be made in a variety of ways; one or a plurality of holes may be formed in a bond-plate into which the bond-conductors may be secured by soldering, welding, pressing, &c., or grooves or ledges may be formed on the surface of the bond-plate and the bond-conductor soldered, welded or otherwise secured therein; or projections on the bond-plate may be bent over the bond-conductors to assist the soldering operation and lock the conductor in place. I prefer to form in the bond-plate one or more holes preferably inclined somewhat from a vertical in a plane at right angles to the rail so that a reaming tool may pass the head of the rail and clean the holes preparatory to the establishment of a joint. In these holes are placed the bond-conductors, which are inserted from beneath, and are provided with a flange or made wedge shaped, so that the melted solder will not run through at the bottom when poured around the joint. The end of the conductor is so arranged that when inserted in a hole it will project a short distance above the bond-plate, so that after the soldering operation is completed, its upper end projecting above the level of the bond-plate may be struck a blow with the hammer and headed or upset so as to effectually prevent disconnection in case the solder should fail during ser-

vice. I do not however restrict myself to the mode of securing the bond-conductor just described, as other ways of establishing a joint between it and the bond-plate may be employed, as will hereinafter be described.

My invention therefore consists of a bond-plate for electric railway conductors electrically integral with the rail itself by being welded or forged thereto, or formed by thickening or upsetting the rail.

My invention also involves a bond-conductor or conductors secured to such a bond-plate.

It also involves other features which will be more particularly hereinafter described, and will be definitely indicated in the appended claims.

In the accompanying drawings, which illustrate the invention, Figure 1 is a side elevation of a rail junction embodying my improvements. Fig. 2 is a cross-section of street railway rail, showing a bond constructed in accordance with my improvements; and Fig. 3 is an elevation of a bond-conductor, one end of which is provided with a flange at the bottom of the pin or terminal by which the joint is made, the other end of which is provided with a tapering pin for accomplishing the same result.

A represents a rail joint, the rail ends being maintained in position by fixed plates, as indicated, in the ordinary manner. Near the end of the rail I provide a metallic projection B which I term a "bond-plate." This projection is made electrically integral with the body of the rail. It may be constructed of any suitable material. If made of iron or steel its cross-section should be approximately equal to the cross-section of the rail, so as to render its conductivity substantially the same as that of the rail, and its surface of junction with the rail body should be such that it will have a current-carrying capacity equal to that of the rail. If made of a better conducting metal, such as brass, its body portion may be made considerably less in cross-section, but its junction area with the rail body should be as near as practicable to the cross-section of the rail, so that the conductivity of the joint may approach that of the rail. The bond-plate may be welded electrically or be forged to the body of the rail, or may be otherwise connected thereto so as to become electrically integral therewith. The bond-plate is preferably inclined or given a slight horizontal dip and is provided with one or a plurality, as may be desired, of holes for the reception of the bond-conductors; or, if the bond-plate be placed in a horizontal plane, the holes themselves should incline away from the vertical so that when the bond-conductor is to be put in place they may readily be reamed out or cleaned to facilitate the soldering operation. The bond-conductor or conductors C will be made of copper or other good conducting material and are provided at the ends with a bend which may be substantially a right angle when used in connection with high rails, the terminals D or D′ being shaped to fit in the holes in the bond-plates. When the bond-plate is attached to low or T-rails the ends of the conductor C may be inclined at an angle acute at one side and obtuse at the other, as indicated in dotted lines in Fig. 3. This slope will permit the bond-conductor to be inserted from the bottom although the bond-plate is attached to a low rail. In such a case the holes in the bond-plate will be made at an angle with a plane transverse to the rail length. The terminals D, D′ may be cylindrical as shown at the left of Fig. 3 and provided with a shelf or flange to stop the bottom of the hole and prevent leakage of solder during the establishment of the joint; or in lieu of this the terminal may be tapered as shown at D′ so that it may be wedged in the bottom of the hole and accomplish the same result. The terminal should be of sufficient length to project above the upper face of the bond-plate when pressed home; and after the solder hardens or cools the upper end may be struck one or more blows with a hammer and upset, thus firmly locking the bond-conductor to the bond-plate and effectually preventing it working loose even if the solder should give way or fuse under heat.

In Fig. 1 I have shown two bond-conductors, by way of example, though of course it will be understood that more than two may be employed, if desired. In determining the area of the joints between the bond-plate and rail, or between the bond-conductor and the bond-plate, the joints will be so designed that the aggregate area will be as much greater than the cross-section of the bond-conductor or conductors as the iron or steel of the rail is less in conductivity than the material of which the bond-conductor is made.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A rail bond for electric railways comprising a bond plate electrically connected with the rail provided with upwardly extending holes to facilitate connection with the bond conductor.

2. A rail bond for electric railways comprising a bond plate electrically connected with the rail and provided with holes to facilitate connection with the bond conductor, said holes inclining outwardly and upwardly, for the purpose described.

3. A rail provided at or near its end with a metallic projection or bond-plate forming an integral part of the rail.

4. A rail provided with a bond plate electrically welded thereto so as to form an integral electric connection therewith.

5. A rail bond comprising a bond-plate connected with the rail provided with an upwardly extending perforation to receive the bond conductor from beneath, and bond con-

ductors adapted to stop the bottom of the perforation to prevent leakage during soldering.

6. A rail bond comprising a perforated bond plate connected with the rail, extending outwardly therefrom, and having a bond conductor extending through the perforations and upset at its end.

In testimony whereof I have hereunto subscribed my name this 13th day of July, A. D. 1894.

DWIGHT D. BOOK.

Witnesses:
E. C. GRIGG,
ROBT. H. READ.