J. E. SLIMP.

METHOD OF SECURING RAIL BONDS TO RAILS.

APPLICATION FILED APR. 28, 1917.

1,276,426.

Patented Aug. 20, 1918.

2 SHEETS—SHEET 1.

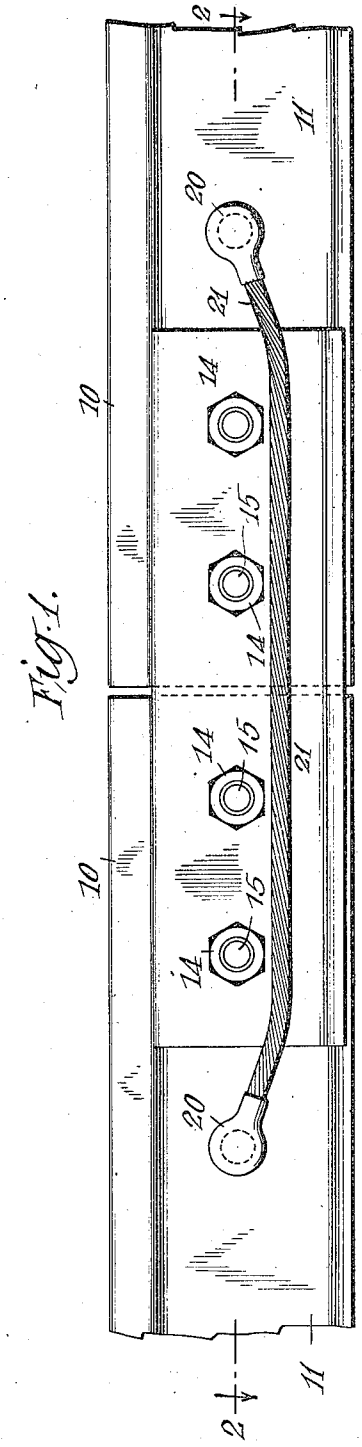


Fig. 1.

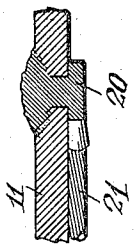


Fig. 5.

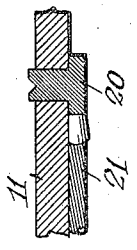


Fig. 4.

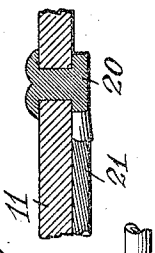


Fig. 3.

Fig. 2.

Inventor

J. E. Slimp

By his Attorney

Cornelius C. Billings.

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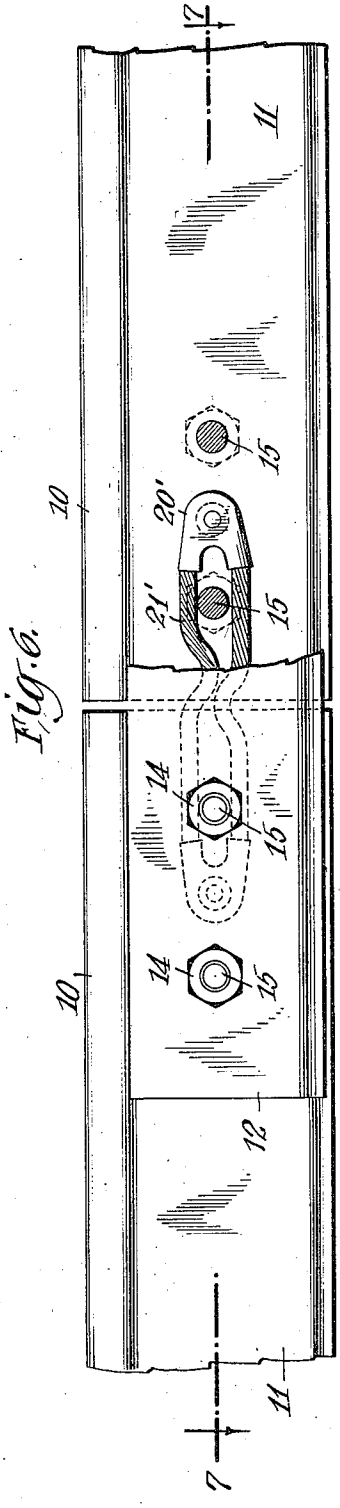


Fig. 6.

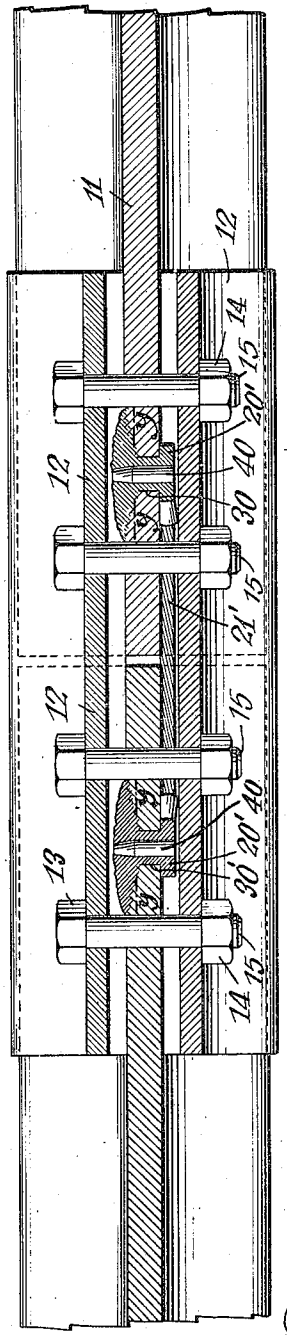


Fig. 7.

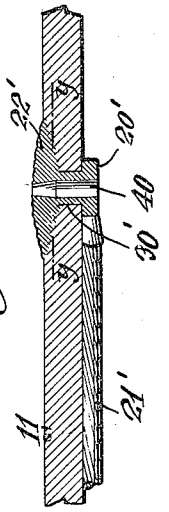


Fig. 9.

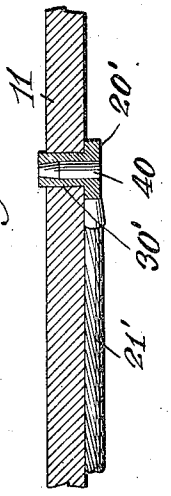


Fig. 8.

Inventor

J. E. Slimp

By his Attorney

Cornelius C. Billings

UNITED STATES PATENT OFFICE.

JAMES E. SLIMP, OF NEW YORK, N. Y.

METHOD OF SECURING RAIL-BONDS TO RAILS.

1,276,426. Specification of Letters Patent. Patented Aug. 20, 1918.

Continuation in part of application Serial No. 872,522, filed November 17, 1914. This application filed April 28, 1917. Serial No. 165,095.

To all whom it may concern:

Be it known that I, JAMES E. SLIMP, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Methods of Securing Rail-Bonds to Rails, of which the following is a full, clear, and exact description.

My invention relates to electric conductors and a method of producing the same and is more especially applicable to electric rail bonds and methods of attaching the same to the rails.

The invention more particularly relates to improvements in rail bonds of the plug terminal type, which embraces all bonds having a portion or all of their contact effected by means of a plug which passes through the web or foot of the rail, which plug is compressed or expanded into intimate contact with the walls of a hole in the web or foot of the rail through which the plug projects.

In all such plugs or terminals of the prior art of which I am aware, there is of course a distinct line of surface contact between the rail and bond. This structure causes a contact resistance which is undesirable, due to the fact that it causes a loss of current and consequent loss of power.

Furthermore, after such bonds have been in service for some time the resistance rapidly increases due to the aforesaid imperfect mechanical and electrical contact. The increase of resistance is due to many causes some of which are the following:

1. The flowing of the copper in the terminal, due to the constant hammering of the car wheels on the joints, thus loosening the terminals in the hole.

2. The corrosion of the terminal connection.

3. The rusting of the metal of the rail surrounding the hole.

4. The electrolytic action due to the contact of the two dissimilar metals.

One of the objects of my invention is to overcome these structural defects and to thereby eliminate the losses.

Another object of my invention is to produce a rail-bond connection, by effecting a molecular union or alloy connection between the metals of the bonds and the rails.

To these ends and to eliminate all chances of deterioration, I propose in the carrying out of my invention to eliminate the contact joints, by forming an alloy connection between the copper of the plugs or terminals of the bonds with the steel of the rails. By this I mean that a molecular union of the two metals is effected, so that the molecules of the metal through a line crossing the union at the surface may be described as being—all steel, steel-copper alloy, copper steel-copper alloy and steel.

This application is a continuation in part of my application, Serial No. 872,522, filed November 17, 1914.

Referring to the drawings forming part of the specification;

Figure 1, is a side elevation of one form of electric bond and rail connection.

Fig. 2 is a section on line 2—2 of Fig. 1, the right terminal being completely welded or joined by my process to the web of the rail and the left terminal being shown in the course of being welded or joined to the web of the rail. A conventional oxy-acetylene or oxy-hydrogen burner is also shown in operative position.

Fig. 3 is a section of an ordinary compressed terminal plug before it is integrally welded.

Fig. 4 is a section of an ordinary plug terminal bond simply inserted in a hole in the rail web.

Fig. 5 is a similar view of a plug terminal bond made integral with the rail by means of my process with or without previous compression or expansion of the plug.

Fig. 6, is a side elevation of another form of electric bond and rail connection, partly in section, with a portion of a fish plate broken away.

Fig. 7, is a section on line 7—7 of Fig. 6, all the parts here shown in place.

Fig. 8, is a detail section of such a plug and rail connection before the alloy or molecular change is effected.

Fig. 9, is a detail section of a plug and rail connection after the metals are alloyed, to form the molecular union.

The same reference characters are used in the various figures of the drawings to designate similar parts.

10 represents the rails, 11 the webs thereof, 12 the fish plates, 13 the bolts to secure the rails and fish plates together in the usual way by nuts 14 on threaded shanks 15. 20 and 20′ respectively represent the plugs or

the bonds, 21 and 21′ respectively represent the wire bond integrally connecting the plugs together and 22 and 22′ respectively represent the rivet side or head of the copper plug. 30 and 30′ respectively are the holes in the web of the rails through which the copper plugs pass. 40 in Figs. 7, 8 and 9 is a steel pin or plug of conical shape driven in the hollow center of the rail bond plug to effect a tight mechanical contact between the sides of the plug and the walls of the holes in the web of the steel rails.

A is the oxy-acetylene or oxy-hydrogen burner and F is the flame therefrom. Holes are bored in the webs of the rails of sufficient size to receive with a tight fit the plug terminals of the bonds. In the construction of solid plugs I cause the plugs to be expanded into the holes by compressing the plugs in the fashion of rivet heads as shown in Fig. 3, and in the construction showing hollow plugs I expand the sides of the plugs out against the walls of the holes by driving a steel pin through the holes of sufficient size to expand the plug out against the walls of the holes, and then conical shaped steel pins are driven into the hollow copper plugs, the steel pins being of sufficient diameter to force the copper of the plugs or terminals tightly against the walls of the holes in the webs of the rails. The conical steel plugs are then permitted to stay in their inserted positions.

The contact connections throughout a portion of their extent are then broken down by alloying the copper of the plugs to the steel of the rails by means of a hot flame such as the oxy-acetylene, oxy-hydrogen or electric arc flames F. In forming the alloy connection, the copper and steel are melted one into the other, thus forming the molecular union between the two metals.

In practice it has been found that the surface of the rail, being of metal having a comparatively high fusing point, should be heated first and the end of a rod of wire or copper or similar metal should then be kept on the rail at the point where the flame or arc is applied. The flame is then moved from point to point on the surface of the rail adjacent to the exposed end of the bond terminal, which is of metal of comparatively low fusing point. This process gives a steel copper alloy on the surface of the rail. Then the copper or low fusing metal of the exposed part of the terminal is melted down and readily unites with the higher fusing metal of the rail; thereby forming a molecular union at the surface.

This operation is effected on the riveted side of the bonds; that is on the opposite side of the bond to that where the body portion of the bonds is located. This eliminates the danger of burning or crystallizing the strands of the body portion of the bond. This precaution is essential for in all previous attempts to apply bonds by heat, such as the soldered or brazing method, it has been done at the sacrifice of the strength and life of the free or body portion of the bond.

An important feature of my process is, that it is as applicable to bonds that have been in service for years, no matter how badly deteriorated the joints may be as it is to the new and unused bonds. As a result of my process the used bond will readily be made more efficient than it was when first installed by the prior methods. In carrying out my process it is not necessary to sand-blast or otherwise clean the rails or copper terminals since the hot flame very rapidly reduces the iron or copper oxids to metal and effectually fuses the copper terminal to the web or foot portion of the steel rail making an integral connection by alloying the two metals together, thus forming a perfect molecular union between the two at the exposed surfaces thereof. The molecules may be said to be arranged as follows along a line *y*—*y* of Figs. 2, 7 and 9, as steel, steel-copper alloy, copper, steel-copper alloy and steel.

If it should appear that the extended end of the copper terminal has insufficient metal in it to properly and effectually fuse the bond to the rail so that the point of union has insufficient area to properly carry the current without loss, then I have found it expedient and desirable to add metals by means of a small rod, plate or strip of copper or other similar metal held in the hot flame at the point it is desired to build up the terminal. This will puddle or melt the rod into the terminal to form an integral part thereof. Either copper, bronze or brass rods may be used for the purpose.

By my method it is possible to bond two rails of any weight to full capacity. This has been impracticable heretofore due to the difficulty of obtaining and maintaining sufficient contact area between the rails and connecting bonds. The shape of the coöperating parts may be changed, and similar metals may be used to take the place of the copper and steel.

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

1. The method of forming a rail bond which consists in providing a close metallic connection or joint between a rail and a bond terminal extending through a hole provided in the rail, heating the metal of the rail adjacent the free end of the terminal to its fusing point, heating the free end of the terminal to its fusing point, and puddling the metals of the rail and of the free end of the terminal together to thereby break down the abutting connection or joint between the heated parts and form an alloy connec-

tion between the rail and the free end of the terminal.

2. The method of bonding rails which consists in first forming close mechanical abutting connections between the rails and the bond terminals, then heating the exposed metal of higher fusing point adjacent to the terminal to its point of fusion, then heating the exposed metal of lower fusing point adjacent to the rail to its point of fusion puddling the metals together to break down the abutting connections at the surface to form an alloy connection between the metals.

In witness whereof I have hereunto set my hand at the borough of Manhattan, city and State of New York, this 11th day of April, 1917.

JAMES E. SLIMP.

In presence of—
ISABEL R. RICHARDS,
ZITA M. GRAHAM.