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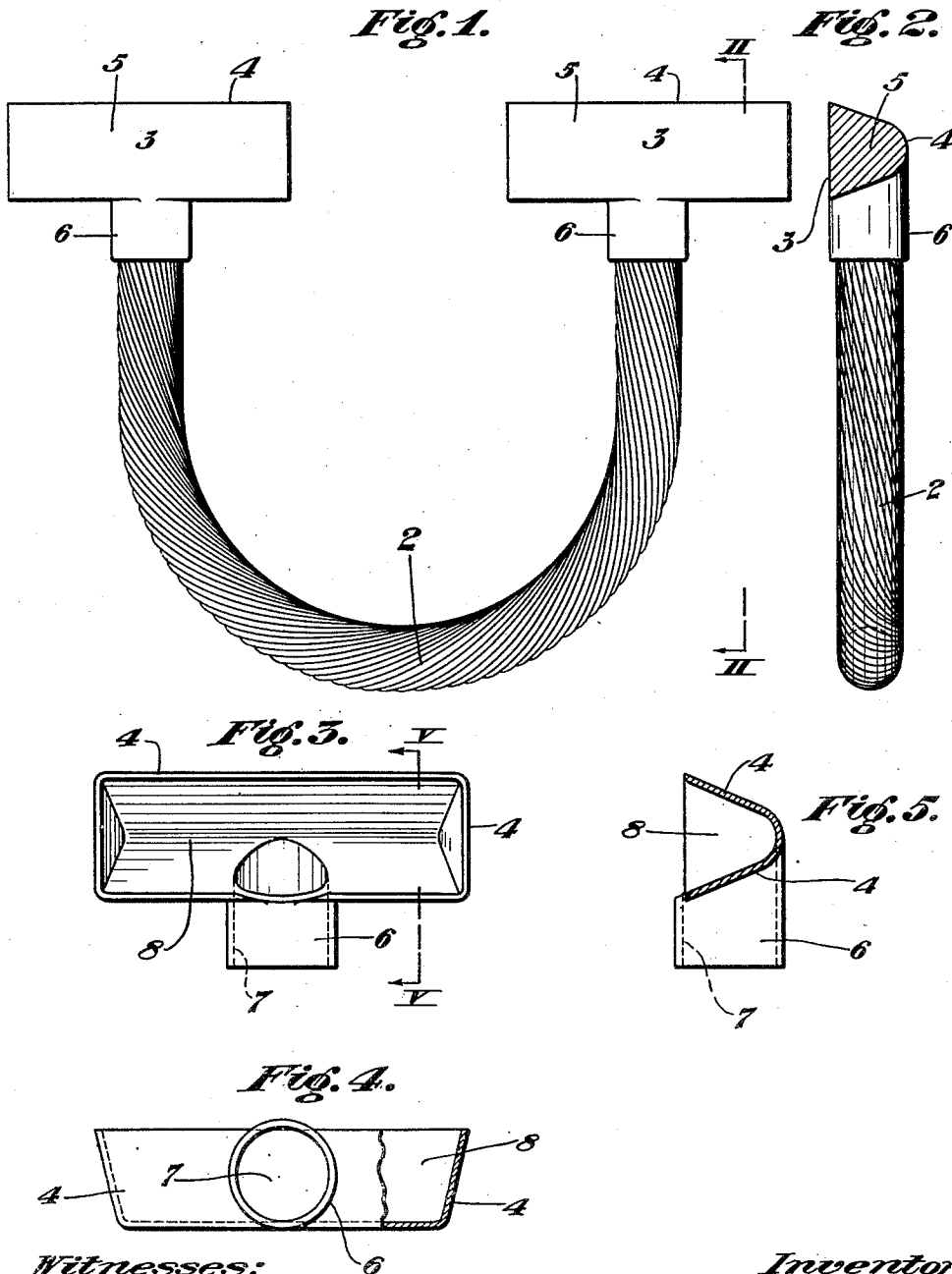
1,554,285

C. L. LARSON

RAIL BOND AND METHOD OF MAKING SAME

Filed Sept. 2, 1921

2 Sheets-Sheet 1



Witnesses:
Edwin Truab

Inventor:
CHARLES L. LARSON,
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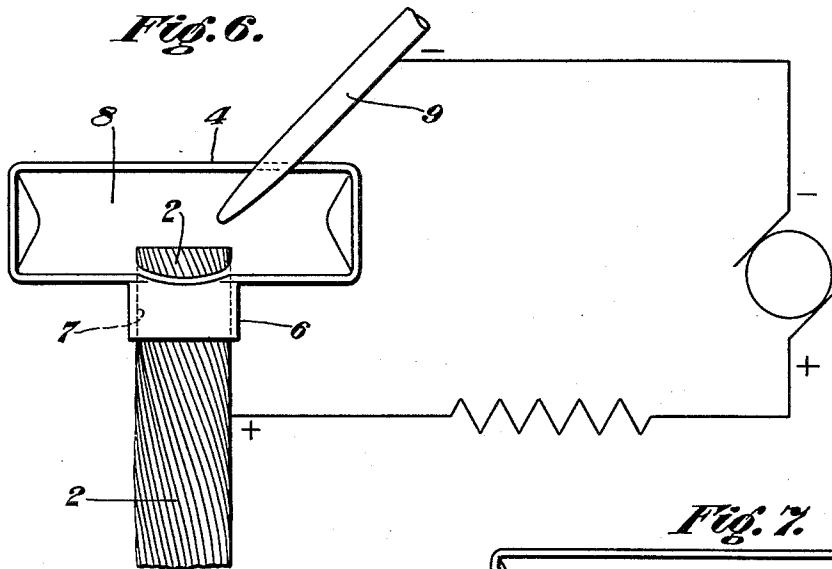
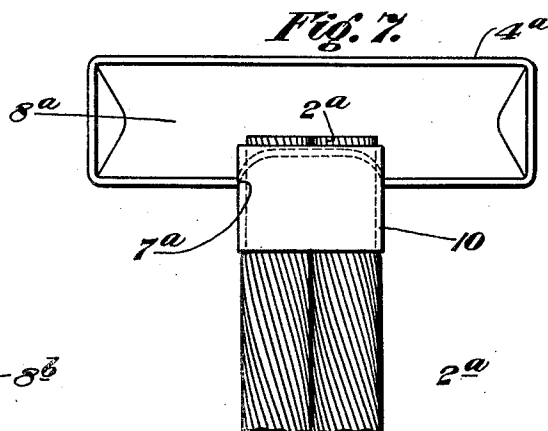
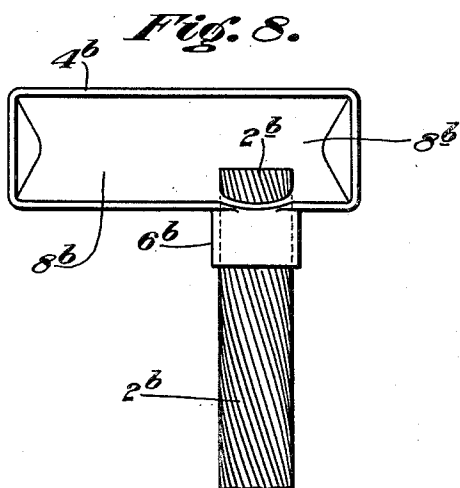
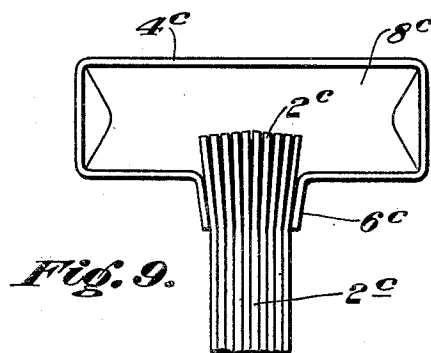
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RAIL BOND AND METHOD OF MAKING SAME

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2 Sheets-Sheet 2



Witnesses:

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UNITED STATES PATENT OFFICE.

CHARLES L. LARSON, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE AMERICAN STEEL AND WIRE COMPANY OF NEW JERSEY, A CORPORATION OF NEW JERSEY.

RAIL BOND AND METHOD OF MAKING SAME.

Application filed September 2, 1921. Serial No. 498,114.

To all whom it may concern:

Be it known that I, CHARLES L. LARSON, a citizen of the United States, and resident of Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Rail Bonds and Methods of Making Same, of which the following is a specification.

This invention relates to rail bonds having a conductor and terminals, with the terminals permanently fixed to the ends of the conductor. The invention, while not limited thereto, more particularly relates to rail bonds having rigid terminals formed of dissimilar metals and a flexible conductor connecting and permanently united or welded to the terminals, and adapted to be secured to the track rails by arc welding.

One object of my invention is the provision of a novel method of making rail bonds whereby the rail bond terminals, in being formed or fabricated, are united to the ends of the bond conductor by filling a hollow metal shell with molten metal and fusing or welding the body of the terminal to the hollow metal shell or crust and to the end of the conductor in the terminal fabricating operations.

Another object of the invention is the provision of an improved method of making rail bonds whereby composite rail bond terminals are formed having an interior or body portion of relatively soft metal which is encased in and fused to a hard metal shell or crust of relatively harder metal.

Another object of the invention is to provide a rail bond having terminals formed of dissimilar metals, with the terminals constructed in such manner as to permit of forging the built-up terminals to make the metal of the terminals dense and homogeneous and at the same time shape the terminals to the desired size and contour.

A further object of this invention is the provision of a rail bond that is readily applied to a track rail by welding processes employing an electric arc.

A still further object of this invention is the provision of a rail bond having the novel constructions, arrangement, and combination of parts shown in the drawings, to be described in detail hereinafter, and to be particularly pointed out in the appended claims.

Referring now to the drawings forming

part of this specification, Figure 1 is a plan, and Figure 2 is a sectional side elevation, the section being taken on the line II—II of Figure 1, showing a completed rail bond of the T-head terminal type, embodying my invention and made in accordance with the method forming part of my invention.

Figure 3 is a plan, Figure 4 a side elevation, and Figure 5 a sectional end elevation, on the line V—V of Figure 3, showing one form of metal shell as formed and used in making rail bonds in accordance with this invention.

Figure 6 is a plan illustrating the manner of building up the interior or body portion of the rail bond terminals and attaching the conductor thereto by the method forming part of my invention.

Figure 7 is a plan showing the manner of connecting the terminals to the ends of the conductors preparatory to building up the body portion of the terminals of a double strand T-head terminal rail bond.

Figure 8 is a plan showing one end of the conductor of a rail bond, of the L-head type, positioned within the metal shell forming part of the completed rail bond terminal, in readiness for building up the body of the terminal and uniting the metal shell and interior or body portion of the terminal to each other and to the conductor.

Figure 9 is a plan showing one end of a laminated rail bond conductor positioned within the metal shell forming part of the terminal of a rail bond, of the T-head type, in readiness to form the interior or body portion of the terminal and unite the shell, body portion, and conductor in accordance with my invention.

In Figures 1 and 2 of the accompanying drawings (which show a rail bond embodying my invention in its finished form) the numeral 2 designates the rail bond conductor, and 3, in a general way, the terminals on the ends of the conductor 2. In this rail bond, which is of the T-head type, the conductor 2 is flexible, being made of a strand of copper wires. The terminals 3 are formed of an outer shell or crust 4 and an interior or body portion 5. In order to provide a rail attaching surface on the bond terminals, which is of approximately the same conductivity as the track rails to which the bonds are applied when in use, the terminals may be built up of dissimilar metals,

the outer surface 4 preferably being made of a hollow trough-like shell of steel or other ferrous metal, and the body portion 5 made of copper or a cuprous alloy.

5 In constructing the terminals 3, the hollow trough-like shells 4 (see Figures 3, 4, and 5) are made by drop forging, being forged from a bar of steel or other metal of suitable size and shape. The shells 4
10 are of substantially triangular cross section and are made with comparatively thin, flat side and end walls and a rounded bottom. Each shell 4 is provided on one side with a boss 6 having an axial opening 7,
15 which is formed by drilling or punching, through which the end of the rail bond conductor 2 projects into the cavity 8 in the hollow terminal shell 4, this boss 6 serving to hold the conductor 2 in place relative to
20 the shell 4, while the body 5 of the terminal is being built up of fused metal.

In forming or building up the composite terminals 3 and securing the ends of the conductor 2 thereto, the cavity 8 in the hollow, trough-like shells 4 will first be cleaned
25 so as to remove all scale or rust. After the end of the conductor 2 has been inserted in the opening 7 in the boss 6 of the shell, the cavity or recess 8 therein is filled with molten metal, usually copper or copper alloy.

The preferred way of supplying the molten metal used to form the body 5 of the rail bond terminals is by means of the electric arc and by the use of a non-metallic
35 electrode 9 as one pole of the electric circuit, the terminal shell 4 and the conductor 2 forming the other pole of the circuit.

In another way of supplying the molten metal the electrode 9, instead of being a non-metallic electrode, will be formed by the metallic rod or pencil from which the
40 molten metal is derived.

In using the preferred way of applying the molten metal an electric arc will be
45 formed between the end of the non-metallic electrode 9 and the shell 4. The inner surfaces of the shell and end of the conductor 2 will become heated thereby to the fusing point. A metallic rod or pencil will
50 then be introduced into the zone of fusion formed by the electric arc and will be melted therein, the molten metal dropping into the cavity 8 of the shell 4 and becoming welded to the fused surfaces of the shell
55 2 and end of the bond conductor 2. By filling the cavity 8 in this manner, with metal melted from the pencil the body 5 of the terminal is built up or formed. The metal forming the body of the terminal,
60 when the terminal is made in this way, is liable to be somewhat porous and relatively weak mechanically and the so formed terminal will have a rough unfinished appearance, although it may now be used in bonding
65 ing rails.

In forming the terminals by using a metallic pencil to form the electrode 9, instead of a non-metallic electrode, the terminal body 5 will be built up as has been described, the one difference being that the
70 electrode 9 itself is melted to supply the metal forming the body 5, instead of using a separate pencil as done when the non-metallic electrode is employed, and the results in using this method not proving as satis-
75 factory as the first described and preferred method.

In order to compact the metal forming the body 5 of the terminals and shape the terminals 3 to the desired contour and size,
80 as well as to provide a finished appearance to the outer surfaces thereof, the terminals are now heated to a forging temperature and drop forged. The flash which forms on the edges of the terminal in this operation is
85 sheared off or otherwise removed, and the terminal is thereby finished.

The operations which have been described will then be carried out in forming a terminal 3 on the other end of the conductor 2,
90 which completes the bond and produces a neat, finished article.

In making rail bonds having terminals like that shown in Figure 7, the method will be the same as has been described in
95 connection with the bond of Figures 1 and 2. The electrode 9 being either non-metallic or the rod or pencil itself. The bond of Figure 7 has a double strand conductor 2^a, and, as shown, the terminal shell 4^a does
100 not have a boss on one side. The adjacent ends of the conductor 2^a preferably will be bound with a metal ferrule or sleeve 10. An aperture 7^a is provided in one side of the shell 4^a to permit the end of the double
105 strand conductor 2^a to be inserted within the cavity 8^a of the shell, the sleeve 10 forming the equivalent of the boss 6. With this construction the bonds are formed and the terminals are built up on the ends of the
110 conductors, as heretofore described, and also will be drop forged to compact the metal of the terminals and finish them to contour and size and form a completed article.

In making rail bonds with L-head terminals, such as that shown in Figure 8, the
115 metal shell will be made in the same way as has been described for Figures 1 and 2. The boss 6^b, however, will be offset from the middle of the length of the terminal, so
120 as to be nearer one end thereof than the other. The end of the bond conductor 2^b will be inserted in the opening 7^b in the boss 6^b on the shell 4^b of Figure 8, and the body of the terminal will be built up in the same
125 way as has been described, and, after being formed on the ends of the conductor, the terminals will be heated and then drop forged to finished size and contour.

In making the rail bond of Figure 9, in
130

which the laminated conductor 2° is made up of a series of thin, flat copper strips (instead of a strand of wires), the metal shell 4° of the terminals will be forged in the same manner as already described, and after the end of the laminated conductor 2° is placed within the hollow trough-like shell 4°, the body of the terminal will be built up or formed as has been described. The terminals also will be finished to shape and size by drop forging, suitable forging dies being provided to make the terminals of the required shape and contour, as will be readily understood.

It will be understood that while the drawings and specifications show and describe various forms of rail bonds made in accordance with this invention, that the invention is not limited thereto, since various changes may be made in the design and construction of the bonds shown, and variations made in the steps of the method which has been described, without departing from the invention, as defined in the appended claims. The invention is not limited to the use of an electric arc in building up the composite terminals, since the necessary molten metal may be supplied through the medium of the oxy-acetylene or oxy-hydrogen blow pipe or in any other desired manner.

I claim:—

1. The method of making rail bonds, which consists in positioning an end of the bond conductor within the cavity of a hollow, trough-like metal terminal shell, then introducing molten metal into said hollow shell to thereby form a solid terminal and unite the conductor end and terminal shell with the metal within said shell, and then forging the terminal to compact and shape the terminal to contour and size.

2. The method of making rail bonds, which consists in forming a hollow, trough-like terminal shell of relatively hard metal, positioning an end of the bond terminal within the cavity in said shell, then filling said cavity with molten relatively soft metal to thereby unite the shell and terminal end to the metal within said shell and form a solid terminal, and then forging the terminal to compact and shape the terminal to contour and size.

3. The method of making rail bonds, which consists in forming a hollow, trough-shaped metal terminal shell, positioning one end of a bond conductor within said hollow terminal shell, and then heating the conductor end and shell and filling said shell

with molten metal to thereby unite the conductor end and shell to the metal within said shell and form a solid terminal, then heating the so formed terminal and forging the heated terminal to compact and shape the terminal to contour and size.

4. The method of making rail bonds, which consists in positioning an end of the bond conductor within the cavity of a hollow, trough-like metal terminal shell, and then melting a metal pencil in an electric arc to fill said hollow terminal shell with the melted metal and thereby form a solid terminal and unite the conductor end, the shell and the metal filling the shell, and then heating and forging the terminal to compact and shape the metal thereof to contour and size.

5. A rail bond comprising a conductor, and terminals on the end of said conductor, said terminals having a crust-like shell of relatively hard metal and an interior of relatively soft metal welded to the interior of said shell and to said conductor end.

6. A rail bond comprising a conductor, and wrought metal terminals on the end of said conductor, said terminals having a crust-like shell of relatively hard metal and an interior of relatively soft metal welded to the interior of said shell and to said conductor end.

7. A rail bond comprising a conductor and terminals on the ends thereof, said conductor being flexible and said terminals being solid and having a forged wrought steel crust welded to an interior of relatively soft wrought metal.

8. A rail bond comprising a flexible conductor and rigid terminals fixed to the ends thereof, said terminals having hard metal faces welded to a soft metal interior and the welded terminals being wrought to contour and size.

9. The method of manufacturing a rail bond comprising the steps of forming up a member having a recess therein and an opening to receive a bond cable, then inserting the bond cable into the opening with the ends thereof exposed in the recess, then uniting the end face of the cable to the member by thermo-deposition of a metal similar to that of the cable, then filling the space in the recess and securing the side faces of the cable within the member to the member by the thermo-deposition of a metal similar to the cable.

In testimony whereof, I have hereunto set my hand.

CHARLES L. LARSON.