No. 672,141. Patented Apr. 16, 1901.

C. B. THWING & C. G. WIBORG.

RAIL BOND.

(Application filed Nov. 10, 1900.)

(No Model.)

Fig. 1.

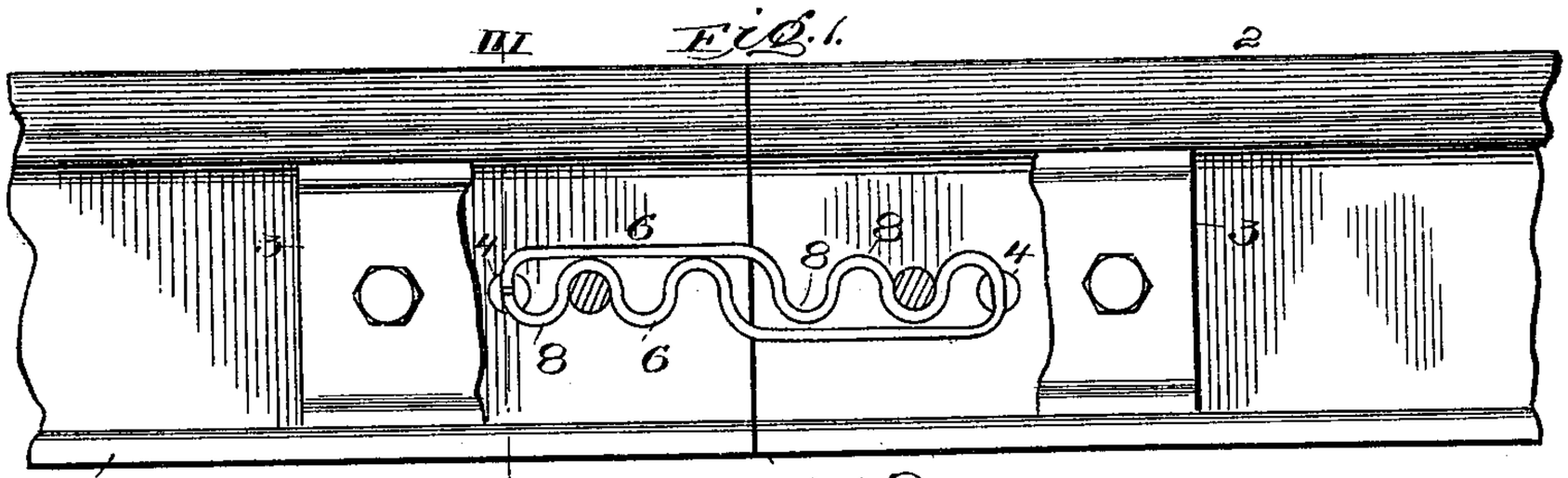


Fig. 2.

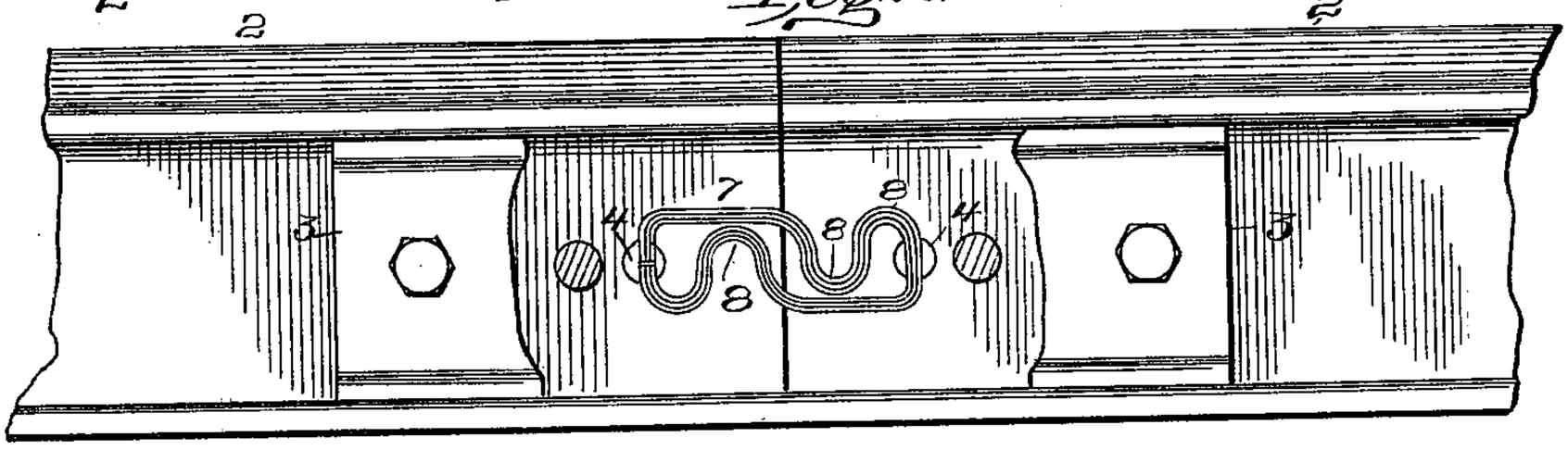


Fig. 3.

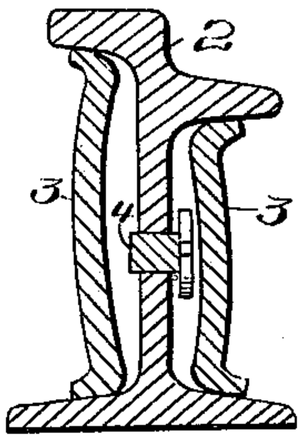


Fig. 4.

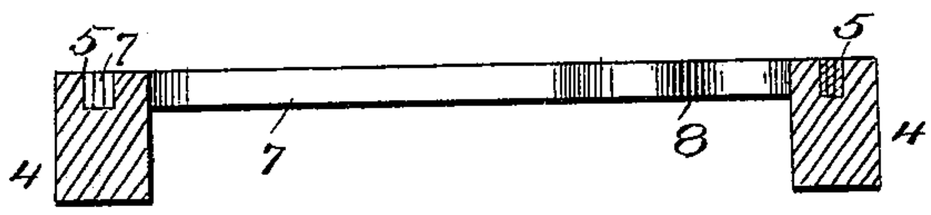
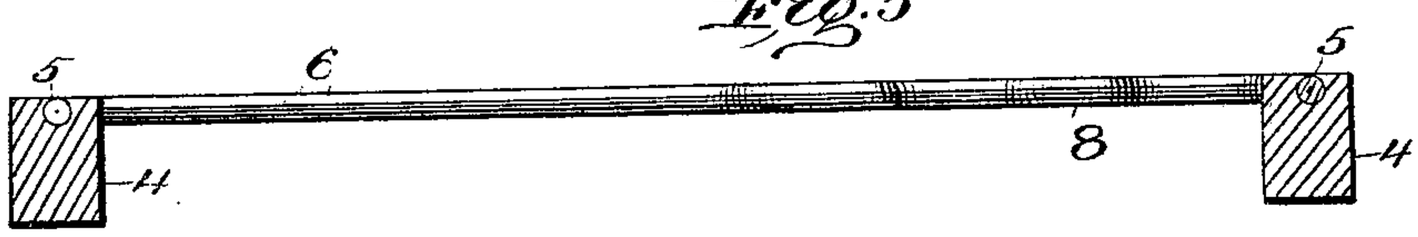


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES B. THWING AND CHARLES G. WIBORG, OF GALESBURG, ILLINOIS.

RAIL-BOND.

SPECIFICATION forming part of Letters Patent No. 672,141, dated April 16, 1901.

Application filed November 10, 1900. Serial No. 36,071. (No model.)

To all whom it may concern:

Be it known that we, CHARLES B. THWING and CHARLES G. WIBORG, citizens of the United States, residing at Galesburg, in the county of Knox and State of Illinois, have invented certain new and useful Improvements in Rail-Bonds; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to rail-bonds for electric railways, and is intended to be applied between the rail and fish-plate, so as to constitute a protected or concealed bond. Owing to the small space which such a bond must occupy it has been found difficult to construct a bond which shall possess sufficient carrying capacity for the current and at the same time combine strength of construction with the flexibility necessary to allow for expansion and contraction of the rails under varying temperatures and for the usual vertical movements of the ends of the rails past each other. Our invention has in practical use been found to combine in a high degree the advantages of compactness, strength, durability, and flexibility with high electric conductivity.

We shall now describe our invention, so that others skilled in the art may make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a side elevation of a rail-joint provided with one form of our improved rail-bond, showing the fish-plate broken away to disclose the bond. Fig. 2 is a similar view showing another form of our bond. Fig. 3 is a vertical cross-section on the line III III of Fig. 1. Fig. 4 shows in section one form of our improved bond. Fig. 5 is a similar view showing another form of bond.

Like figures of reference indicate like parts in each view.

In the drawings, 2 2 are the ordinary rails, and 3 3 the fish-plates. Two steel or iron plugs 4 4, whose length is less than the distance between the inner surfaces of the two fish-plates 3 3, have each a slot 5 in one of their ends, the depth of which slot is slightly less than the distance between the inner face of the fish-plate and the rail, as seen in Fig. 3. Into these slots 5 are laid the ends of the pair or pairs of bent copper conductors, shown as a wire 5 in Figs. 1 and 5 and as a series of rectangular strips 7 in Figs. 2 and 4, the said ends being welded, brazed, or soldered to the steel plugs in such manner that the plane of the copper wire or strips shall be at right angles to the axes of the plugs. When the plugs are driven or pressed into suitable holes in the rails, the connection is complete. The necessary flexibility is secured by making one or more loops or U-shaped bends 8 in each of the copper wires or strips, these loops or bends being symmetrically arranged in each pair of conductors. The purpose of using a pair of conductors connecting the plugs is to obtain sufficient cross-section of conducting material within the available space, while at the same time increasing the flexibility. The loops or bends should have as nearly as convenient the form of the arc of a circle and should be as large as the vertical space will allow. Such a looped or sinuous form imparts, even to wires and strips of considerable size, a good degree of flexibility both longitudinally and vertically without in the least impairing their strength. When a single pair of heavy wires is to be used, the plugs should be placed beyond the first bolt in each rail and the loops so formed as to inclose said bolts, as shown in Fig. 1; but they may be applied as shown in Fig. 2—that is, between the first bolt-holes.

When it is desired to reduce the resistance of the bond by making it as short as possible, the copper should be in the form of the strips 7, and two or more of such strips may be used to constitute the conductors. In this form the bond is exceedingly flexible, while offering the minimum of electrical resistance.

Prior forms of rail-bonds in which the wires cross themselves to form a closed loop are inferior to our form, since the wires must be flattened to allow them to pass, thus impairing their flexibility. A sharp or V-shaped bend is objectionable, since it impairs the strength of the wire. The U-shaped or semicircular form of loop is the one preferred.

The use of steel plugs gives a much more permanent connection with the rail than where copper plugs are employed, since copper expands and contracts about forty per

cent. more than steel or iron, thus causing a loosening of the plugs in cold weather, permitting moisture to enter and to oxidize the surface of the metals, thus greatly impairing their conductivity. When the plugs are made of the same material as the rails, this does not occur. It has been found that axles which have been pressed into car-wheels are as bright as when new when the wheels are removed after many years of use. The plugs can be made of sufficient size to furnish the necessary conductivity, while the copper connections may be made small enough to give flexibility. When the copper is welded to the iron, as in the preferred construction, the connection between the two rails is very perfect and is not impaired by long exposure to the weather.

The slotted form of plug is preferred, since it permits the use of strips of a rectangular cross-section, thus utilizing all of the available space. It also allows the wires or strips to be easily inserted in the process of construction and permits the progress of the welding to be readily observed during the process. The sinuous or undulating form of the copper wires or strips gives great flexibility in the smallest possible space.

It is obvious that aluminium or any soft metal or alloy having a high conductivity may be substituted for copper in the connecting-strips.

We claim—

1. The combination, with a pair of railway-rails, of a rail-bond consisting of a pair of steel or iron plugs pressed or driven into suitable holes in the rails behind the fish-plate, said plugs being connected by one or more pairs of copper conductors bent into a sinuous or undulating form.

2. The combination with a pair of railway-rails, of a rail-bond consisting of a pair of steel or iron plugs pressed or driven into suitable holes in the rails behind the fish-plate, said plugs being connected by one or more pairs of copper conductors bent into a sinuous or undulating form and welded, brazed, or soldered thereto.

3. A rail-bond comprising a pair of steel or iron plugs adapted to be driven or pressed into suitable holes in the rails, and one or more pairs of separate copper conductors welded, brazed, or soldered to the plugs and bent into a sinuous or undulating form.

4. A rail-bond comprising a pair of steel or iron plugs adapted to be driven or pressed into suitable holes in the rails, and one or more pairs of separate copper conductors welded, brazed, or soldered into transverse slots or grooves in one end of each of the said plugs, the said slots or grooves extending at right angles to the axes of the plugs.

5. The combination with a pair of railway-rails, of a rail-bond consisting of a pair of steel or iron plugs pressed or driven into suitable holes in the rails behind the fish-plate, said plugs being connected by one or more pairs of copper conductors bent into a sinuous or undulating form and partially encircling one or more of the fish-plate connecting-bolts.

6. A rail-bond composed of a pair of steel or iron plugs adapted to be driven or pressed into suitable holes in the rails, said plugs being connected by one or more pairs of separate copper conductors bent into a sinuous or undulating form, each of the conductors being formed of a number of strips rectangular in cross-section and welded, brazed, or soldered into transverse slots or grooves in one end of each of the said plugs, the said slots or grooves extending at right angles to the axes of the plugs.

7. A rail-bond composed of a pair of steel or iron plugs adapted to be driven or pressed into suitable holes in the rails, a copper conductor connecting said plugs by two separate loops or portions, the ends of said conductor being welded in a slot or slots extending transversely of one end of one of said plugs, the other plug being connected to the conductor by means of a similar transverse slot into which the body of the conductor extends, the plug and conductor being welded together at this point.

8. A rail-bond composed of steel or iron plugs adapted to be driven or pressed into suitable holes in the rails, a copper conductor composed of two or more strips rectangular in cross-section, said conductor connecting said plugs by two or more separate loops or portions, the ends of said conductor being welded in a slot or slots extending transversely of one end of one of said plugs, the other plug being connected to the conductor by means of a similar transverse slot into which the body of the conductor extends, the plug and conductor being welded together at this point.

In testimony whereof we affix our signatures in presence of two witnesses.

CHARLES B. THWING.
CHARLES G. WIBORG.

Witnesses:
E. L. JARE,
H. C. COBB.