No. 834,690. PATENTED OCT. 30, 1906.

C. R. STURDEVANT.

RAIL BOND.

APPLICATION FILED JULY 7, 1905.

Fig. 1.

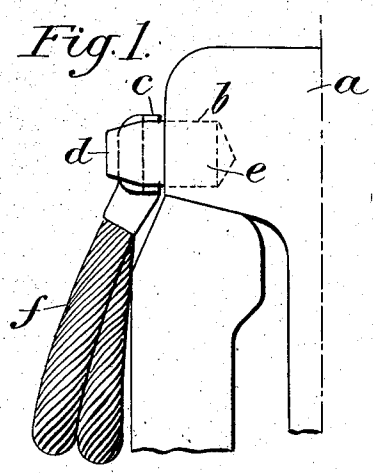


Fig. 4.

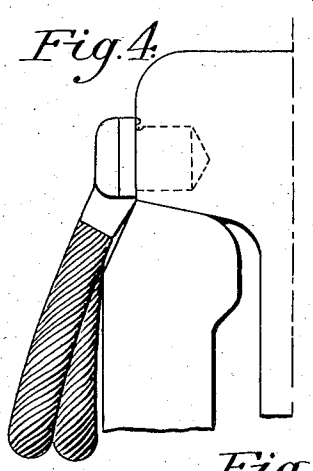


Fig. 2.

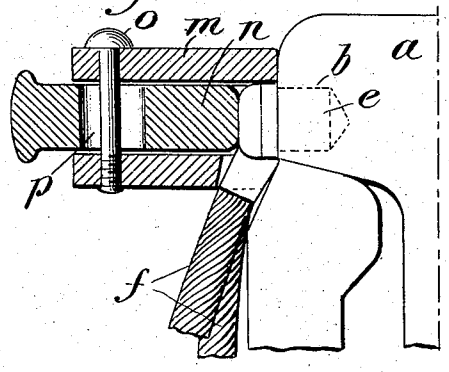


Fig. 3.

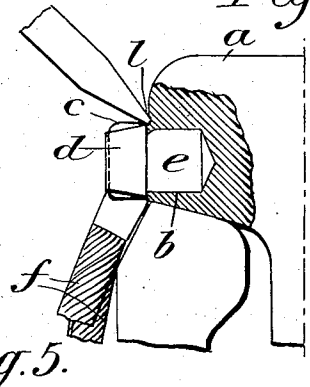
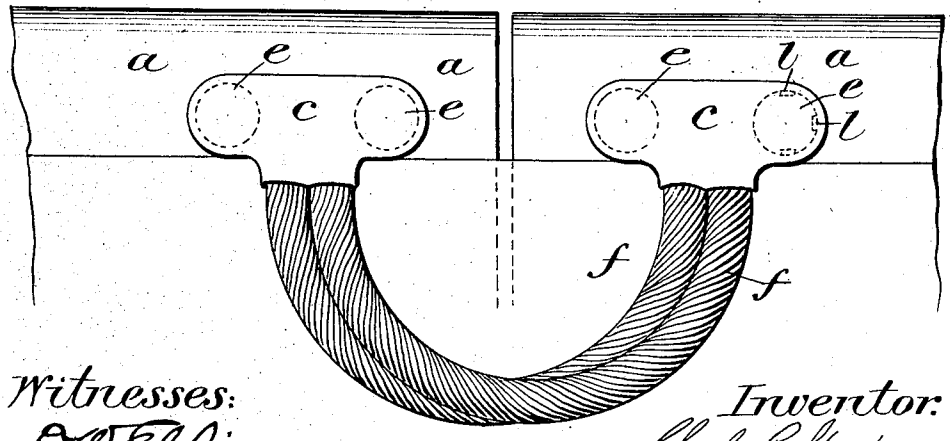


Fig. 5.



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RAIL-BOND.

No. 834,690. Specification of Letters Patent. Patented Oct. 30, 1906.

Application filed July 7, 1905. Serial No. 268,717.

To all whom it may concern:

Be it known that I, CHARLES R. STURDEVANT, a citizen of the United States, residing at Worcester, county of Worcester, State of Massachusetts, have invented certain new and useful Improvements in Rail-Bonds; and I 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.

My invention relates to the construction of the bond and the manner of applying it to the rails.

The particular objects in view are to provide a bond which shall afford a large contact area with each rail and which can be effectively secured to the rail by expanding the stud or studs which project from its terminals into bottomed cavities or cup-shaped holes in the rails by simply driving them therein in contradistinction to riveting or otherwise securing them in openings or perforations passing through the rails and without the necessity of employing special fastenings or requiring the use of particular compressors or other tools or driving devices.

Further objects are to locate the bond in the most advantageous position with respect to its installation, to shorten the length of the connector between the terminals of the bond, and to secure a maximum of contact area and a minimum of contact resistance for a given quantity of metal in the bond, also to permit the bond to be easily and quickly installed at a low cost due to the fact of its particular location and the further fact that it may be applied by unskilled labor without the employment of special tools.

Other objects are to provide additional means for preventing the terminal studs from working loose in their holes in the rails and to reduce the liability of corrosion of the contact-surfaces between the terminal studs and the rails by protecting the joint at the outer edge of the holes in the rails.

Heretofore solid terminal stud-bonds have been installed by inserting terminal studs through holes in the rail-section and then compressing the terminals in these holes by special hydraulic or screw-compressor tools. After the terminal has been inserted in the hole compression is applied to the opposite ends of said terminal to expand the metal in the hole and force the end portions of the terminal which project beyond the sides of the rail out over the rail-surfaces. The compressors used for this purpose are heavy and cumbersome and difficult to handle and are likewise very expensive to make and keep in repair. Moreover, the permanency and efficiency of the contact which the terminals make with the rail when thus compressed will depend to a large extent upon the particular design of the compressor and upon the skill with which it is manipulated. Poor workmanship or badly-designed compressor-tools will lead to corroded contact-surfaces, which will destroy the efficiency and usefulness of the bond. It is therefore evident that a method of applying these terminals which will obviate the use of these compressors will possess great advantage. In applying terminals of this character it is highly essential to obtain a very intense pressure between the copper of the terminal and the steel of the conductor-rail, so as to insure a low contact resistance and to permanently exclude all traces of air and moisture. I have found that if a properly-designed copper terminal be driven with great force into a cup-shaped hole drilled partly through a rail-section the terminal will make a very rigid and intimate contact with the metal of the rail, resulting in as low a contact resistance as it is possible to obtain under the best conditions of operation by the most efficient type of hydraulic compressor and with the most highly-skilled labor. The construction of the bond and the mode of applying the same greatly reduces the cost of application, produces a stronger rail-section, insures greater uniformity in results, increases the effective area of contact, and practically eliminates the possibility of moisture entering and corroding the joint.

In the accompanying drawings, Figure 1 indicates a fragmentary end view of a rail, showing the bond in its initial position. Fig. 2 is a similar view showing in section a simple form of tool for driving the studs of the bond into the holes in the rail-section. Fig. 3 is a corresponding view showing the head of the rail partly in section and the mode of upsetting or turning the metal at the edge of the hole into the body of the terminal studs. Fig. 4 is a view corresponding to Fig. 1, show-

ing the completed bond. Fig. 5 is a side view of the adjacent ends of two rails having the completed bond applied thereto.

Referring to the drawings, *a* indicates the head of adjacent rail-sections, which are provided on their outer sides with bottomed cavities or cup-shaped holes *b*, drilled into the body of the head and preferably provided with a conical bottom portion. There are as many of these holes *b* provided in the end of each rail-section as there are studs on the coöperating terminals of the bond.

Each bond consists of two solid metal terminals, preferably comprising a T-shaped head *c*, of copper, at each end, which are joined by suitable flexible conducting means, illustrated in the drawings as two strand wire-cable sections *f f*, intimately united to the heads *c* of the terminals. Projecting from the inside face of the body or head *c* of each terminal is one or a plurality of studs *e*, preferably two in number, which are adapted to engage the corresponding cup-shaped holes in the sides of the rail-heads *a*. On the outer face of each terminal head *c* there is provided integral bosses or projections *d*, which are included within the area of the head or body *c* and are preferably tapered outwardly to afford sufficient metal, together with studs *e* when the terminal is subjected to heavy blows from a hammer or suitable tool to completely fill the cavities or holes *b* in the rail-head. The length of the studs *e* is slightly greater than the depth of the holes *b*, so that when the ductile metal of the studs and the terminal head *c* is compressed under the riveting action of the hammer or upsetting-tool it will flow into every portion of the cavity or hole and establish a most efficient electrical contact between the metal of the terminal and the rail *a*.

In applying the bond to the cavities or rail-sections the holes *b* are properly spaced by means of a templet and are drilled to the proper depth into the body of the rail-head. The studs on the respective terminal heads *c* are then inserted in their appropriate holes. An upsetting-tool of the character shown in Fig. 2 is inserted over the boss *d* and a few heavy blows of a hammer delivered to the plunger-head *n* of said tool, which serves to force the studs *e* into the cavity or hole and to upset the boss or projection *d* on the outer face of the head *c* sufficiently to cause the metal to expand over the sides of the rail about the holes to a slight degree, as indicated in Fig. 3. By means of a chisel or other upsetting-tool portions of the metal in the rail-head about the cavities or holes *b* are driven into the body of the studs *e*, as indicated in Figs. 3 and 5, after which the upsetting-tool (illustrated in Fig. 2) is again applied to the head of the terminal and the metal in the projection *d* still further upset and compressed until the terminal assumes the ultimate form shown in Fig. 4, whereby the metal in the studs *e* is forced with great pressure against the sides and bottom of the cavities or holes *b*, and the inner face of the terminal head *c* is caused to closely hug the surface of the rail-head about and between said holes *b*. By providing two or three indentations or projections *l* by means of the upsetting chisel or punch the studs *e* will be securely locked within the cavities or holes *b*, and no amount of shock or jar incident to traffic over the rail will serve to loosen them, and, furthermore, the whole inner surface of the terminal head *c* will be held in intimate electrical contact with the side of the rail-heads *a*.

It is to be noted that in addition to the increased contact area afforded by the multiple studs *e*, which are forced into and engage the walls and bottoms of the cavities or holes *b* with heavy pressure and over a large area of surface contact, the location of the holes in the side of the rail-head *a* greatly simplifies the operation of drilling the rail for the reception of the bond and renders the operation of installing the bond both easy and expeditious, even with unskilled labor, and, furthermore, the fact that the holes may be located quite close to the ends of the rail-sections enables a much shorter conductor *f* to be employed, which may be given any desired capacity by increasing the number of cable-sections employed. It is also to be noted that the connection between the bond and the rail is above the upper edge of the fish-plate, thereby avoiding the excessive length of connector common to the old form of bonds, which were necessarily made longer.

It will be observed that a bond constructed in accordance with this invention presents two or more terminals at each end, which are held under great pressure in bottomed cavities or cup-shaped holes in the side of the rail-heads adjacent to the ends thereof by forcing the metal of the bosses *d* into the body of the head *c* and driving a corresponding quantity of metal from the head into the studs *e*, which affords a large conductive capacity at the joints thus formed and also enables short thick conductors *f* to be employed, thereby reducing the resistance in this element of the bond and effecting a large saving in copper. The location of the cavities or holes in the sides of the rail-heads enables the drilling to be effected expeditiously and also affords an intimate connection between the whole inner surface of the terminal heads and the studs thereof with the metal of the conductor-rail.

While I have illustrated a special tool for upsetting the bosses or projections on the outer face of the terminal head and for driving the studs into intimate contact with the sides and bottoms of the bottomed cavities

or cup-shaped holes in the rail-heads, it is to be understood that the invention is not dependent for its successful application upon the employment of any special tool, as the upsetting and driving operations may be effected by a few direct and heavy blows of a hammer delivered upon the bosses on the head of the terminal.

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

1. A rail-bond comprising a flexible connector, a solid terminal, an integral driving-stud projecting from the inner face of the terminal, and a boss or enlargement upon the outer face of the terminal in line with the stud, said stud being constructed and adapted to be secured in a bottomed cavity in the rail by being expanded therein by driving compression applied to the boss or enlargement.

2. A rail-bond combined with a pair of rails having bottomed cavities, said bond comprising a flexible connector, solid terminals, and an integral driving-stud projecting from the inner face of each terminal, said studs being driven into cavities in the rails and secured therein by the expansion of their metal that is due to the driving compression.

3. A rail-bond, combined with a pair of rails having bottomed cavities in the heads thereof, said bond having a flexible connector having solid terminals, and integral studs projecting from the inner faces of the terminals, said studs being secured to the rails by expanding them in the rail-cavities by driving compression.

4. A rail-bond combined with a pair of rails, having bottomed cavities formed therein, the bond comprising solid terminals united by a flexible connector, integral driving-studs projecting from the inner faces of the terminals, and corresponding bosses or enlargements on the outer faces of the terminals, said studs being secured in bottomed cavities in the rails by driving compression, and the edges of the cavities in the rails being calked or indented and covered by the upset bosses or enlargements of the terminals.

5. A rail-bond comprising a flexible connector and solid terminals, each of said terminals having a plurality of studs on its inner face, and bosses or enlargements on the outer face of the terminals in alinement with the studs.

6. A rail-bond comprising solid terminals, a flexible connector, united to one edge thereof, and a plurality of laterally-extending integral studs projecting from the inner face of each terminal, the conductor being connected to the terminals at points between the studs.

7. A rail-bond comprising a multiple flexible loop-shaped connector, and solid T-shaped terminals connected thereto, each of said terminals having a plurality of studs on its inner face, and bosses or enlargements on its outer face in alinement with the studs.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES R. STURDEVANT.

Witnesses:
H. M. LATHAM,
THOS. MACDUFF.