912,916.

C. R. STURDEVANT.

RAIL BOND.

APPLICATION FILED JAN. 13, 1906.

Patented Feb. 16, 1909.

4 SHEETS—SHEET 1.

Fig. 1.

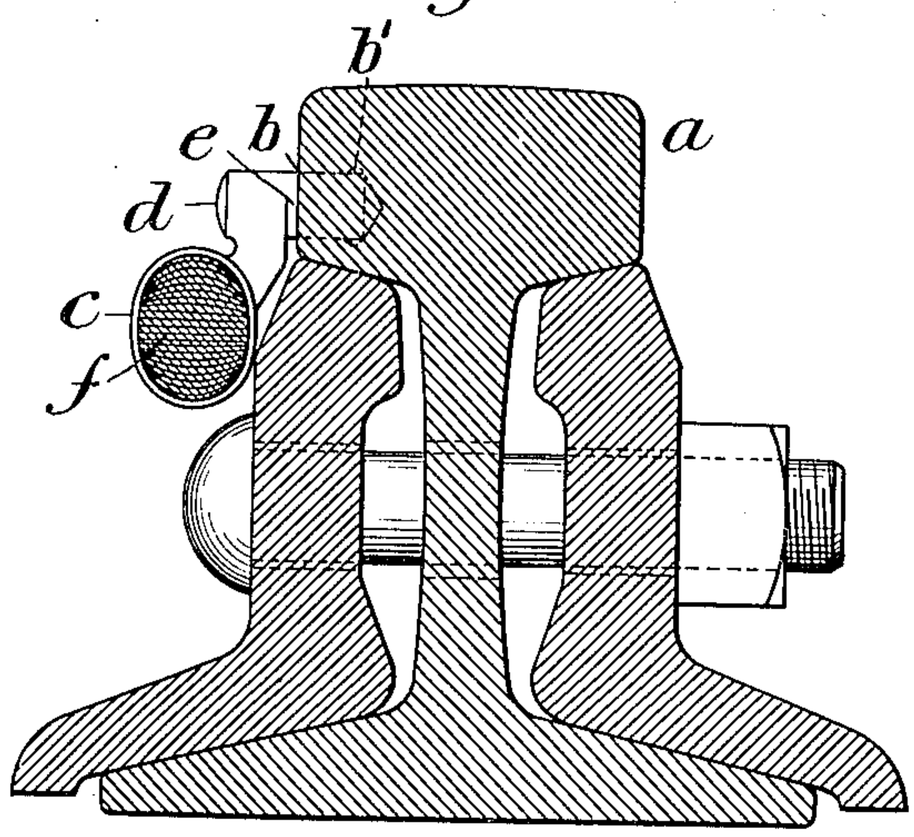


Fig. 2.

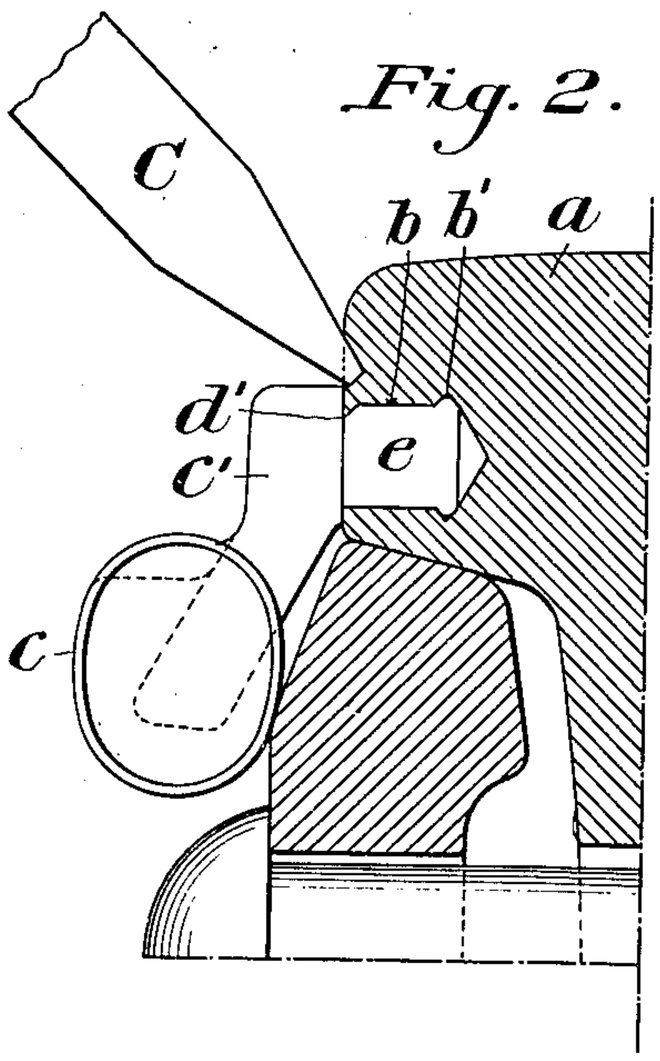
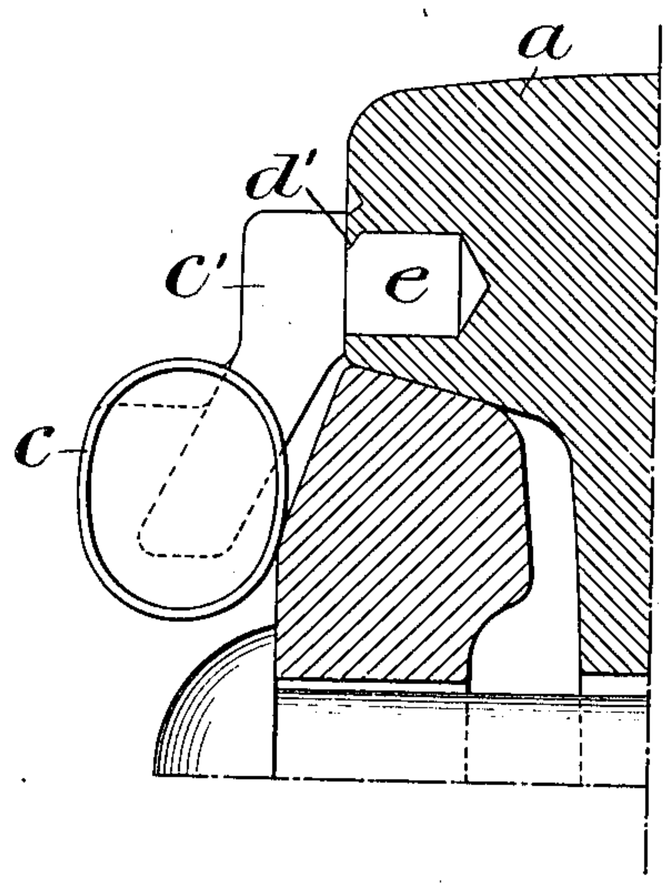


Fig. 3.



WITNESSES

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4 SHEETS—SHEET 2.

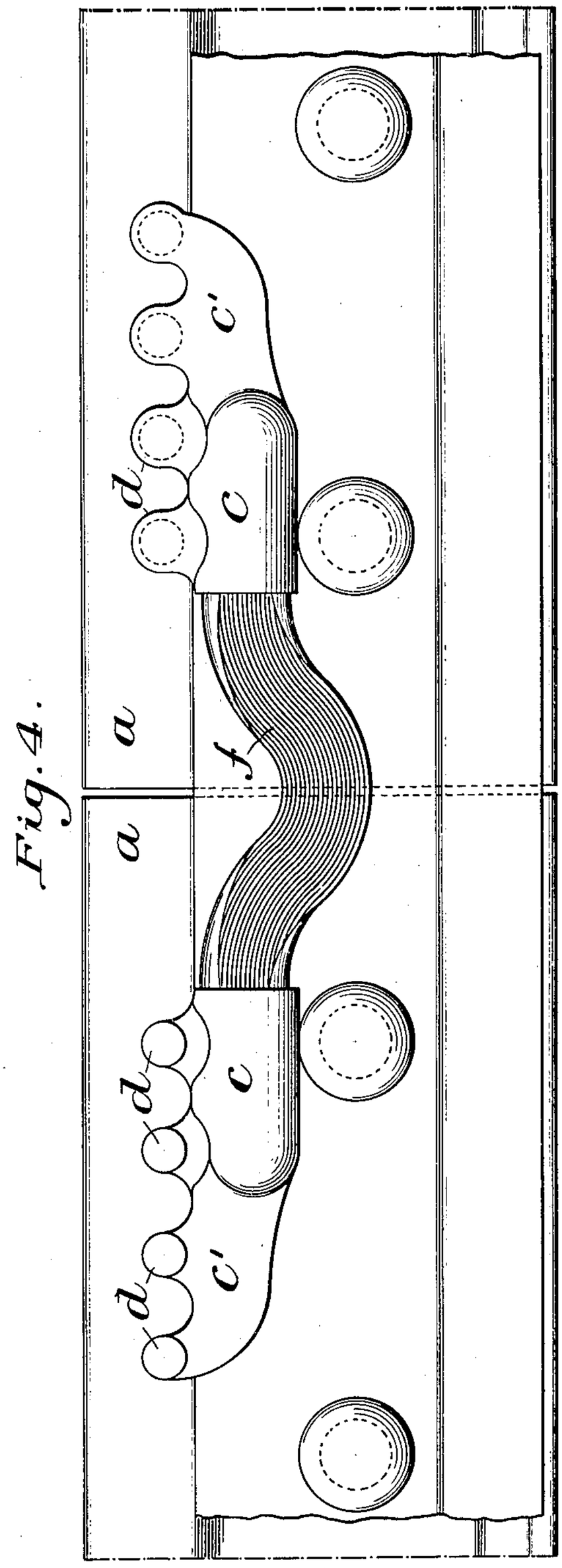

Fig. 4.

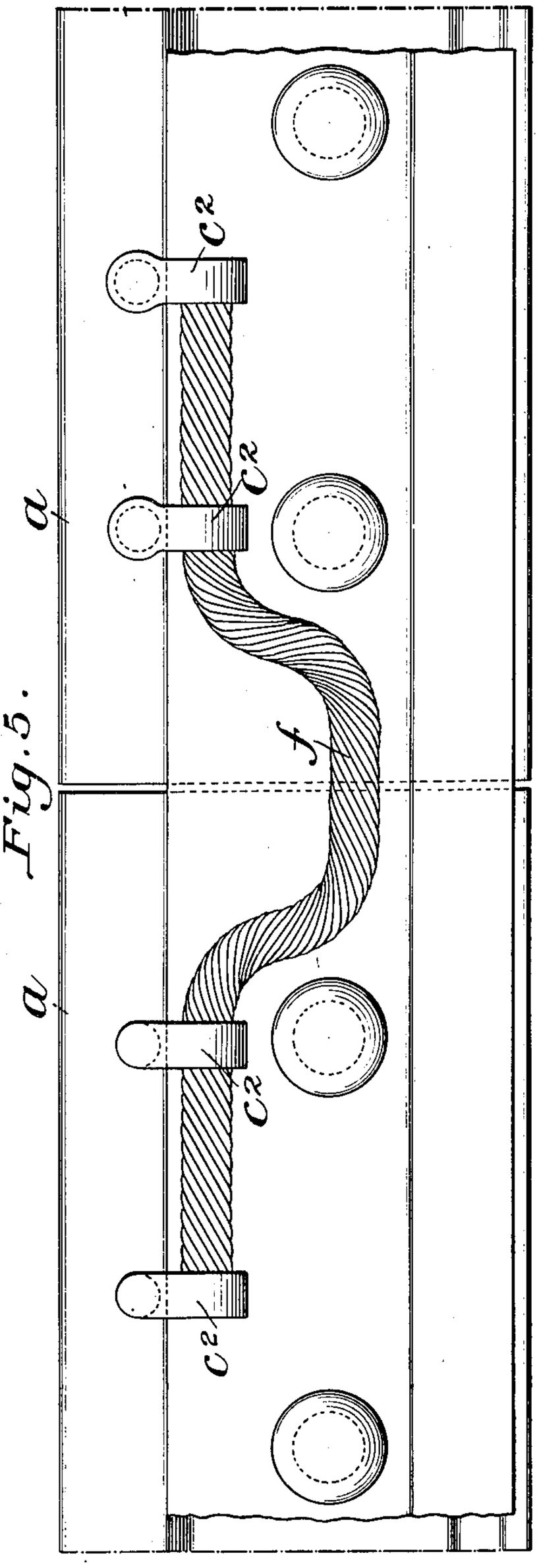

Fig. 5.

WITNESSES

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4 SHEETS—SHEET 3.

Fig. 7.

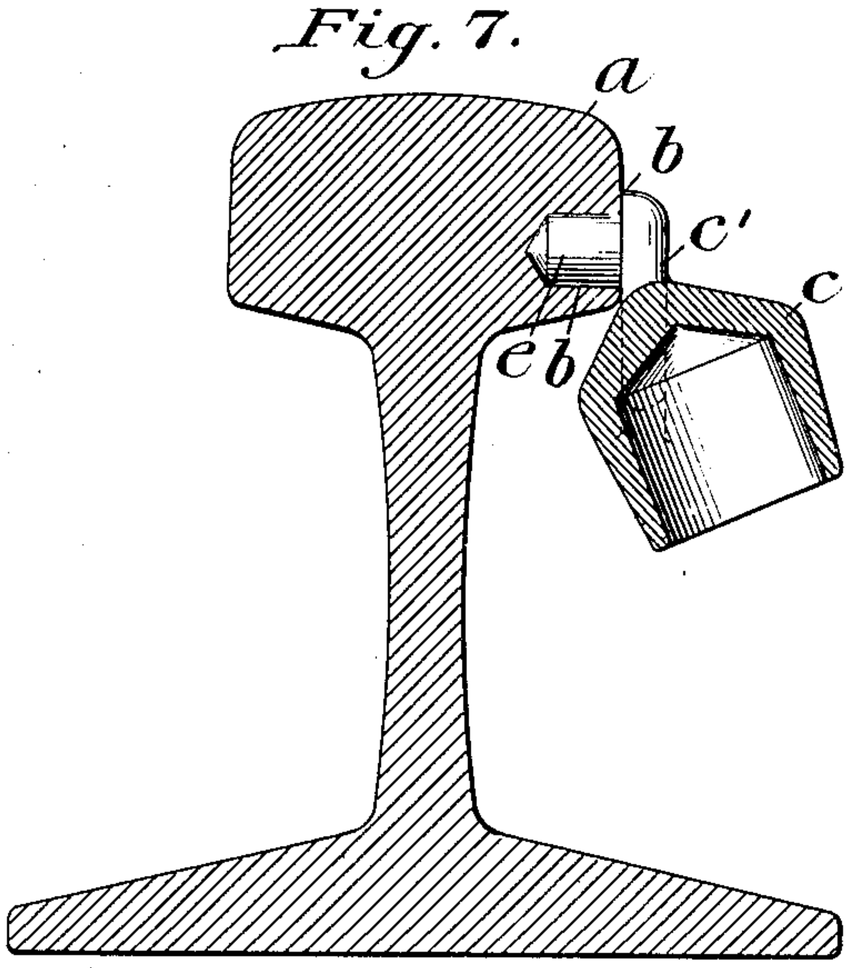


Fig. 6.

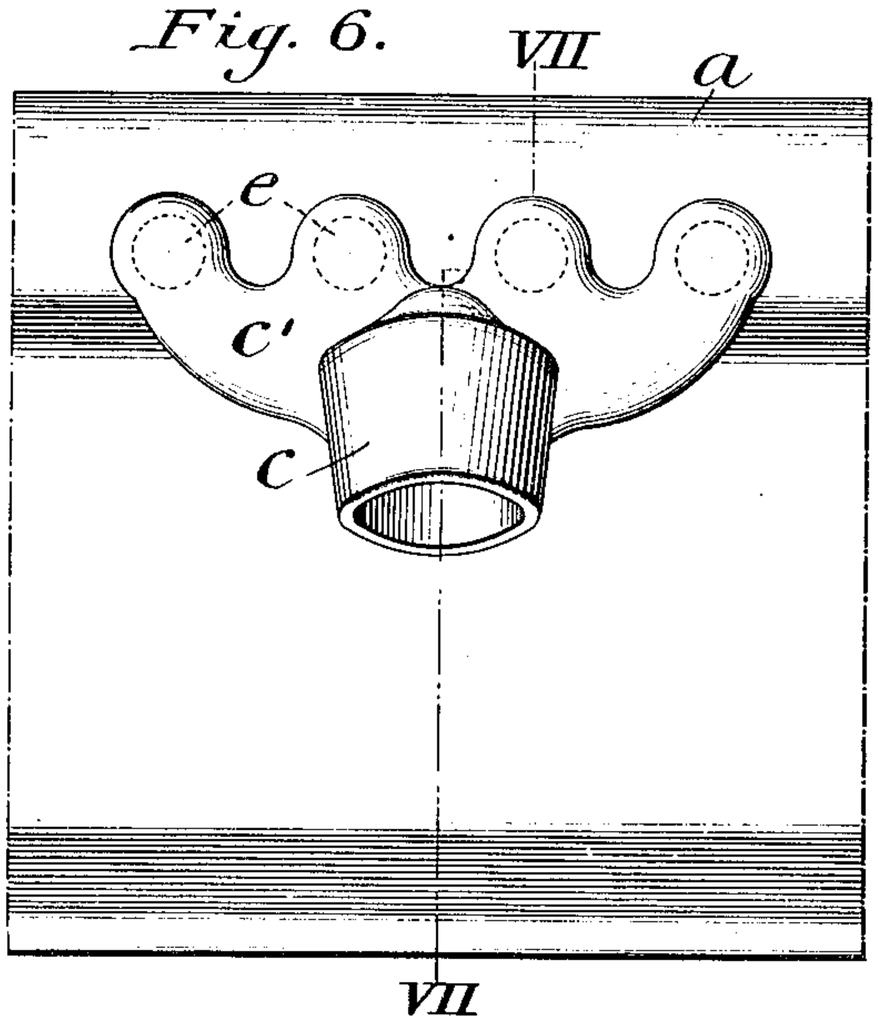


Fig. 9.

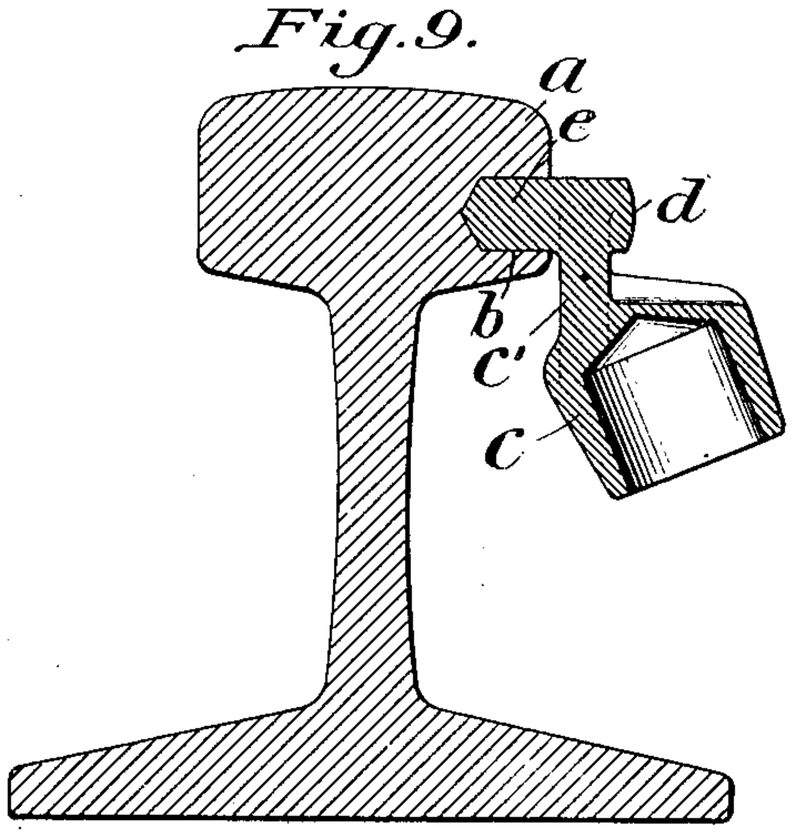


Fig. 8.

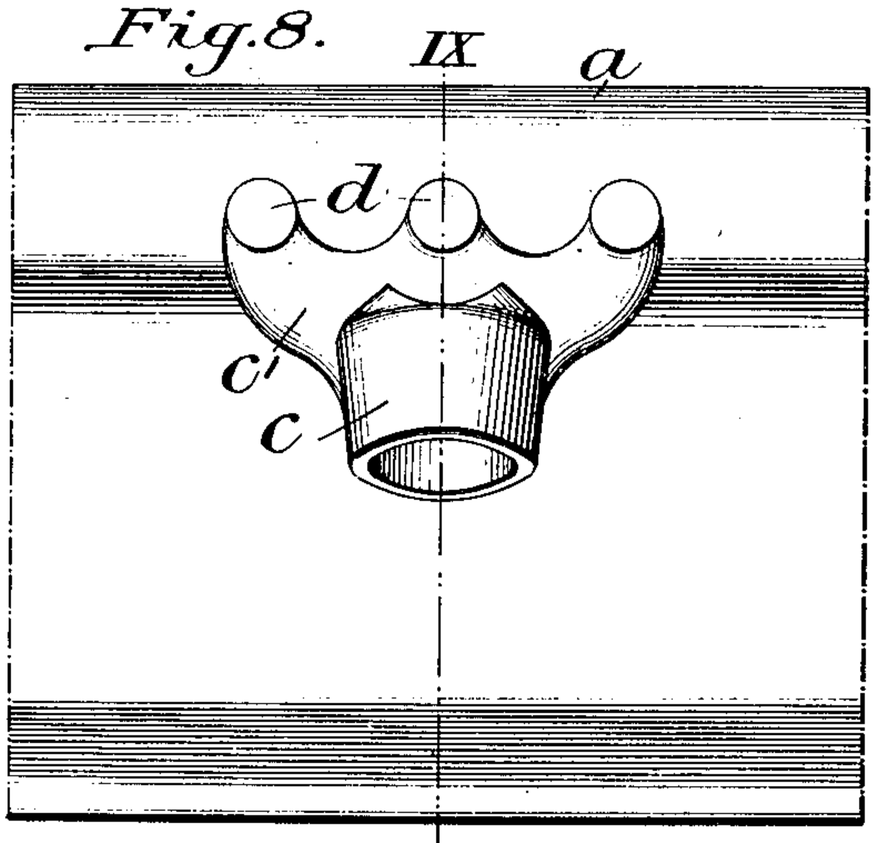
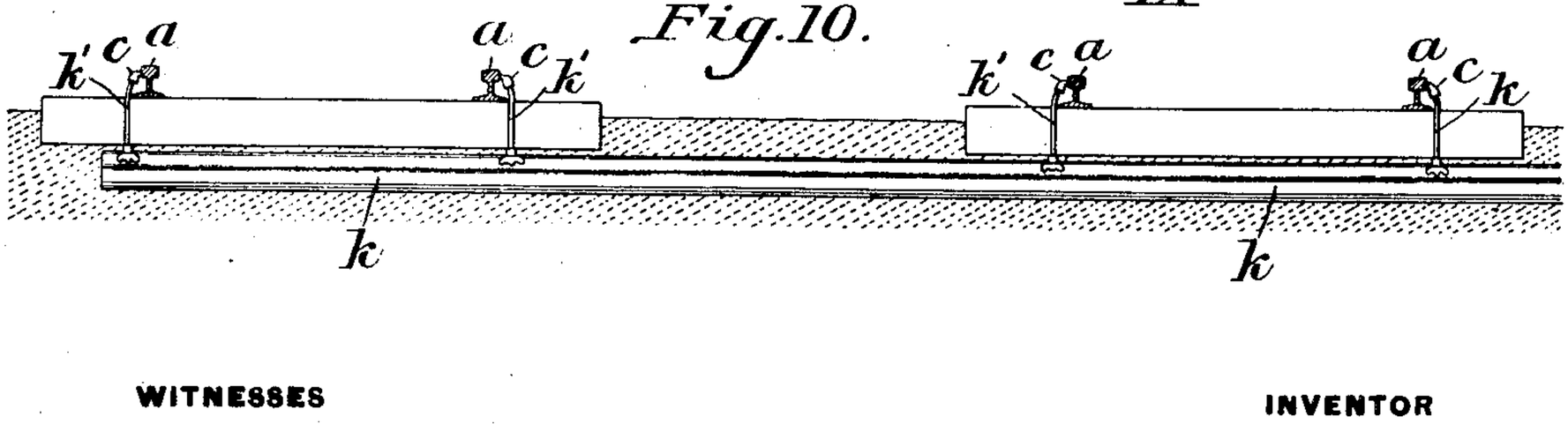


Fig. 10.



WITNESSES

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APPLICATION FILED JAN. 13, 1906.

912,916.

Patented Feb. 16, 1909.

4 SHEETS—SHEET 4.

Fig. 11.

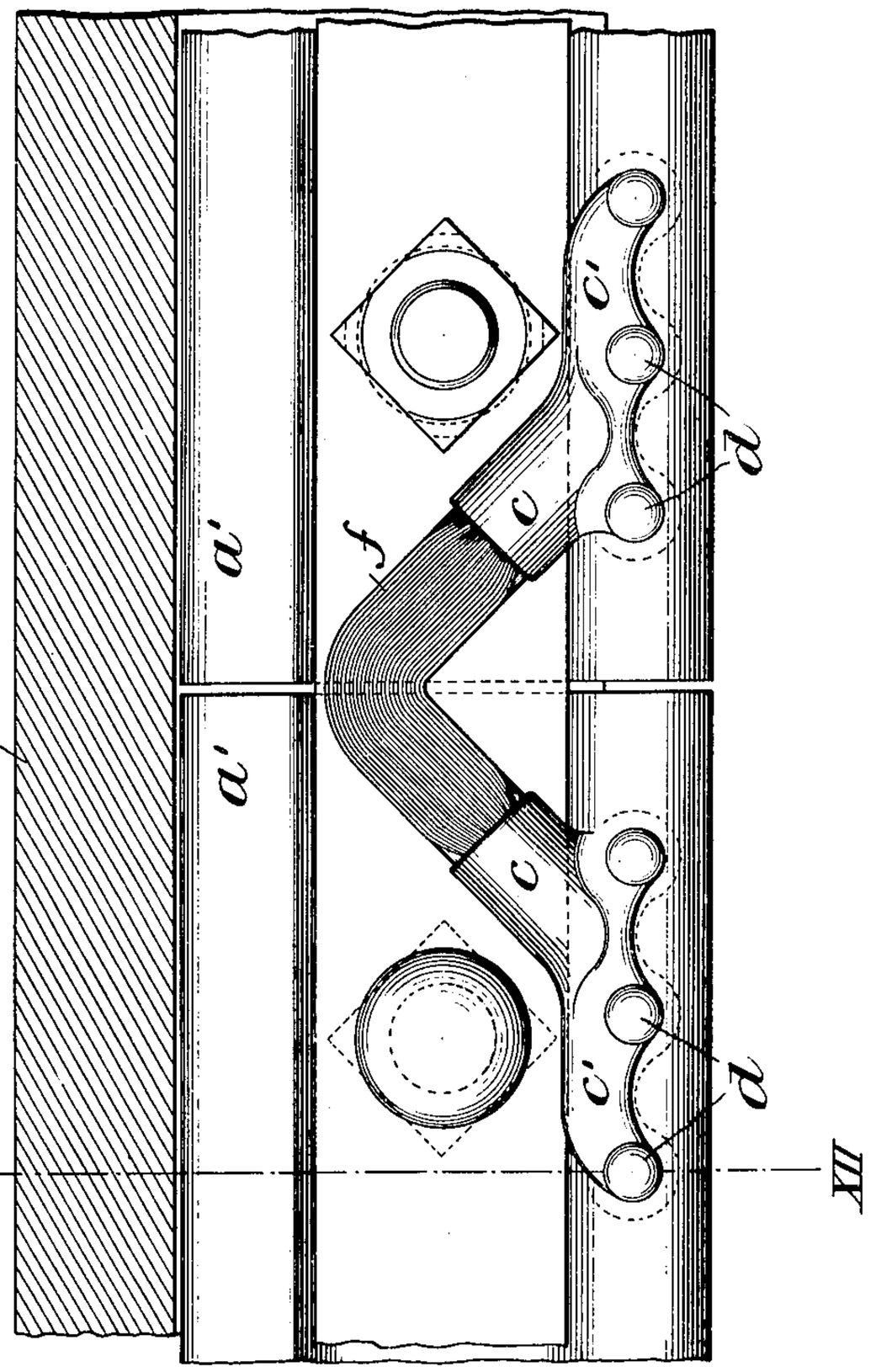
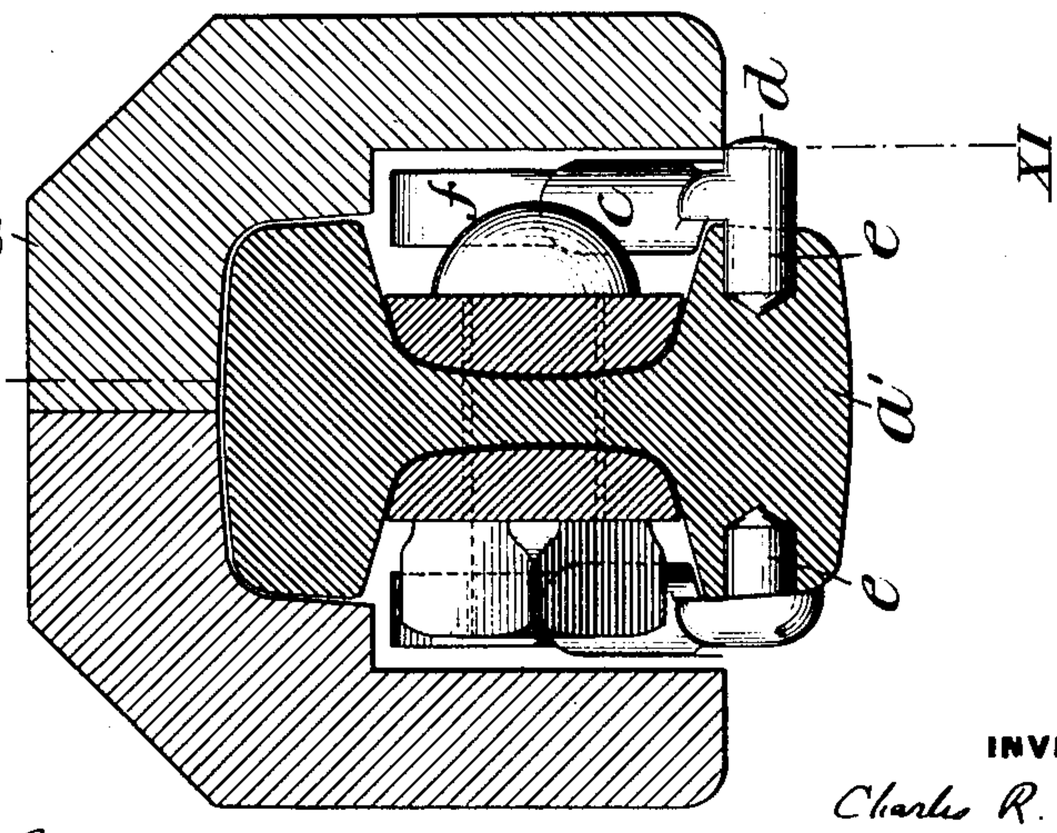


Fig 12.



WITNESSES

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UNITED STATES PATENT OFFICE.

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RAIL-BOND.

No. 912,916. Specification of Letters Patent. Patented Feb. 16, 1909.

Application filed January 13, 1906. Serial No. 295,896.

To all whom it may concern:

Be it known that I, CHARLES R. STURDEVANT, a resident of Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Rail-Bonds for Electric Railways and the Like, of which the following is a specification.

My invention relates to certain new and useful improvements in rail bonds for electric railways and the like, and has for its object to provide a bond for connecting the adjacent ends of the rails, which shall afford a large contact area with each rail; which shall be located in the most advantageous position with respect to its installation; which will maintain a high efficiency, due to the short length of the bond and the large contact area between its terminals and the rail; which will avoid the danger of the terminals working loose from the rail and admitting air and moisture which will corrode the joint; and which will permit a bond of very large capacity to be installed quickly and at a low cost, due to its form and particular location.

Other objects of the invention will appear more fully hereinafter.

In the accompanying drawings—Figure 1 is a cross-section of a rail and joint-plates showing the bond in its initial position. Fig. 2 is a corresponding fragmentary view, showing the mode of calking or turning the metal at the edge of the hole into the body of the terminal studs. Fig. 3 is a fragmentary view corresponding to Fig. 1, but showing the completed bond. Fig. 4 is a side view of a rail joint and bond, the terminal member at the left-hand end showing the incompleted condition corresponding to that shown in Fig. 1, and the terminal at the right-hand end in completed form. Fig. 5 is a view similar to Fig. 4, but showing a modification. Figs. 6 and 8 are side views showing a modified form of terminals, and Figs. 7 and 9 are sections on lines VII—VII and IX—IX of Figs. 6 and 8, respectively. Figs. 8 and 9 show the bond in its incompleted form. Fig. 10 is a cross-sectional view showing the terminals of Figs. 6, 7, 8 and 9, used in cross-bonding. Fig. 11 is a sectional side elevation showing the bond applied to a feeder rail; and Fig. 12 is a section on the line XII—XII of Fig. 11.

Referring to the drawings, *a* indicates the heads of adjacent rail sections, which are provided on their outer sides with 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 socketed metal terminals, *c*, of copper, one at each end, having laterally extending branches or arms *c'*, as illustrated in the drawings. Projecting from the inside faces of the arms *c'* of the body or head *c* of each terminal, are a plurality of studs *e*, preferably one stud on each arm, which studs are adapted to engage the corresponding cup-shaped holes in the sides of the rail heads *a*. On the outer face of each of the arms *c'* of the terminal head *c*, there is provided an integral boss or projection *d*, which are preferably tapered outwardly to afford sufficient metal, together with studs *e*, when the terminal is subjected to heavy blows from a hammer or pressure from a suitable tool, to completely fill the holes *b* in the rail head. These holes may be enlarged, or their walls roughened at the inner ends, as indicated at *b'* in Figs. 1 and 2, in order to form further retaining means for the studs. The length of the studs *e* is preferably slightly greater than the depth of the holes *b*, so that when the ductile metal of the studs and the arms *c'* of the terminal head *c* is compressed, under the riveting action of the hammer or any upsetting tool, it will flow into every portion of the hole, and establish a most efficient electrical contact between the metal of the terminal and the rail *a*.

In applying the bond to the rail sections, the holes *b* are properly spaced by means of a templet or gang drill 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, and a few blows of a hammer delivered to the boss *d* serve to force the stud *e* into the hole, and to upset the boss or projection *d* on the outer face of the arm *c'* 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. 2. By means of a diamond pointed chisel C, or other calking tool, portions of the metal in

the rail head about the holes *b* are turned into the body of the studs *e*, as indicated at *d'* in Fig. 2, after which the metal in the projection *d* is still further upset or compressed until the studs of the terminal assume the ultimate form shown in Fig. 3, whereby the metal in the studs *e* is forced with great pressure against the sides and bottom of the holes *b*, and the inner faces of the arms *c'* of the terminal head *c* are caused to closely hug the surface of the rail head about said holes *b*. By providing two or three indentations *d'*, by means of the calking chisel or punch, the studs *e* will be securely locked within the holes *b*, and no amount of shock or jar, incident to traffic over the rail, will serve to loosen them.

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 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. It is also to be noted, that the connection between the bond and the rail is exposed and above the upper edge of the joint plate, thereby avoiding an excessive length of connector, and the necessity of disturbing the rail joint while installing the bond.

A leading and most important advantage of this form of bond is that it can readily be made up in short and flexible bonds having very large capacities, and further, in case of any slight inaccuracy in the spacing of the holes in the rail head, for the reception of the studs, such inaccuracy may be remedied by bending the arms of the terminals as may be necessary and thereby the studs may be readily adjusted so as to register properly with the holes into which they are to be inserted.

Another important advantage of this form of bond lies in the fact that it has several entirely independent connections to the rail, therefore being less liable to cause an open joint and having all the advantages of as many single bonds as there are studs on each terminal.

It will be observed that a bond, constructed in accordance with this invention, presents two or more terminal studs at each end, which are held under great pressure in cup-shaped holes in the side of the rail head adjacent to the end 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 large conductors *f* to be employed, thereby reducing the resistance in this element of the bond and affecting a large saving in copper. The location of the holes in the sides of the rail heads enables the drilling to be effected expeditiously, and their cup-shaped form affords a means of practically sealing the contact surface from moisture, thus preventing oxidation of these surfaces. Bonds of this character may be effectively employed as substitutes for the well-known old form of soldered or brazed bonds which are attached to the ball of the rails, with less cost of installation, and with an increase in the efficiency of the joint.

While a hammer or compressor has been described 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 bottom of the 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 either a hammer or compressor, but that any special tool for the upsetting and driving operations may be used.

In Figs. 6, 7, 8 and 9, I have shown my preferred forms of terminal ends without the flexible conductor connected thereto. Such terminal ends without the connecting conductor will be found of especial advantage for use in cross bonding or in any other kind of bonding where conductors are required of unusual length, such, for instance, as represented in Fig. 10, where a surface rail is shown bonded to a sub-surface equalizing rail *k* by a connection *k'*. To meet such uses a copper cable of the required length is selected by the operator or cut by him to the length desired, and the respective ends thereof inserted into the respective holes of the terminal ends by soldering or sweating in or other convenient connecting means.

While I have shown two, three and four terminal studs on the respective terminals represented in the drawings, yet this number may if desired be increased in order to give the necessary contact between the bond and the rail. In Fig. 5 I have shown a modified form of such rail bond, wherein each terminal c^2 consists of a plurality of separate metal stud-bearing branches, which has the same advantages, and the application of which is made to the conductor rail in the same manner as the form of rail bond above described. As will be seen, the flexible conducting means not only connects the terminals to each other but also connects the stud-bearing branches composing each terminal. This construction also per-

mits the studs c^2 to be adjusted as to position. In Figs. 11 and 12, I have shown the bond applied to a feeder rail a', which is carried in a housing a^2. In this case, the terminals are shown as applied to the base portion of the rail. In either form of bond the shape of the terminal studs or the shape of the holes in the rail may be as described or be threaded or enlarged at the bottom or roughed in addition to the forcing in of the terminal studs by means of pressure or by hammering, for anchoring purposes.

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

A rail bond having at the ends terminals, each terminal comprising a plurality of solid metal stud-bearing branches adjustable, towards and away from each other.

In testimony whereof, I have hereunto set my hand.

CHAS. R. STURDEVANT.

Witnesses:
CHAS. F. GARLAND,
WM. A. BACON.