No. 812,900. PATENTED FEB. 20, 1906.

E. G. THOMAS.

RAIL BOND.

APPLICATION FILED DEC. 24, 1902.

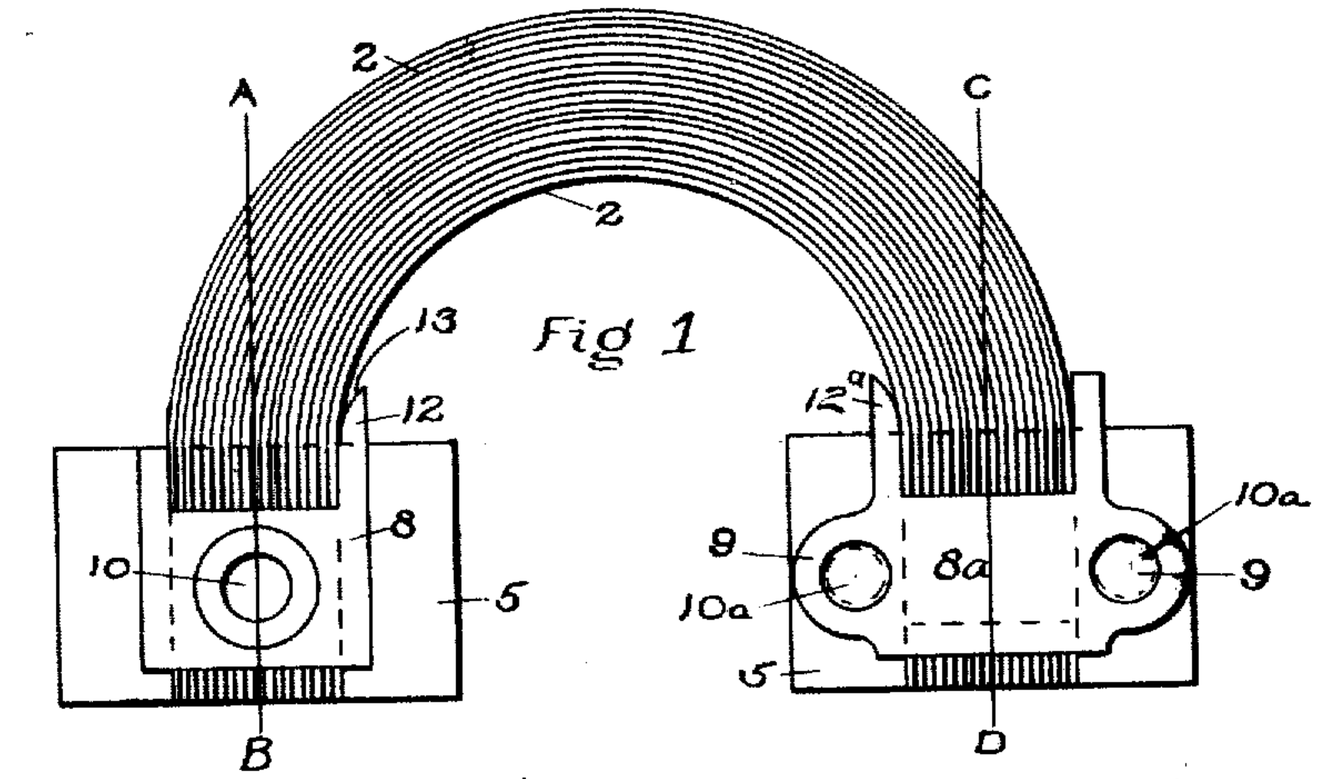

Fig 1

Fig. 2

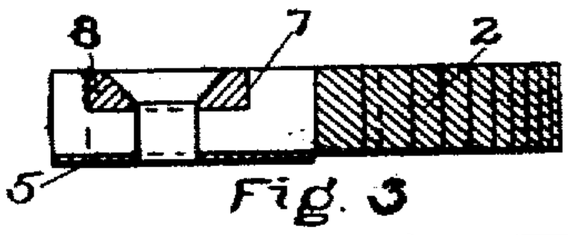

Fig. 3

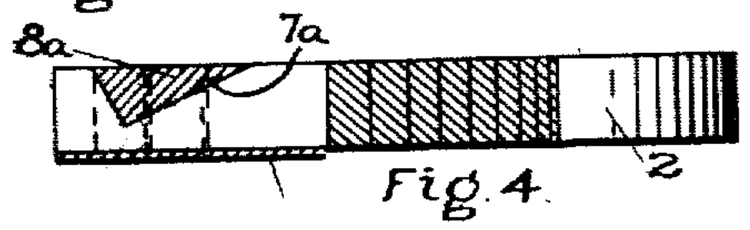

Fig. 4

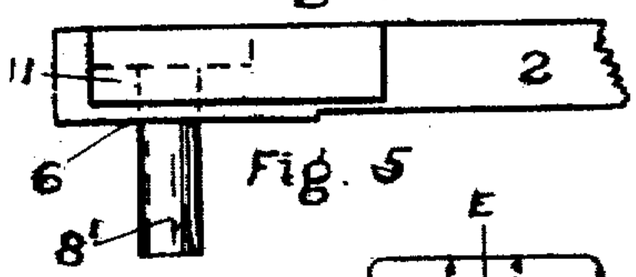

Fig. 5

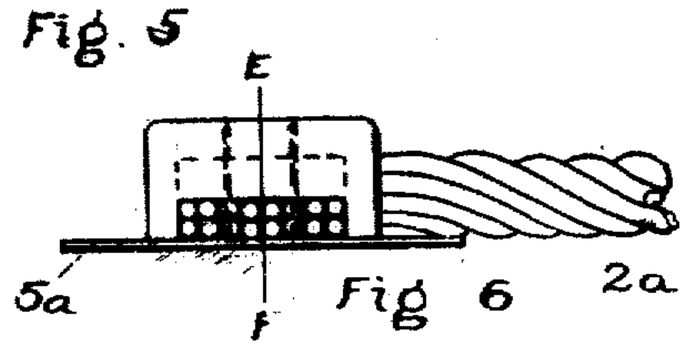

Fig 6

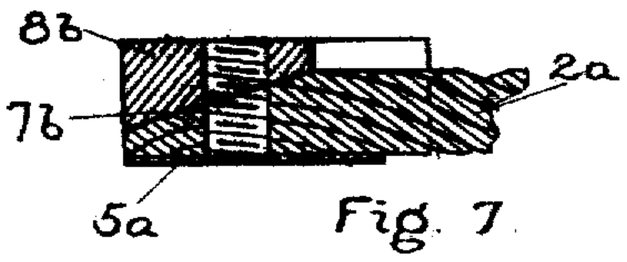

Fig. 7

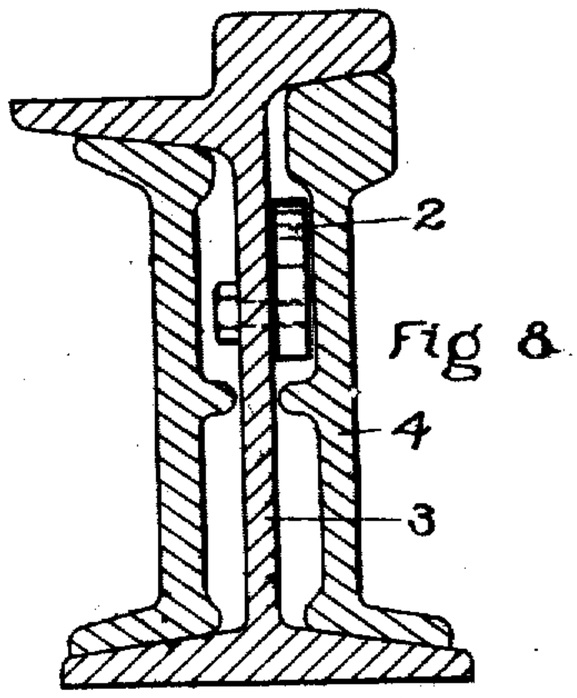

Fig 8

Witnesses

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RAIL-BOND.

No. 812,900. Specification of Letters Patent. Patented Feb. 20, 1906.

Application filed December 24, 1902. Serial No. 136,458.

To all whom it may concern:

Be it known that I, EDWARD G. THOMAS, a citizen of the United States, and a resident of Cambridge, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Rail-Bonds, of which the following is a specification.

In electric-railway construction it is now a common practice to utilize the rails for conducting the return current back to the generator and to join the adjacent ends of the rails by flexible conductors, commonly called "rail-bonds," in order to provide the necessary electrical connection between the rails, the fish-plates or rail-joints themselves being insufficient for this purpose. It is desirable that these bonds shall be located beneath the plates of the rail-joints; but the space between one of these plates and the adjacent web of the rail is so limited, especially in width, that much difficulty has been met with in devising a sufficiently flexible and durable bond of the requisite current-carrying capacity which could be located within this space and attached at its ends to the rails over sufficient contact areas.

My invention is intended to provide an improved rail-bond which will fulfil the above requirements, and relates more particularly to a novel construction and manner of attachment of the ends of the bond whereby I am enabled to form a strong and durable union between the rails and the ends of the strands, strips, or laminæ of which such bonds are usually composed over an ample contact area.

With this object in view I form an attaching-surface on one side of the bond at each end of the same, which surfaces are soldered or otherwise united either to the rails directly or to special attaching-strips which are themselves soldered to the rails, the construction being preferably such that the flexible portion of the bond is spaced slightly away from the rails, so as to be out of contact therewith. As it is usually desirable to secure these bonds to the rails by means of bolts or rivets in addition to the solder, my invention also includes a novel construction whereby I am enabled to pass bolts or rivets through the ends of my bond and to secure the necessary clamping action thereby without danger of causing the strands or strips to separate from one another or otherwise impairing the integrity of the end of the bond, as will be more fully explained hereinafter.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a preferred form of my bond. Fig. 2 is an edge view thereof looking from the bottom of Fig. 1. Fig. 3 is a transverse section on the line A B in Fig. 1. Fig. 4 is a similar section on the line C D in Fig. 1. Fig. 5 is an edge view of one end of my bond as viewed in Fig. 3, showing a slight modification. Fig. 6 is an end elevation of a portion of a bond, showing another modification. Fig. 7 is a section on the line E F in Fig. 6, and Fig. 8 is a transverse section through a girder-rail and rail-joint, showing one of my bonds applied thereto.

Referring to Figs. 1 to 5 of the drawings, my bond is shown therein as composed of a number of superimposed flat strips of metal 2, which except at their ends are bent to a semicircular or other form adapted to provide the necessary flexibility. Inasmuch as the bond is to lie between one side of the rails 3 and the plate 4 of a rail-joint and must expand and contract in a plane parallel therewith, these strips 2 are necessarily narrow, sufficient conducting capacity being given to the bond by using a large number of them. At each end of the bond the strips 2 are held together in such manner that the collective edges of the ends of the strips themselves form an attaching-surface on one side of the bond. This surface may be attached directly to the side of the rail, if desired; but I usually prefer to secure an increased area of contact with the rail by soldering a thin attaching-strip 5 to the edges of the strips 2 at each end of the bond, the opposite face of each strip 5 being adapted to be secured to the surface of the rail. These strips 5 serve not only to increase the areas of contact with the rails, but also to hold the flexible portion of the bond out of contact with the rails, and to obtain the latter result when the strips 5 are not employed I prefer to make the ends of the strips 2 slightly wider than the flexible portions thereof, as shown at 6 in Fig. 5, the attaching-surfaces being in this case formed by the edges of the laterally-extended portions 6. In practice the ends of these flexible strips are usually soldered together.

It is usually desirable to secure rail-bonds

to the rails by bolts or rivets in addition to the solder; but inasmuch as the space between the rails and the plate of a rail-joint is very narrow, as previously stated, it is also desirable that the flexible portion of the bond shall be as wide as this space, if possible, and one portion of my invention relates to an arrangement whereby practically the full width of this space is made available for the reception of said flexible portion without preventing the use of bolts or rivets for attaching the bond to the rails. To this end I cut away a portion of the outer side of the bond at or near its ends, thus forming a transversely-extending space or recess 7 in each end of the bond, and I locate a binding-plate 8 in this recess, the attaching means being passed into or through this plate or formed integral with it. This arrangement is best shown in Figs. 2 and 4, the plate 8 being shown in Figs. 2 and 3 as countersunk to receive the head of a bolt or rivet, thus preventing the latter from projecting beyond the outer edges of the strips 2 and enabling the bond to be made practically as wide as the space in which it is located. The plate 8 thus provides a solid part for holding the threads or head of the attaching bolt or rivet, the ends of the strips 2 themselves being evidently not well adapted for this purpose by reason of their edgewise arrangement. In Fig. 4 the recess 7^a and binding-plate 8^a are shown as having a triangular transverse section, and said plate is shown at the right-hand end of Fig. 1 as provided with laterally-extending ears 9, each having an internally-threaded perforation 10^a, adapted to engage the threaded end of an attaching-bolt. In this case two attaching-bolts are used with each plate 8^a, neither of which bolts passes through the strands or laminæ of the bond, whereas at the left-hand end of Fig. 1 the plate 8 is shown as provided with a single perforation 10, in which case the attaching means passes through a corresponding perforation formed in the substance of the bond proper. In Fig. 5 an attaching-rivet 8′ is shown as formed integral with the binding-plate.

I consider the form of the recess 7^a shown in Fig. 4 to be preferable to that shown in Fig. 3, for the reason that the former leaves the current-carrying capacity of the flexible strips practically undiminished, since the electric current which begins to pass through the attaching-surface as soon as it reaches one edge of the same is thereby progressively diminished, so that the entire current does not have to pass through a contracted area of the strips in order to reach the opposite edge of said surface. I also prefer to employ the double attaching means provided for by a binding-plate with two perforations, because the end of the bond is thereby prevented from twisting or turning in the plane of the rail-web after having been applied thereto, and in this case amalgam may be used to provide a good electrical contact between the meeting surfaces.

When the attaching means pass through the substance of the ends of the bond, as is the case in some of the constructions illustrated, the perforations which receive said means necessarily sever the extreme outer ends of some of the strands or strips from the remaining portions thereof, and in order to hold the ends of all the strands together and preserve the solidity of the ends of the bond I provide means for engaging the side edges of the outer strands at or near their ends and preventing the separation of the strands under the compressing action of the attaching bolts or rivets. This is especially desirable if a solder attachment is employed, in which case the parts are heated during the process of attachment and the solder is necessarily fluid. According to the construction shown such means are provided by extending the ends 11 of the binding-plate 8 inward or toward the attaching-strip 5 in such manner that said ends will bear against the outer faces of the end of the bond and prevent the assembled strips or strands from spreading or separating in any manner. These ends 11 will evidently serve to hold the strips or strands together against any force tending to pull them apart and will therefore resist the action of the strains produced by the flexing of the bond. I therefore prefer to employ them even though the ends of the bond be not perforated, such ends being shown at 11^a in Fig. 2.

In Fig. 1 the binding-plates 8 and 8^a are shown as having their inwardly-turned ends 11 and 11^a extended somewhat farther toward the intermediate or flexible portion of the bond than are the central portions of said plates. This arrangement is desirable because it provides security against the bending of the strips or strands at the edge of the recess or at any point where the bond has less thickness than at its flexible portion.

When the flexible portion of the bond is semicircular in form, as herein illustrated, the inner strips or strands being shorter than the outer ones necessarily tend to straighten more than the latter when the ends of the bond separate, with the result that said inner strips are liable to bend too abruptly where their soldered ends run into the free intermediate portion. This abrupt bending may be prevented by the construction shown in Fig. 1, in which that one of the ends 11 of the plate 8 which is adjacent to the inner strip 2 is turned inward against the same and extended not only to the point where the solder terminates, but beyond the same, thus forming an extension 12, having a curved inner face 13, which face normally stands slightly away from the innermost strip 2, but supports the same when the bond is extended,

and thus prevents said innermost strip from bending on any sharper curve than that of the face 13, thereby distributing the bending action at the end of this strip over a sufficient portion of its length to prevent any danger of its breaking at this point. The plate 8^a is shown as provided with a similar extension 12^a.

In Figs. 6 and 7 I have illustrated one end of a bond made of twisted wires 2^a, the ends of these wires being soldered together and formed on one side into a flat attaching-surface, to which may be secured an attaching-strip 5^a, as above described. The opposite side of the end of the bond is shown at 7^b as beveled, thus providing between the strip 5^a and the plane of the outer edge of the bond a transversely-extending space, which is the substantial equivalent of the recesses 7 and 7^a. The binding-plate 8^b is formed to fill the space and may have any or all of the constructional features of the plates 8 and 8^a. The binding-plate 8^b is shown in these figures as extending somewhat beyond the plane of the outer edge of the bond. Any of the binding-plates may be so constructed, and the depth of the transverse recess may thus be diminished to any desired extent in cases where the width of the space in which the bond is to be located is sufficient to permit the installation of this arrangement.

I am aware that rail-bonds have heretofore been made of strips or strands arranged edgewise with respect to the webs of the rails and adapted to bend in a plane parallel therewith; but, so far as I am aware, these prior bonds have always been attached to the rails by casting or forging a copper head around the collective ends of the strips or strands at each end of the bond and forming each head integral with a bolt, pin, or tube passing through the web of the rail and riveted thereto. The main objections to this construction are that it is difficult to obtain perfect electrical contact with all the ends of the strips or strands and that the contact-surface between the ends of the bond and the rail is in this case located at the edges of the perforation formed in the web of the latter, which perforation therefore has to be made of considerable size, and thus renders the contact liable to become defective on account of the expansion and contraction of the rail at this perforation with reference to the bolt or pin contained in it. My arrangement provides a method of attachment without making it necessary to form a large perforation in the rail or, in fact, to perforate the rail at all, and also provides for an intimate union of the ends of the strips or strands to one another and to the rail, the union thus formed between the strips or strands and between the bond and the rail being readily exposed to view at any time by removing the plate of the rail-joint, if necessary, so that the character and condition of the connection may easily be ascertained. Furthermore, so far as I am aware, I am the first to provide a rail-bond of the type described in which a plate is employed for confining the ends of the strips or strands, and I consider the constructional features whereby this result is accomplished to form important elements of my invention, which is not limited to the precise construction herein shown and described.

The word "strips" as used in the subjoined claims is intended to include wires, flat strips or laminæ, and equivalents thereof.

I claim as my invention—

1. A rail-bond comprising a number of flexible strips provided with an attaching-surface intersecting the intended path of the electric current conveyed by the bond and formed by the collective exposed surfaces of the strips on one side of the bond, and also having a transversely-extending recess opposite said attaching-surface, in combination with a binding-plate located in said recess.

2. A rail-bond comprising a number of flexible strips, and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, and extending beyond the edges of said collective surfaces in the same plane therewith, said bond being also provided with a transversely-extending recess opposite said attaching-strip, in combination with a binding-plate located in said recess.

3. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, in combination with a U-shaped binding-plate having its middle portion placed against said strips opposite said attaching-surface and having its ends arranged to confine said strips against lateral separation.

4. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond and also having a transversely-extending recess opposite said attaching-surface, in combination with a U-shaped binding-plate embracing said strips and having its central portion located in said recess.

5. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, said bond being also provided with a transversely-extending recess opposite said attaching-strip, in combination with a U-shaped binding-plate embracing said strips and having its central portion located in said recess.

6. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond,

and also having a transversely-extending recess opposite said attaching-surface, in combination with a U-shaped perforated binding-plate having its central portion located in said recess.

7. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, said bond being also provided with a transversely-extending recess opposite said attaching-strip, in combination with a U-shaped perforated binding-plate having its central portion located in said recess.

8. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, and having a transversely-extending recess opposite said attaching-surface, said attaching-surface intersecting the intended path of the electric current conveyed by said bond, in combination with a binding-plate located in said recess, and means for preventing the lateral separation of said strips.

9. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, and extending beyond the edges of said collective surfaces in the same plane therewith, said bond being also provided with a transversely-extending recess opposite said attaching-strip, in combination with a binding-plate located in said recess, and means for preventing the lateral separation of said flexible strips.

10. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, and also having a transversely-extending recess opposite said attaching-surface, said attaching-surface intersecting the intended path of the electric current conveyed by said bond, the bottom of said recess forming an acute angle with said attaching-surface, in combination with a binding-plate located in said recess.

11. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, and extending beyond the edges of said collective surfaces in the same plane therewith, said bond being provided with a transversely-extending recess located opposite said attaching-strip and having its bottom forming an acute angle with said attaching-strip, in combination with a binding-plate located in said recess.

12. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, and also having a transversely-extending recess opposite said attaching-surface, the bottom of said recess making an acute angle with said attaching-surface, in combination with a U-shaped binding-plate having its central portion located in said recess.

13. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, said bond being also provided with a transversely-extending recess, the bottom of which forms an acute angle with said attaching-strip, in combination with a U-shaped binding-plate having its central portion located in said recess.

14. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, in combination with a U-shaped binding-plate embracing said strips opposite said attaching-surface, the ends of said binding-plate being formed to extend laterally beyond the central portion thereof, in a direction parallel with the length of the strips, for the purpose set forth.

15. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said strips on one side of the bond, in combination with a U-shaped binding-plate embracing said flexible strips opposite said attaching-strip, the ends of the binding-plate being extended laterally beyond the central portion thereof, in a direction parallel with the length of the strips, for the purpose set forth.

16. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, and also having a transversely-extending recess opposite said attaching-surface, said attaching-surface intersecting the intended path of the electric current conveyed by said bond, in combination with a binding-plate having its central portion located in said recess and having its ends extended beyond said central portion, toward the flexible portion of the bond.

17. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, and extending beyond the edges of said collective surfaces in the same plane therewith, said bond being also provided with a transversely-extending recess opposite said attaching-strip, in combination with a binding-plate having its central portion located in the said recess and having its ends extended beyond said central portion, toward the flexible portion of the bond.

18. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed sur-

faces of the strips on one side of the bond, in combination with a U-shaped binding-plate embracing said strips opposite said attaching-surface and having an extended end provided with a rounded inner surface adjacent to the flexible portion of the bond, for the purpose set forth.

19. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, in combination with a U-shaped binding-plate embracing said strips opposite said attaching-surface and having an extended end provided with a rounded inner surface adjacent to the flexible portion of the bond, for the purpose set forth.

20. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, and also having a transversely-extending recess opposite said attaching-surface, in combination with a binding-plate located in said recess and having an extended end provided with a rounded inner surface adjacent to the flexible portion of the bond and normally out of contact therewith, for the purpose set forth.

21. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, said bond being also provided with a transversely-extending recess opposite said attaching-strip, in combination with a binding-plate located in said recess, and having an extended end provided with a rounded inner surface adjacent to the flexible portion of the bond and normally out of contact therewith, for the purpose set forth.

22. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, in combination with a binding-plate placed against said strips opposite said attaching-surface, said binding-plate being provided with two perforations located adjacent to the edges of the bond, and the direction of said perforations being perpendicular to said collective exposed surfaces of the flexible strips.

23. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, in combination with a U-shaped binding-plate embracing said strips opposite said attaching-surface, said binding-plate being provided with two perforations located adjacent to the edges of the bond, and the direction of said perforations being perpendicular to said collective exposed surfaces of the flexible strips.

24. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said strips on one side of the bond, in combination with a binding-plate placed against said flexible strips opposite said attaching-strip, and provided with two perforations located adjacent to the edges of the bond, the direction of said perforations being perpendicular to said collective exposed surfaces of the flexible strips.

25. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, in combination with a U-shaped binding-plate embracing said flexible strips opposite said attaching-strips and provided with two perforations located adjacent to the edges of the bond, the direction of said perforations being perpendicular to said collective exposed surfaces of the flexible strips.

26. A rail-bond comprising a number of flexible strips provided with an attaching-surface formed by the collective exposed surfaces of the strips on one side of the bond, and also having a transversely-extending recess opposite said attaching-surface, in combination with a binding-plate having its central portion located in said recess and also having two perforations located adjacent to the edges of the bond.

27. A rail-bond comprising a number of flexible strips and an attaching-strip secured to the collective exposed surfaces of said flexible strips on one side of the bond, said bond being also provided with a transversely-extending recess opposite said attaching-strip, in combination with a binding-plate having its central portion located in said recess and also having two perforations located adjacent to the edges of the bond.

28. A binding-plate for rail-bonds provided with two perforated lugs and also having its end portions extended beyond one edge of its central portion, transversely to the direction of the perforations in said lugs.

29. A U-shaped binding-plate for rail-bonds having its end portions extended laterally beyond one edge of its central portion, and also having two perforated lugs located on opposite sides of said central portion.

30. A rail-bond comprising a number of flexible strips having superimposed flat attaching portions the corresponding edges of which extend laterally beyond the flexible portion of the bond, said extending edges providing collectively an attaching-surface at one side of the bond.

31. A rail-bond comprising a number of flexible strips having superimposed flat attaching portions the corresponding edges of which extend laterally beyond the flexible portion of the bond, said extending edges providing collectively an attaching-surface at one side of the bond, in combination with

means for clamping said attaching-surface against a rail.

32. A rail-bond comprising a number of flexible strips having superimposed flat attaching portions the corresponding edges of which extend laterally beyond the flexible portion of the bond, said extending edges providing collectively an attaching-surface at one side of the bond, in combination with a binding-plate embracing said strips opposite said attaching-surface.

33. A rail-bond comprising a number of flexible strips having superimposed flat attaching portions the corresponding edges of which extend laterally beyond the flexible portion of the bond, said extending edges providing collectively an attaching-surface at one side of the bond, in combination with a binding-plate applied to said strips opposite said attaching-surface and perforated to receive an attaching bolt or rivet.

34. A rail-bond comprising a number of flexible strips having superimposed flat attaching portions the corresponding edges of which extend laterally beyond the flexible portion of the bond, said extending edges providing collectively an attaching-surface at one side of the bond, in combination with means for confining the attaching portions of said strips in superimposed relation.

In testimony whereof I have hereunto subscribed my name this 19th day of December, 1902.

EDWARD G. THOMAS.

Witnesses:
E. D. CHADWICK,
JOSEPH T. BRENNAN.