Nov. 15, 1938. A. R. TEGGE 2,136,766

THIRD RAIL

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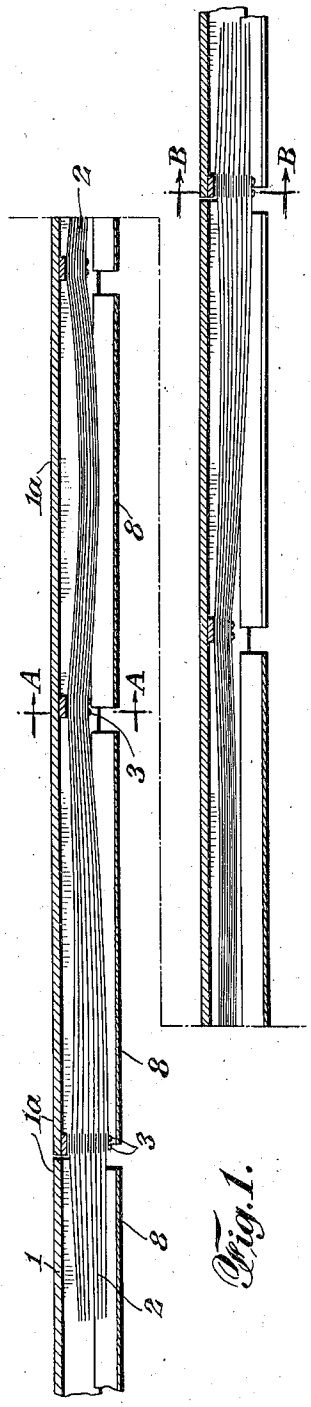


Fig. 1.

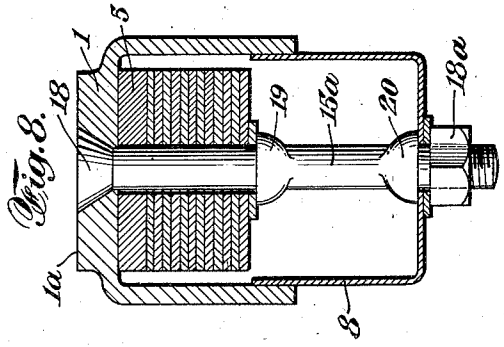


Fig. 8.

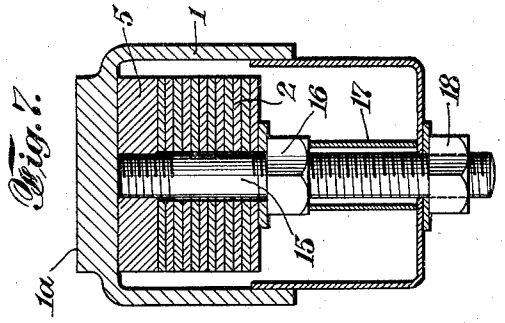


Fig. 7.

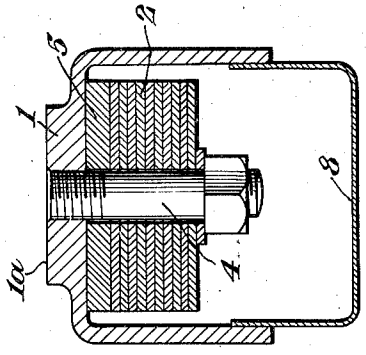


Fig. 6.

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Fig. 3.

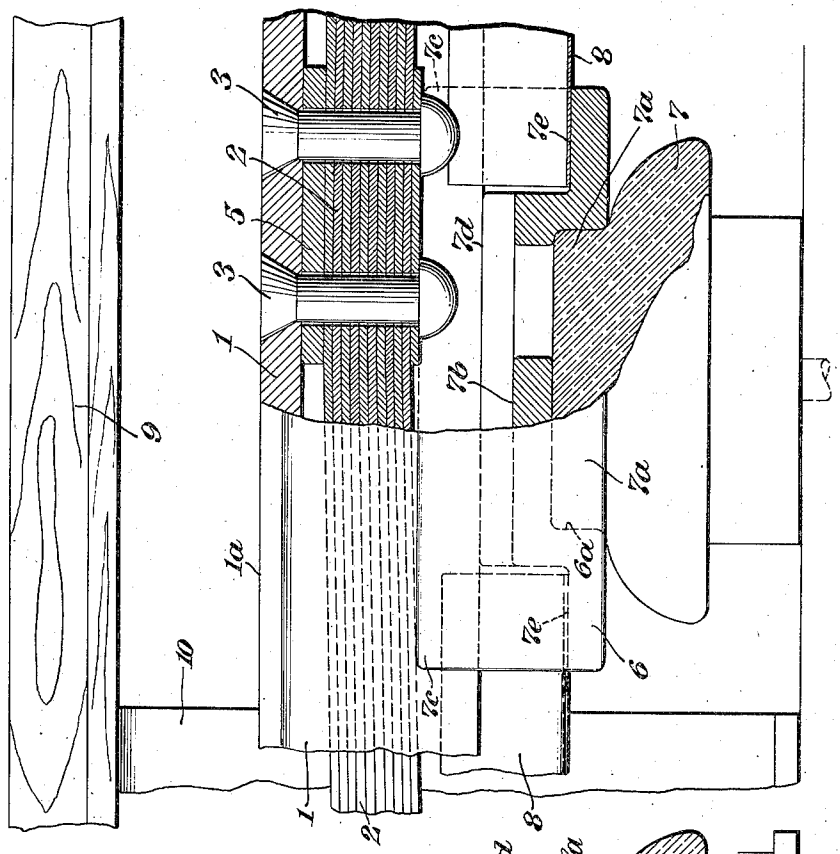
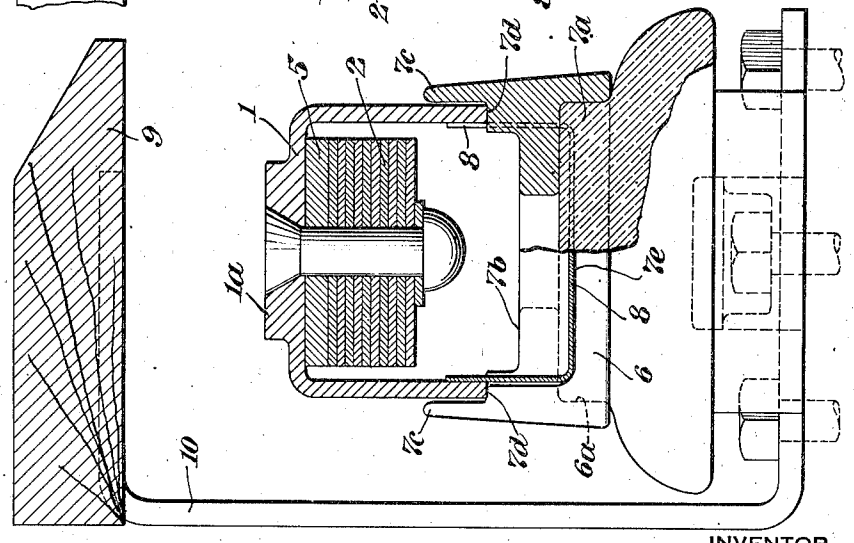


Fig. 2.



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Fig. 5.

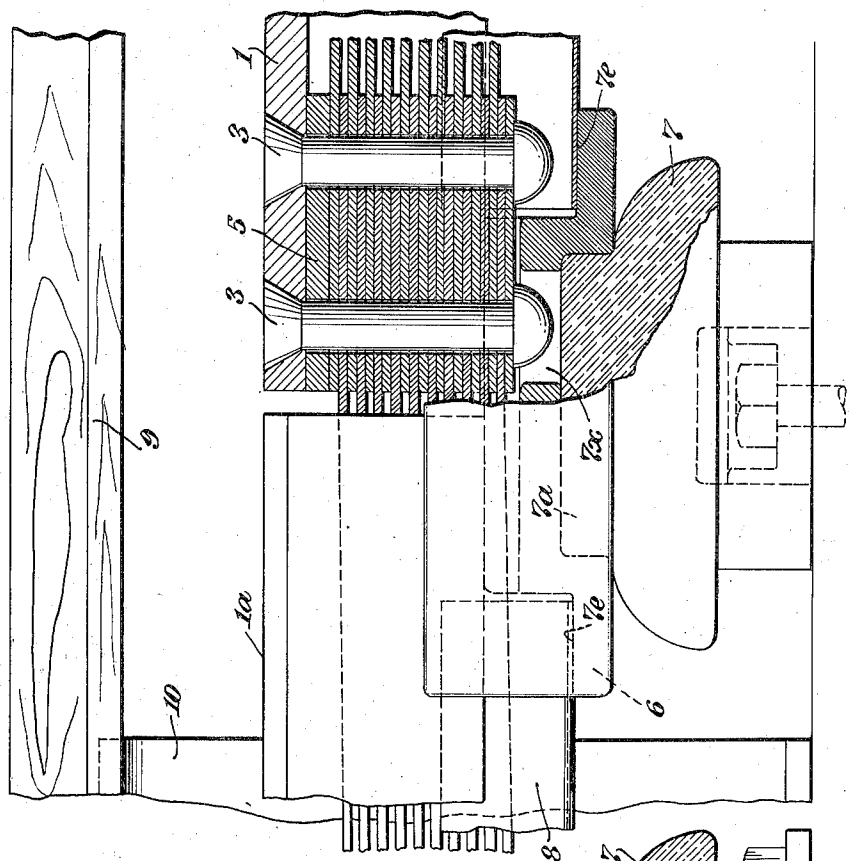
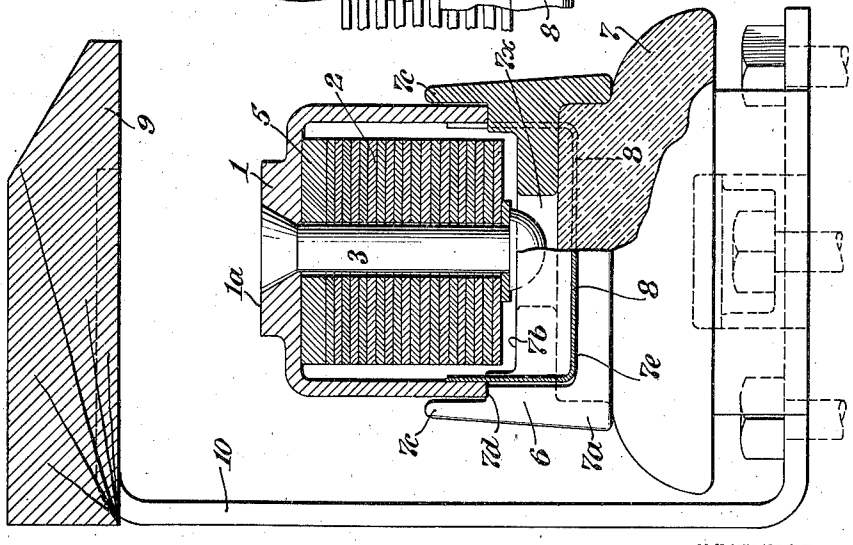


Fig. 4.



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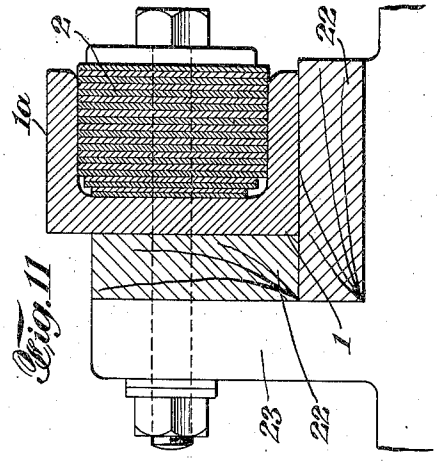


Fig. 11

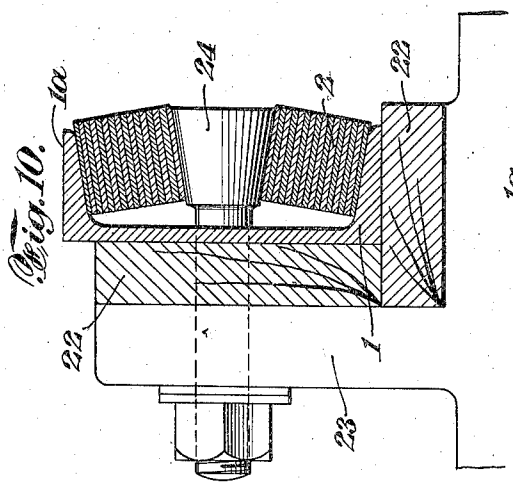


Fig. 10.

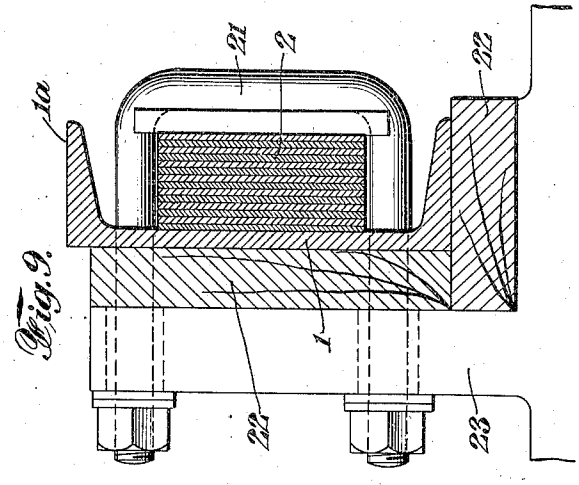


Fig. 9.

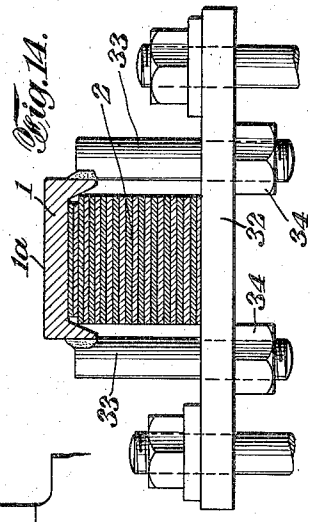


Fig. 14.

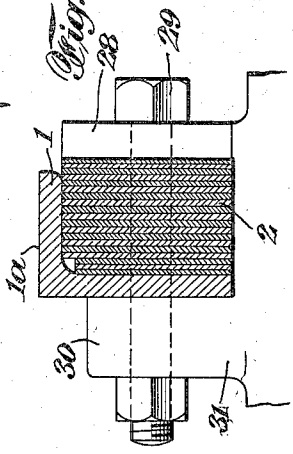


Fig. 13.

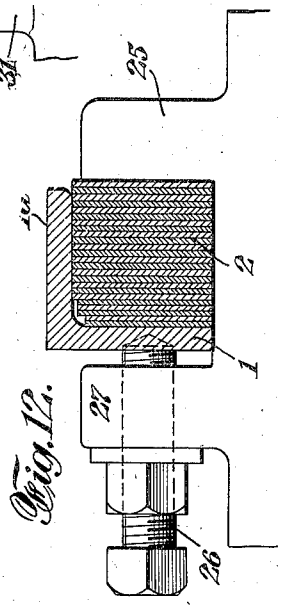


Fig. 12.

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THIRD RAIL

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Application June 12, 1936, Serial No. 84,848

11 Claims. (Cl. 191—29)

The present invention is an improvement on the standard third rail construction which latter comprises rail sections of high conductivity steel resting on insulators. As ordinarily constructed each of these standard rails weighs 150 pounds per yard and is 33 feet long. The rails are bolted together by means of ordinary rail splices. The conductivity of each standard rail is equivalent to 2½ million circular mils of copper. The current carrying capacity of the rail at the joint is considerably less than at other points in the rail. To improve the conductivity at the joint, four short bonds or jumpers of 250,000 circular mils capacity are used at the joints, the ends of these bonds being welded to the ends of adjacent rails to bridge the joint. To prevent large drops in potential in the third rail, it is connected at intervals to the feeder or power current supply cable. The standard construction has been found satisfactory and economical provided sub-stations are placed at intervals not exceeding four or five miles. For sub-stations placed at intervals greater than that the standard construction is not satisfactory. It also imposes space and weight limitations which often cannot be met or are serious draw-backs. The present improvement avoids these and other limitations and disadvantages of the standard third rail and has its own advantages and novel features as will appear especially to those skilled in the art from the following disclosure. The improved third rail is usable with advantage not only under abnormal different conditions but also in substitution of the standard construction used under normal conditions.

With the above objects in view, preferred illustrative embodiments of the invention are shown in the accompanying drawings, and these embodiments will then be described with reference to the invention, and the invention will be pointed out in the claims.

In the drawings:

Fig. 1 shows in side elevation a length of third rail consisting of individual sections within the invention assembled end to end;

Figs. 2 and 3 are respectively cross sectional and lengthwise views on a larger scale of the third rail of Fig. 1 at points A between joints, the supporting saddles and insulators and other parts being added to these figures;

Figs. 4 and 5 are the same as Figs. 2 and 3 except that the views are taken at the joints B between adjacent rail units;

Fig. 6 is a cross sectional view which substitutes a bolt for the rivet construction shown in the previous figures; and

Figs. 7 to 14 are cross sectional views showing other forms of my invention.

Referring to the drawings, Fig. 1 shows a length of third rail consisting of individual sections within the invention assembled end to end. Means for supporting the rails is omitted from this figure for simplicity, this being shown in other figures.

The individual sections consist of a durable metal contact rail 1, having a surface 1*a* for the collector shoes of an electric car or locomotive to traverse and having a flexible conductor 2 extending the length of the contact rail attached at intervals thereto by suitable securing means, such as the rivets 3 or studs 4.

The contact rails of Fig. 1 may have the special channel section shown in Figs. 2 to 5, though other shapes may be used if desired. The channeled contact rails 1 there shown have equal walls and are used in inverted position so that the bottom of the channel becomes the top of the rail which is shown thickened for greater durability, this being the contact portion 1*a* traversed by the collector shoes to take off the power current.

These Figures 2 to 5 are on a larger scale than Fig. 1, and show a means for supporting the contact rails to form the third rail in an electric railway system and further show the usual guard-board to prevent accidental contact with the third rail. Figs. 2 and 3 are respectively cross sectional and lengthwise views through the third rail at points between joints; and Figs. 4 and 5 are the same at the joints between adjacent rail units.

The functions of the contact rails 1 are to provide a wear-resistant portion for the collector shoes to traverse; and to provide a means of support, having the necessary strength, for the current carrying and transfer element 2. For this purpose the contact rails 1 are preferably made of a wear and corrosion resistant steel. They may be relatively light in weight and may be rolled, pressed or otherwise formed into the desired shape.

The functions of the flexible conductor elements 2 are to be readily joined to one another in the field to make a continuous conductor to carry the current with the least resistance, to transfer this current to their contact rails 1, and to deflect, sag or otherwise deform to allow for differences in expansion between the contact rails and the conductor elements due to temperature change. Low electrical resistance implies that the con-

ductor elements 2 be made of copper, aluminum or other low resistance material or alloy.

The illustrations show the conductor elements 2 as having a laminated or multiple flat-strip construction. This is preferable but not essential. A flexible cable made up of a plurality of fine wires or other construction having the required characteristics for the purpose can be used.

The difference in thermal expansion of the contact rails 1 and of the conductor elements 2 is taken care of by the flexible non-rigid construction of the conductors such as the illustrative laminated construction and by the manner of attachment of the laminated conductors to the rails and to one another. Thus the laminations 2 are rigidly attached only at spaced intervals to the contact rails, as by means of rivets, studs or otherwise, the laminations between the points of attachment being permitted to deflect or sag relatively to contact rail. The deflection or sag of these laminations is adjusted, before riveting or bolting up, so that at the operating temperature range no stress causing deflection is thrown into the contact rails. For successful operation it is necessary that the contact surface of the rails be parallel with the running tracks and that hills and valleys in the contact surface should be minimized.

Efficient transfer of the current from the conductor 2 to its contact rail 1 is obtained through giving generous areas to the contacting surfaces and through applying pressure on said surfaces obtained through the studs 4 (Fig. 6) or the hot-driven rivets 3.

Since there are definite limitations to the lengths of the laminations or strips 2, continuity of the conductor is obtained by overlapping and interleaving the ends of the laminations or strips. Generous overlaps are provided in order to minimize any drop in potential due to the joints in the laminations. This is shown in Figs. 4 and 5 where the long rivets 3 are shown in holes through the interleaved ends of the laminations of adjacent conductors and in taper holes through the tread of one of the contact rails. These rivets 3 (Figs. 4 and 5) for securing together the flexible conductors of adjacent contact rails will be applied in the field where the third rail is being erected, whereas the rivets 3 (Figs. 2 and 3) for securing the laminated conductors at intervals to their contact rails can be applied in the shop or in the field. The unitary contact rails and attached conductors as fabricated at the shop and shipped to the job may for example, have a standard length of 36 feet but of course may be be made in shorter or longer lengths as may be found desirable.

Preferably a small plate 5 of a high conductivity material such as copper is welded to the steel contact rail at each stud or rivet location to carry the current from the conductor 2 to the contact rail. By making these plates 5 of the same metal as the laminations and by welding them as stated to the contact rails, electrolytic corrosion is prevented at the contact surfaces, since there is then no difference in electrical potential between the contact rail, the plates 5 and the conductor 2 of the rail.

As an alternative or as an additional element, resistance to the current flow between the conductor 2 and its contact rail can also be materially reduced or minimized by spraying, plating or otherwise metallizing the steel at the contacting surfaces with the same metal as the metal of the conductor or with some other suitable high conductivity material.

Figs. 2 to 5 show members 6 conveniently called saddles on account of their form, located at intervals under the contact rails in support thereof, said saddles being themselves supported on insulators 7 which in turn are supported from the ties by any well known or preferred construction. These saddles 6, preferably made of cast metal, have a cylindrical bottom-recess 6*a* opening downwardly and receiving up into them the cylindrical bosses 7*a* of the insulators. The upper part of each saddle consists of a bottom portion 7*b* and the ends 7*c*. The sides of the contact rail channel 1 rest on ledges 7*d* located in the ends of the saddle. These ledges 7*d* support the contact rail with the ends 7*c* of the saddle at the sides of the rail to prevent lateral displacement of the rail.

U-sectioned elongated covers 8 close the open bottom of the inverted U-sectioned contact rails 1. These covers prevent the free access of moisture laden air to the conductor within the rail so as to avoid as much as possible galvanic and electrolytic corrosion. The covers 8 are made of bent up, relatively thin springy metal and their sides when pushed up into the rail channel, preferably bear resiliently more or less snugly against the side walls of the rail channel. It will thus be seen that rain will be shed by the sides of the rail without getting into the compartment formed by the rail and its bottom closure or cover. The covers 8 are as long as the distance between adjacent insulators; and each cover as indicated in Figs. 2 to 5 is supported by its ends being bottomed in recesses formed in the ends of the trough shaped saddles, the bottoms 7*e* of said recesses being shown located at a somewhat lower level than the main bottom portion of the trough. The ends of the previously referred to ledges 7*d* and the central elevated portion of the bottom-web 7*b* of the saddle act as stops to prevent endwise displacement of the covers.

Figs. 2 to 5 indicate the height of the vertical space occupied by the laminations relatively to the other parts, assuming the laminations to be made of copper. If aluminum be used for the laminations, they will occupy nearly twice as much vertical space to carry the same current. This would bring the head of the rivets 3 (Figs. 2 to 5) below the bottom of the saddle. For this reason a hole 7*x* is cast through the bottom of the saddles to make room for said rivet heads. This keeps the total vertical height of the third rail the same irrespective of whether copper or aluminum laminations be used.

9 in Figs. 2 to 5 indicates the usual safety-board supported on brackets 10 above the third rail so that men crossing the tracks will not come into contact with the live contact rail.

Figs. 7 and 8 show in cross section forms of the third rail construction adapted to be prefabricated and shipped in desired lengths to the field for assembly and connection of their conductors end to end. In Fig. 7 each contact rail has a stud 15 screwed into its copper plate 5 the latter being welded to the rail. The conductor laminations 2 are upheld on this stud and clamped by nut and washer 16 on the stud. The stud projects through a hole in the cover 8, the bottom of the cover at said hole being clamped between the spacing sleeve 17 and the nut and washer 18 on the stud.

Fig. 8 shows essentially the same principle of construction as Fig. 7 and substitutes a special

rivet 15a for the stud construction. The nut 18a and spacing sleeve 17 are substituted by pinched out projections 19 and 20 on the shank of the rivets which act as abutments and stops. Their functioning is clear from an inspection of Fig. 8.

Figs. 9 to 14 are cross sectional views through other forms of third rail constructions embodying one or more of the principles of construction of this invention.

Fig. 9 shows the conductor laminations 2 standing on edge clamped by a U-bolt 21 to the web of a structural steel channel contact rail 1 supported on edge with its shoe-traverse portion at 1a. The rail is insulated by the nonconducting members 22 from longitudinally spaced metal brackets, one of which is shown at 23. The U-bolt 21 extends through the vertical arm of the bracket.

It will be understood that the units like that shown in Fig. 9 are located spaced apart along the line of the third rail to secure the laminated conductor elements 2 to the contact rails and at their interleaved ends to each other and to the rails as shown and described in connection with the rivets 3 and studs 4 in the previous figures. This same understanding and explanation applies to the next to be described Fig. 10 et seq. The brackets in each instance may be supported from the ties or roadbed.

Fig. 10 differs from Fig. 9 in showing the laminations 2 divided into two groups which are clamped to the upper and lower flanges of the contact rail by means of the wedge shaped head 24 of the bolt there shown.

Fig. 11 shows the laminations 2 on edge and clamped to the web of contact rail 1 by means of bolt passed through holes in the laminations.

Fig. 12 shows the laminations on edge and clamped by compression between a steel angle contact rail 1 and a lug 25 on a bracket, the clamping screw 26 threading through a second lug 27 on the bracket opposed to the first lug.

Fig. 13 shows the laminations on edge in the angle of contact rail 1 clamped by copper plate 28 and bolt 29 against the vertical web of the rail which in turn is clamped by said bolt against the vertical lug 30 of the bracket 31. Here the bolt passes through holes in the laminations.

Fig. 14 shows the laminations 2 horizontally clamped between the steel channel contact rail 1 and the third rail bracket 32. Here the rail is used with its web horizontal and its flanges extending downwardly. Welded or otherwise secured to its flanges are the posts 33 having screw threaded ends passing through apertures in the bracket member 32 and fitted with nuts 34 on the underside of said member.

I have illustrated and described preferred satisfactory embodiments of the invention but it will be understood that changes may be made therein and also that other embodiments are possible within the spirit and scope of the invention as defined in the appended claims.

What I claim is:

1. A third rail, the individual sections of which comprise a contact rail which is channel-shaped in cross section and which is used with its open portion downward so that the top of the inverted channel is the contact surface for traverse by the collector shoes, a flexible conductor of high conductivity metal extending the length of the unit within said channel for carrying the power current for the rail, means for securing said conductor at intervals along its length to the channel, means for supporting said rails at intervals intermediate and at their ends comprising saddles supported on insulators, the sides of the rail channels resting on the saddles between the saddle-ends, adjacent rail ends at the joint therebetween being supported on the same saddle, covers for closing the open bottoms of the rail channels extending between adjacent saddles and having their ends supported thereby.

2. A third rail, the individual sections of which comprise a contact rail which is channel-shaped in cross section and which is used with its open portion downward so that the top of the inverted channel is the contact surface for traverse by the collector shoes, a flexible conductor of high conductivity metal extending the length of the unit within said channel for carrying the power current for the rail, means for securing said conductor at intervals along its length to the channel, and a cover for the open mouth of the rail channel, said cover itself having a channel-shaped cross section with its sides received up between the sides of the rail channel.

3. A third rail, the individual sections of which comprise a durable metal contact rail having a surface for the collector shoes to traverse, a flexible laminated conductor extending the length of the contact rail for carrying the power current and distributing it to the contact rail, and means for conductively securing said flexible laminated conductor at intervals along its length to the rail, the laminated ends thereof being left free for interleaving with the laminated ends of the similar conductors of the endwise adjacent rails, and means for securing together said interleaved ends, and high conductivity metal integrated with a contact rail at the places where the laminated conductor is conductively secured to the rail.

4. An individual section for use in third rails, which includes a hollow member having an exposed surface for traverse by collector shoes, a flexible laminated conductor extending for the length of said section in the hollow thereof for carrying current, and means for securing said conductor at spaced intervals along its length to the section, the ends of said laminated conductor being left free for interleaving with the ends of similar laminated conductors of adjacent sections.

5. In a third rail, an individual section which includes an inverted channel-shaped member with the top thereof forming a contact surface for traverse by collector shoes, a conductor extending the length of said section for carrying power current to the third rail, and means for securing said conductor at intervals to the channel, the ends of said conductor being adapted to be directly attached to the ends of adjacent conductors of adjacent sections.

6. In a third rail, an individual section which includes an inverted channel-shaped member with the top thereof forming a contact surface for traverse by collector shoes, a conductor extending the length of said section for carrying power current to the third rail, and means for securing said conductor at intervals to the channel, the ends of said conductor being connected to the ends of adjacent conductors of adjacent sections, and a metal piece secured to said section at the places where said conductor is secured to the section.

7. A third rail including individual sections, each section being provided with a surface for

traverse by collector shoes and a length of a flexible conductor extending for substantially the length of the section, the ends of the conductors of adjacent sections being interleaved and overlapped, means for securing said conductor to said section, and means for securing the overlapped ends of the conductors of adjacent sections.

8. A third rail, including individual sections adjacent each other, each section including an inverted channel-shaped member with the top thereof forming a contact surface for traverse by collector shoes, and a length of a flexible stranded conductor extending for substantially the length of the section, the ends of conductors of adjacent sections being interleaved and overlapped, means for securing said conductor at intervals to said member, means for securing the overlapped ends of the conductors of adjacent sections together and to one of said members, and means for supporting said inverted channel-shaped members at intervals intermediate and at their ends comprising saddles supported on insulators, the adjacent ends of said inverted channel-shaped members being supported on the same saddle, and covers for closing the open bottoms of said channel-shaped members, said covers extending between adjacent saddles and having their ends supported by said saddles.

9. An individual section for use in third rails which includes a channeled contact rail open at its bottom and having side walls and a thickened top wall for the traverse of collector shoes of electric engines, a flexible multi-strip conductor of high conductivity metal extending the length of said channeled section and projecting a short distance beyond one end thereof, metallic plate members of the same material as said conductor integrated to the underside of said top wall at spaced intervals along the length of said rail, and pinning means extending through said conductor for firmly securing the latter to said rail at each location of one of said metallic plate members, the said conductor being permitted to sag between plate members.

10. A third rail, including individual sections adjacent each other, each section being provided with a surface for traverse by collector shoes, and a length of a flexible conductor of multiple strip construction extending for substantially the length of the section, the ends of the conductors of adjacent sections being overlapped and interleaved, means extending through said conductor at spaced intervals for securing said conductor to said section, and pinning means for securing the overlapped and interleaving ends of the conductors of adjacent sections together and to one of said sections, the said conductor being permitted to sag between securing points.

11. A third rail of multi-section construction comprising in composite a channeled rail member open at its bottom and having side walls and a top wall for the traverse of collector shoes of electric engines, a flexible multi-strip conductor of high conductivity metal extending the length of said rail member and constructed of sectional lengths of multi-strip conductor, whose adjacent ends are overlapped and interleaved to form electrically conductive joints, metallic plate members of the same material as said conductor welded to the under side of said top wall at spaced intervals along the length of said rail member, means for firmly securing said conductor to said rail member at each location of one of said metallic plate members,, there being a plate member for each joint of overlapped, interleaved ends of said conductor member whereby said overlapped interleaved ends are firmly connected together, means for supporting said channeled rail member at intervals comprising spaced saddle members on which the bottom ends of the side walls of said channel rail member rest, and covers for closing the open bottom of said channeled rail member extending between adjacent saddle members, the ends of said covers being supported by said adjacent saddle members.

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