May 1, 1951 G. A. MANEY 2,551,500

CONCRETE RAILWAY TIE

Filed March 3, 1945 2 Sheets-Sheet 1

Fig. 1

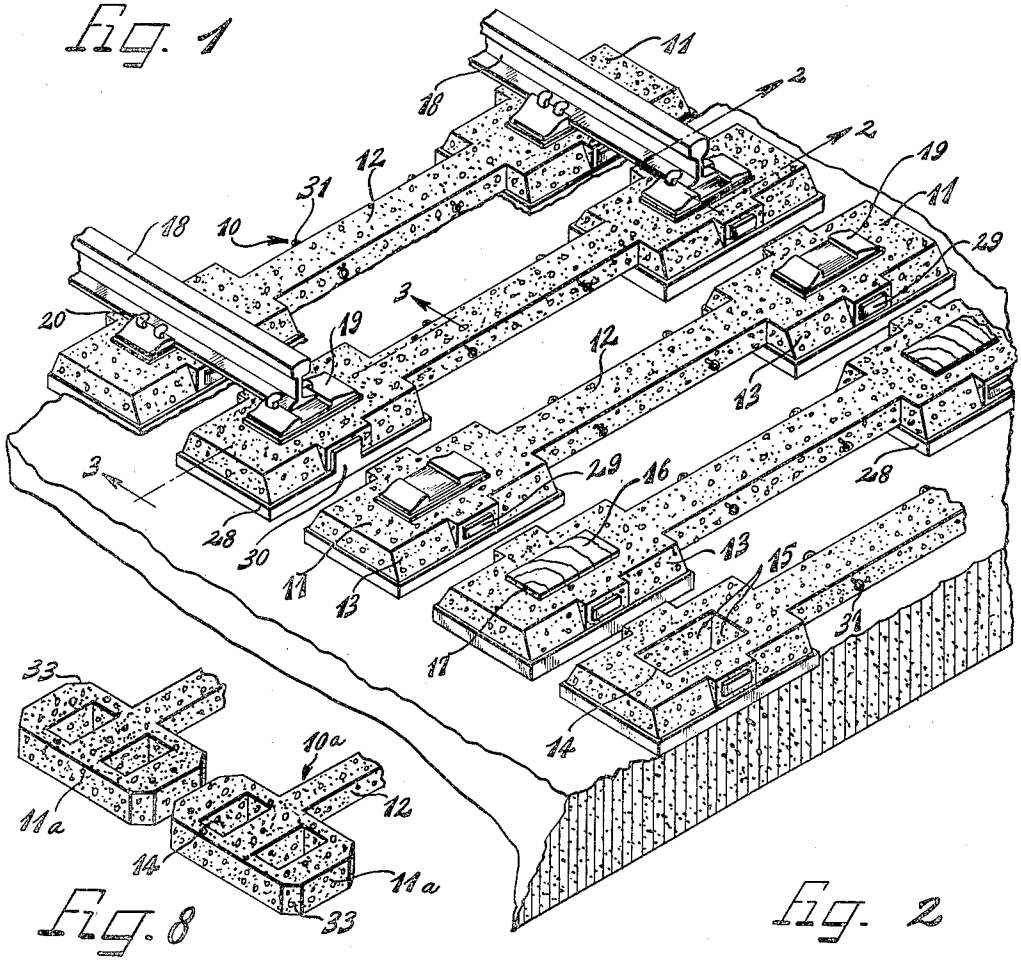


Fig. 8

Fig. 2

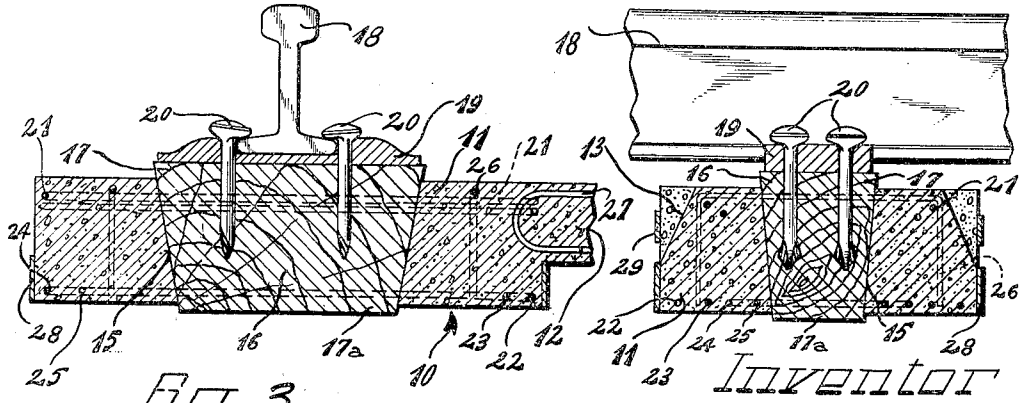


Fig. 3

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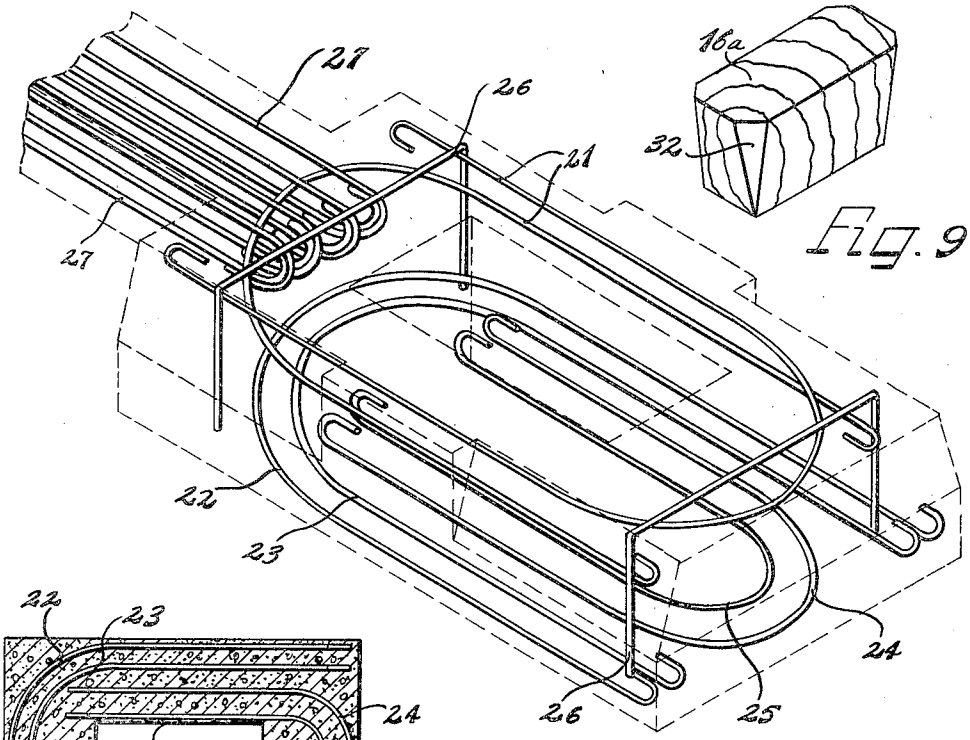


Fig. 9

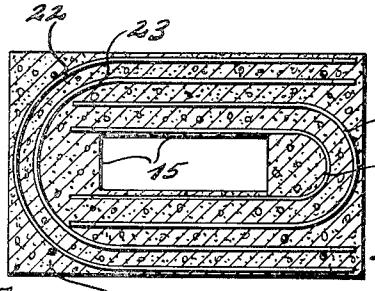


Fig. 4

Fig. 5

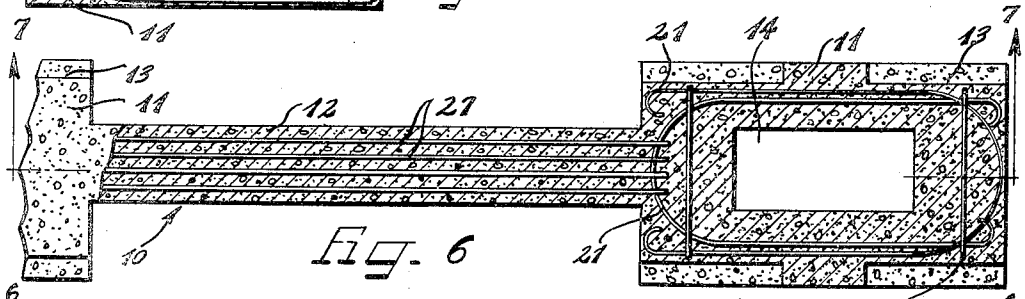


Fig. 6

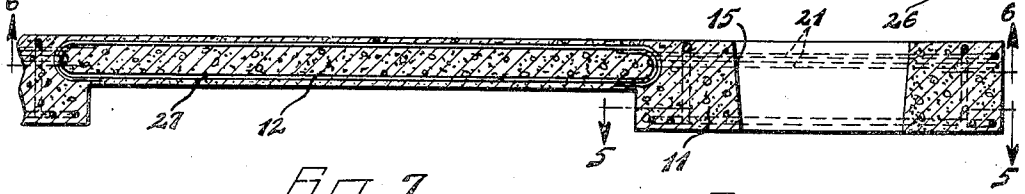


Fig. 7

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CONCRETE RAILWAY TIE

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Application March 3, 1945, Serial No. 580,887

10 Claims. (Cl. 238—85)

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This invention relates to a railway tie of reinforced concrete, and more particularly to a concrete tie which is strong, light in weight, and resistant to damage, and which provides firm support for the rails and secure anchorage therefor.

It is an object of this invention to provide a concrete railway tie to which rails may be spiked in the usual manner.

It is another object of the invention to provide a concrete railway tie having rail securing inserts held therein against unintentional removal or loosening.

It is a further object of the invention to provide a concrete railway tie so formed as to eliminate center binding thereof in use.

It is an additional object of this invention to provide a concrete railway tie providing large bearing areas on the road bed or ballast.

It is also an object of this invention to provide a reinforced concrete railway tie in which a minimum of reinforcing material is required.

It is still another object of this invention to provide a concrete railway tie having rail receiving inserts therein cushioning and distributing the impact of the rails on the tie under a load passing thereover.

It is a still further object of this invention to provide a concrete railway tie having inserts permitting the use of conventional rail-fastening means.

It is still another object of this invention to provide a concrete railway tie having rail-receiving inserts wedged therein for preventing imposition of any substantial vertical load on the tie from the rail.

It is still another object of this invention to provide a low-cost, light-weight concrete railway tie.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings:

In the drawings:

Figure 1 is an isometric view of a series of railway ties of this invention in various stages of completion.

Figure 2 is a vertical cross-sectional view through the tie taken substantially on the line 2—2 of Figure 1;

Figure 3 is a vertical longitudinal sectional view through a portion of the tie taken substantially on the line 3—3 of Figure 1;

Figure 4 is a phantom view of a portion of the tie illustrating the reinforcing members therein;

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Figure 5 is a horizontal sectional view of an end portion of the tie taken on the line 5—5 of Figure 7;

Figure 6 is a fragmentary horizontal sectional view of the tie taken on the line 6—6 of Figure 7;

Figure 7 is a fragmentary longitudinal vertical sectional view taken on the line 7—7 of Figure 6;

Figure 8 is a fragmentary isometric view of a pair of ties of slightly modified form; and

Figure 9 is an isometric view of a slightly modified insert for the tie.

The tie 10 is formed with a footing 11 at each end joined by a connection 12, the connection being of lesser width and thickness than the footings 11 and spaced above the bottom surfaces of the footings. The inner and outer end faces of the footings 11 are preferably vertical, but the side faces thereof may be beveled or chamfered as indicated at 13. The central portion of the footing, however, normal to the axis of the tie, extends the same distance as the bottom of the footing. The chamfering of the footings reduces the weight of the tie without affecting its strength. Of course, the end faces may also be chamfered if desired.

Extending vertically through each footing 11 is an aperture 14 defined by sloping surfaces 15 in the footings, to provide a larger opening in the upper surface of the footing than in the lower surface. The openings are rectangular, and the surfaces 15 flat. The aperture 14 thus is of frusto-pyramidal shape. A frusto-pyramidal block 16 of wood or similar material somewhat larger than the aperture 14 is provided for insertion in the aperture. The block 16 is forced into the aperture and held securely therein by reason of the wedging action resulting from the greater dimensions of the block. Also due to the larger size of the block 16, a portion 17 thereof projects above the footing 11. A conventional rail 18 is secured to the block 16 by means of a conventional tie plate 19 and conventional spikes 20. The wedged engagement of the block 16 in the aperture 14 is so tight and secure that the spikes 20 may be drawn out of the block 16 without causing movement of the block in the aperture. A portion 17a of the block, preferably, also projects below the footing to rest in the ballast.

The block 16 may be of one piece, or may be of laminated construction. It may conveniently be included in the footing at the time the tie 10 is cast or molded. In that case, the block serves to form the aperture 14.

In Figure 9, I have illustrated a rail-receiving block 16a, identical in function to the block 16

above described, but possessing bevels or chamfers 32 at what were formerly the corners of the block. These bevels or chamfers 32 are preferably provided by making a straight cut at each corner of the block in such location that the area of the bottom face of the block is not reduced. As a result, while the side and end faces of the block 16*a* remain sloping, the bevels or chamfers 32 extend vertically.

When the block 16*a* is employed, the aperture 14 of the footing 11 is formed to correspond to the shape of the block. The most convenient manner of so forming the aperture 14 is by casting the block in the tie, as suggested above in connection with the block 16. The shape and arrangement of the block and aperture provide surfaces at different angles than the side and end faces of the block, resulting in improved and more efficient distribution of lateral stresses to the footing.

The projecting portion 17 of the block 16 or 16*a* holds the rail 18 out of direct contact with the footing 11 and thus eliminates any possibility of the footing becoming worn, chipped or cracked due to vibration or impact of the rail thereon. The projection of the block above the upper surface of the footing 11, as well as the frusto-pyramidal shape of the block and of the aperture of the footing, result in transmission of a load passing over the rail 18 directly to the block 16 or 16*a*, and the transmission of the load through the block to the footing 11 in lateral directions only, without any substantial vertical load being imposed on the footing and certainly no vertical load sufficient to cause failure of the footing. The bottom of the block rests on the ballast or roadbed, and thus transmits the vertical load directly to the roadbed, relieving the footing of this load.

To strengthen the footing 11 against failure caused by the lateral load, reinforcing members are disposed in the footing about the aperture 14. The reinforcing members may take any suitable form, but as shown are preferably formed of high strength steel wire having an elastic limit of approximately 150,000 pounds per square inch bent into the general form of a U. Two such members 21 are disposed near the top of the footing, one slightly spaced below the other and with the bends or bights thereof in opposed relation. The free ends of each reinforcing member 21 are preferably bent or hooked back in the direction of the bights. Four reinforcing members 22, 23, 24 and 25, of successively smaller dimensions so that a smaller member may lie within a larger one, are disposed near the bottom of the footing 11 in substantially the same plane. The free ends of each of these members are curved or bent back toward the bight thereof in a plane normal to the plane of the bight. The members 22 to 25 are arranged so that two of the members have the bight thereof in opposed relation to the bight of the other two members. The reinforcing members 21 to 25, inclusive, are arranged axially of the tie. As is obvious, these reinforcing members in effect encircle the aperture 14 and reinforce the concrete of the footing 11 about the aperture.

Two reinforcing members 26 extend transversely of the tie axis in the footing, being disposed with the aperture 14 therebetween. The members 26 are positioned near the top of the footing 11 and have the ends thereof bent downwardly to extend along the sides of the footing to points adjacent the bottom thereof.

A plurality of reinforcing members 27 is provided in the connection 12, each being of a length to extend throughout the length of the connection 12 and into the footing 11 at either end thereof. The reinforcing members 27 are substantially straight and have the ends thereof bent to extend toward each other, thus forming a hook at each end. Four of the members 27 are disposed near the top of the connection 12 and four near the bottom thereof, and as already indicated extend axially of the connection 12. The ends of the members 27 overlap or extend beyond the adjacent ends or bights of the members 21 to 25, but spaced therefrom.

The shape, disposition, and material of the reinforcing members 21 to 27, inclusive, permit a maximum reinforcement of the tie with a minimum of material, thus reducing the cost of the tie without any sacrifice of strengh. The reinforcement of the footing enables it to absorb the load and shocks transmitted from the rail 18 by the block 16 without cracking or other damage, and the reinforcement of the connection 12 in overlapping relation with the reinforcements of the footings 11 gives added strength not only to the connection but to the entire tie, and also strengthens the tie at the junctions of the connection and footings. The reinforcement of the concrete tie, it will be understood, may employ any suitable material and take any desired form which will strengthen the tie at the portions thereof which otherwise might fail under the stresses to which they are subjected. The reinforcing members and the arrangement thereof as shown and described constitute a preferred example, but the invention is not limited to such reinforcement.

A protective band or facing 28 of suitable material, such as sheet metal, may be provided about the footing 11 to prevent abrasion and chipping of the footing by ballast, tamping tools, and the like. The protecting member 28 is shown in the drawings as extending only partially upward along the ends and sides of the footing, but it will be obvious that it may be extended as desired. A plate or facing 29 of any suitable material may also be provided at each side of the footing 11 adjacent the top surface thereof to prevent wear or chipping of the footing in the event a rail anchor is installed on the rail 18 to bear on the side of the footing. It will be obvious that if desired the protective member 29 may be formed integral with the protective member 28, as indicated at 30 in Figure 1. The formation of the protective members 28 and 29 as a single protective member 30 requires but little additional material, and has considerable advantage in the securement of the protective member on the footing, both from the standpoint of reducing the number of operations required and from the standpoint of permanence. The protective facings 28 and 29 may be applied to the footings in any suitable manner. They may, for example, be embedded in the concrete.

Grab hooks or eye members 31 may be provided in each tie to facilitate the transportation and handling thereof and thus reduce the possibility of breakage before installation.

Portions of ties 10*a* are shown in Figure 8 having footings 11*a* substantially similar to the footings 11 of the tie 10 already described, but having somewhat more than twice the width thereof. Two apertures 14 are provided in each footing, one at each side of the center line, and the connection 12 joins the upper central por-

tions of the footings 11a. The sides of the footings are shown as vertical throughout, although they may be beveled or chamfered in the same manner as shown and described in connection with the tie 10. The footings 11a may have beveled corners 33 to facilitate the handling and installation of the tie and to provide greater space between adjacent footings. The tie 10a is otherwise substantially the same as the tie 10.

It will be seen that the tie 10a serves the purpose of two adjacent ties, with a saving in weight over a pair of the ties 10 by reason of the elimination of one of the connections 12. The tie 10a also provides a very large bearing surface by reason of the relatively large surface areas of the footings 11a, so that the tie resists shifting except under a very considerable force. The weight of the tie, of course, is also a factor in this resistance to shifting. The tie 10a also has the advantage that track may be laid more rapidly, because installation of one of these ties is in effect the installation of two ties, and requires no more time than the installation of a single individual tie. It will be obvious that the footings may be made of such size that three or more apertures may be formed therein to accommodate a corresponding number of rail-receiving blocks. Practical considerations, however, such as those of weight and unwieldiness, make it preferable to limit the size of the tie.

The tie is made of concrete of any desired or suitable type, and thus the inherent defects of a conventional wooden tie are avoided. For example, destruction of the tie by rot, termites, and many other causes is eliminated. The concrete tie of this invention is stronger than a conventional wood tie, and its greater weight is an advantage in that it provides greater stability.

The stability of the tie is also aided by the provision of the relatively large footings, which provide a large bearing area on the roadbed, so that shifting of the tie is minimized. Furthermore, the footings provide the bearings at the places where they are needed, that is, under the rails, instead of having the entire tie bear on the roadbed.

The reduced width of the connection 12 provides ample space between the ties for tamping of ballast or other operations. The reduced thickness of the connection 12 and its position raised above the bottom of the footings avoids any considerable amount of wear on the connection, since it is substantially out of contact with the ballast, and more important, prevents the connection from having any bearing on the roadbed. This construction eliminates center binding of the tie, a prime cause of maintenance work, and thus contributes materially to economy in maintenance of the tracks. The raised position of the connection also provides improved drainage of the roadbed.

The blocks 16 or 16a of wood or the like insulate the rail, and prevent leakage of signal current to the ground or across the tie. The blocks may be impregnated with phenolic or urea-formaldehyde resins or other impregnating materials, and because of their relatively small size the impregnation may be complete and effective, instead of incomplete and only partially or temporarily effective as is usually the case with a conventional wood tie which has been impregnated. The impregnating material may be a preservative or hardening agent, or both. Should a block become worn or defective for any reason, it may be removed by pressure or a blow on the small end thereof, and replaced by a new block. The removal of worn blocks may be effected by a simple leverage arrangement lifting one end of the tie without removing the tie as a whole from its place. The wedging engagement of the block in the footing results in the block material being forced more firmly about the spikes when a load is applied to the block. The relatively small size of the wooden blocks also has the advantage of permitting the use of selected sections of wood, eliminating knots, weather cracks, concealed dry rot, and the like. The blocks are inexpensive, and compared to a conventional wood tie their cost is trifling.

In case of damage to a tie by derailment of a train or other cause, repairs may often be made without even requiring removal of the tie. This is especially the case when the connection 12 is the damaged portion. Usually all that is necessary is the straightening of bent reinforcing members and the casting or molding of new concrete about the reinforcements after removing the cracked concrete.

The tie of this invention greatly reduces maintenance costs, by reason of its long life, stability, resistance to damage, elimination of center binding, the relative cheapness of the rail-receiving blocks and their easy replacement, and the simplicity of repair of the tie if damaged but not rendered totally ineffective.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A concrete railroad tie comprising an elongated central portion, a footing at each end of said central portion wider than said central portion and having a vertical aperture therethrough defined by upwardly diverging surfaces, and a rail-receiving block wedgingly engaged in said aperture and projecting beyond the top and bottom surfaces of the footing.

2. A concrete railroad tie comprising a pair of footings each having a plurality of vertical apertures therethrough substantially frusto-pyramidal in form providing a larger opening in the top of the footing than in the bottom, a connecting portion joining said footings at the central portions thereof, and a frusto-pyramidal block wedged in each aperture projecting above and below the footings.

3. A concrete railroad tie comprising a pair of footings each having a vertical aperture therethrough larger at the top than at the bottom, a connecting portion joining said footings at the central portions thereof, and a rail-receiving block in each aperture projecting above and below the footing, said block having a generally frusto-pyramidal form with vertically chamfered corners.

4. A concrete railroad tie having a vertically disposed aperture near each end, said apertures having upwardly diverging walls, a block positioned in each of said apertures having side walls inclined to conform with the walls of said apertures, the upper surfaces of said blocks being in spaced relation above the tie and the lower surfaces of said blocks being in spaced relation below the tie, whereby a vertical force applied on the upper surface of one of said blocks will be

mainly transmitted to the ballast of the roadbed beneath said block.

5. A concrete railroad tie having a vertically disposed aperture near each end, said apertures having the shape of an inverted frusto-pyramid and a frusto-pyramidal block positioned in each of said apertures, the upper surfaces of said blocks being in spaced relation above the tie and the lower surface of said blocks being in spaced relation below the tie, whereby the major portion of a vertical force applied on said blocks will be transmitted directly to the roadbed while a small portion of the force will be transmitted laterally into the tie and absorbed therein.

6. A concrete railroad tie including a pair of spaced footings each having a vertical aperture therethrough, a connecting member joining said footings, and a rail-receiving block in each of said apertures projecting both above and below the respective footing.

7. A concrete railroad tie including a pair of spaced footings each having a vertical aperture therethrough, a connecting member joining said footings, and a rail-receiving block in each of said apertures projecting both above and below the respective footing, and metallic reinforcing bars embedded in said footings and positioned to completely surround said apertures in horizontal elevation.

8. A concrete railroad tie including a pair of spaced footings each having a vertical aperture therethrough, a connecting member joining said footings, and a rail-receiving block in each of said apertures projecting both above and below the respective footing, reinforcing bars extending through said connecting member, reinforcing bars embedded in each of said footings and positioned to directly surround each of said apertures, and the reinforcing bars in said connecting member being interlocked with those in the footings.

9. A concrete railroad tie including a pair of spaced footings each having a vertical aperture therethrough, a concrete cross member connecting said footings and of less height than said footings so that the footings extend below the

cross member, a rail-receiving block in each of said apertures projecting both above and below the respective footing, a plurality of vertically spaced layers of reinforcing in each footing positioned to directly surround the respective aperture, and reinforcing bars extending longitudinally through said cross member and interlocked at their ends with one of the layers of reinforcing in each of said footings.

10. A concrete railroad tie comprising a pair of footings each having an aperture extending vertically therethrough, a block positioned in each aperture and projecting above and below said footings, a connecting member joining said footings, and a protective band disposed about said footings to prevent chipping of the footing during roadbed maintenance work.

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