March 3, 1942. M. L. CANTRELL ET AL 2,275,129

RAIL FASTENING

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Fig. 1

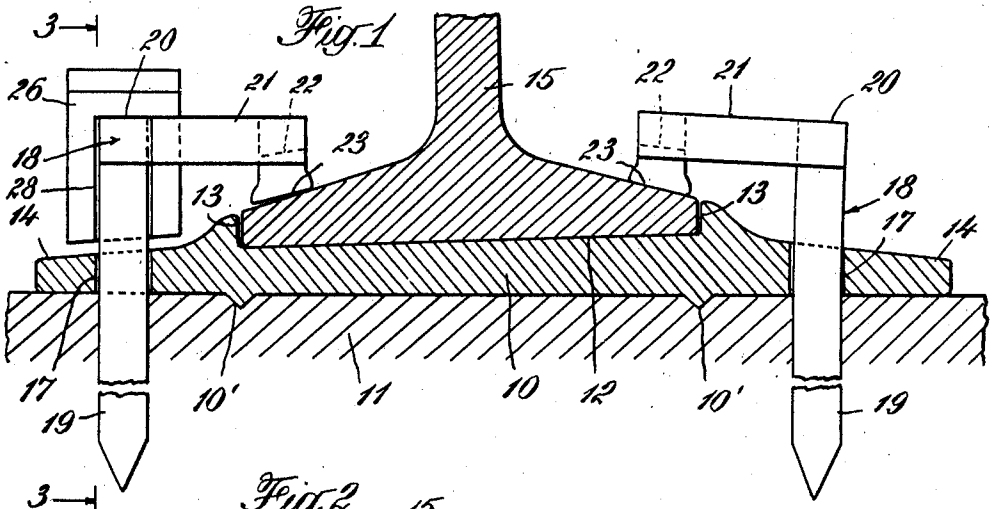

Fig. 2.

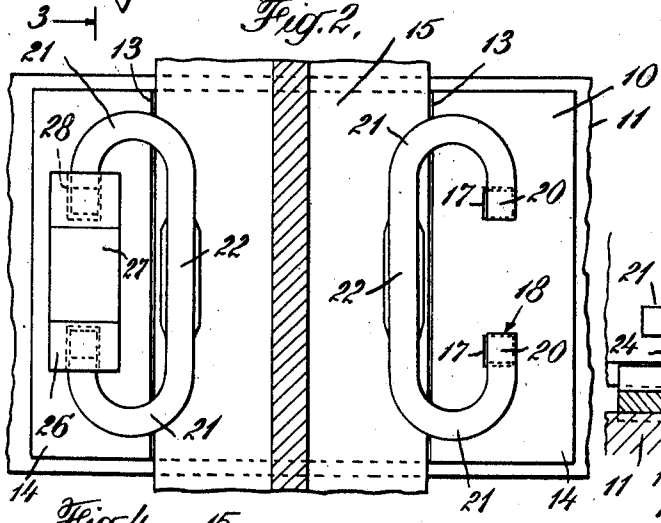

Fig. 3.

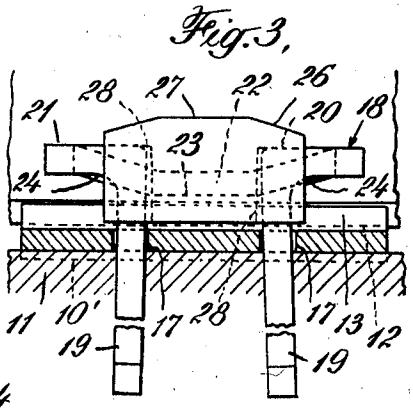

Fig. 4

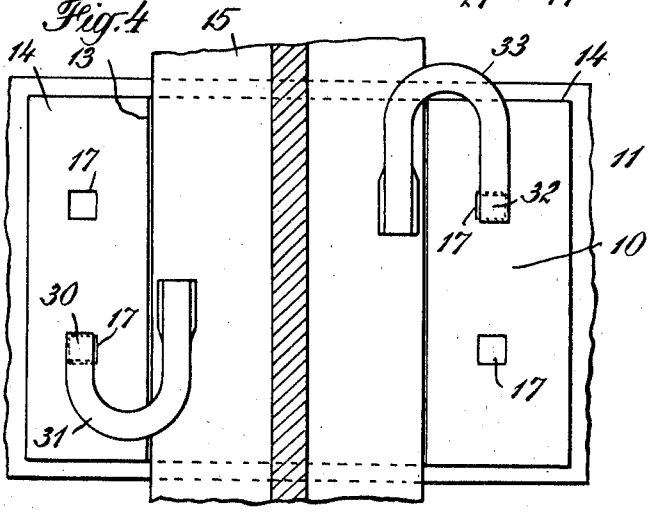

Fig. 9.

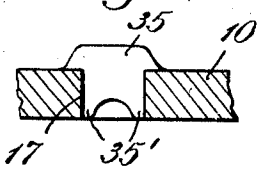

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Fig. 5,

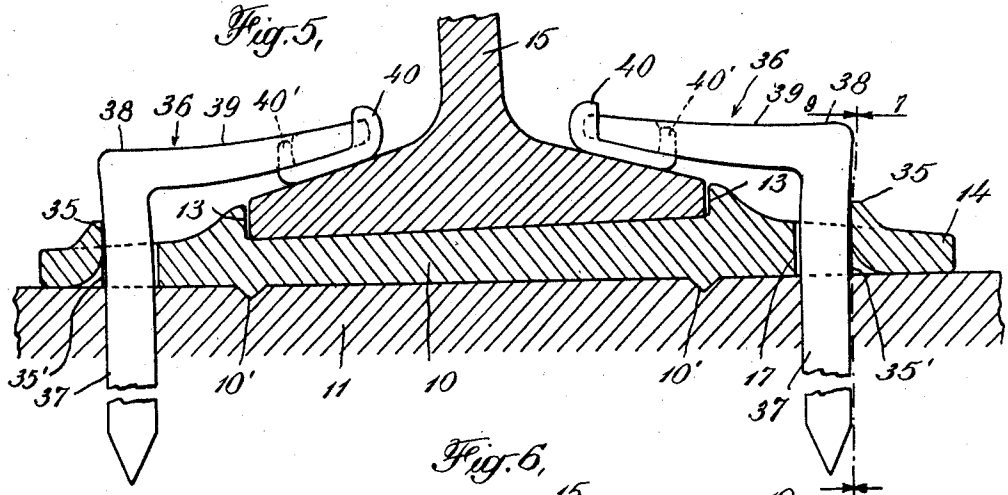


Fig. 6,

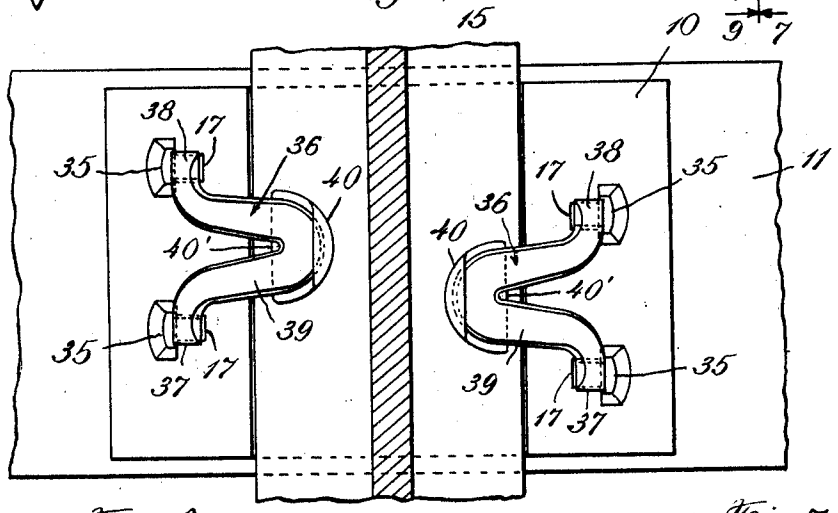


Fig. 8,

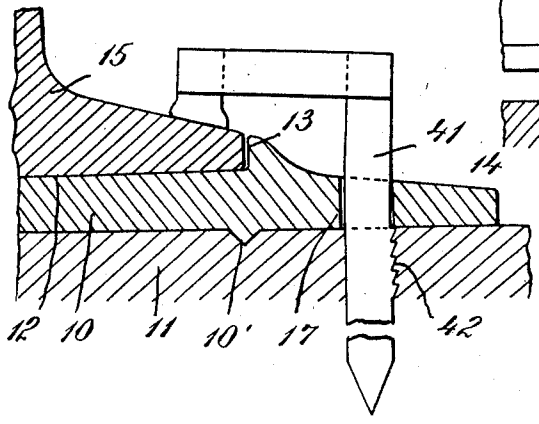
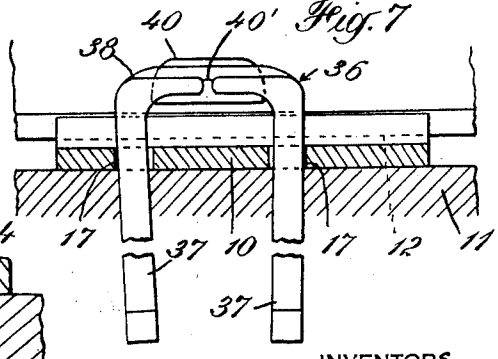


Fig. 7



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UNITED STATES PATENT OFFICE

2,275,129

RAIL FASTENING

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Application July 13, 1939, Serial No. 284,230

5 Claims. (Cl. 238—349)

This invention relates to track structures and more particularly to an assembly including a rail, a tie plate, a tie and a novel tie-penetrating fastening which engages the rail and normally holds the plate against the tie, and which is easy to install and yet, by reason of the coaction between the parts of the assembly, is effective in resisting withdrawal or loosening of the fastening in the tie. The fastening is of a simple construction adapted for manufacture at low cost, and by its inclusion in the new assembly, a locking relation between the rail, the tie plate and the tie is obtained which prevents or greatly reduces abrasive movement of the plate upon the tie transversely, longitudinally and vertically. While the fastening normally retains the rail seated on the plate, it operates to accommodate the wave motion of the rail under passing loads and, coincidentally, to retard and effectively resist longitudinal movement of the rail with respect to both the plate and the tie.

It is well known that the rails of a conventional track structure tend to move up and down on the tie plates as a train passes over them and that this movement of the rails under passing loads causes them to "creep" longitudinally. Likewise, it is recognized that as a result of this up and down movement the tie plates are subjected to a shifting action which develops a destructive mechanical wear of the ties, and that conventional spikes are loosened or caused to work out of the ties, thereby weakening the entire track structure.

One feature of the present invention, therefore, resides in the provision of a novel rail fastening which yieldingly opposes the rail wave motion and effectively resists creeping of the rail without the use of the usual mechanical devices adopted for this purpose, and which may be easily installed so that the embedded end of the fastening is cramped in the tie, whereby the fastening is more resistant to withdrawal and holds the tie plate in a stationary position. The rail fastening of the invention comprises a lower portion or shank which may be inserted through a conventional spike opening in the plate and driven into the tie, the shank being preferably provided on top with a striking head for this purpose. Laterally disposed from the head and preferably integral with the shank is a spring arm which projects inwardly over the rail base and engages the top of the base so that it urges the rail against its seat and also produces a reaction tending to bias the shank of the fastening toward the edge of the tie plate opening remote from the rail.

A track structure including the new fastening may be readily assembled by mounting the tie plate on the tie and the rail on the plate and then driving the shank through the plate opening into the tie, which may be prebored to facilitate the proper entrance of the shank. As the fastening is driven, the end of the spring arm engages the top of the rail base, which slopes downwardly from the rail web, and thereafter further driving of the fastening not only stresses the spring arm so that the latter exerts an initial holding force on the rail, but also causes the end of the arm to slide down the sloping top of the rail base, thereby urging the top of the shank outwardly from the rail. As a result, part of the shank near the head is forced toward or against the outer edge of the plate opening, so that the shank tends to fulcrum about this edge as a pivot and force its embedded end laterally in the tie toward the rail. Accordingly, the fastening is cramped in the tie and its resistance to withdrawal is greatly increased.

Another feature of the invention resides in the provision of a novel rail fastening having a double-shank which cooperates with the tie plate in such a manner that the embedded parts of the shanks are cramped toward or away from each other, thereby further greatly increasing the resistance of the fastening to withdrawal from the tie. Preferably, the tie plate is formed with two spaced openings for the shanks on one side of the rail seat, and the two shanks are connected together near the top with a spacing between them which normally is slightly different from the spacing between the openings in the plate. Thus, if the shanks are closer together than the openings, they are cramped away from each other by the edges of the openings as they are driven into the tie, and if the shanks are further apart than the openings, they are cramped toward each other by the plate when they are driven. In either case, the cramping action serves to resist any tendency for the shanks to withdraw from the tie, and the shanks, in conjunction with the intervening plate portion, develop oppositely directed restraining forces which tend to counteract the torque transmitted to the shanks by the spring arm incident to its restraint of rail movement transversely of the plate, thus preventing or reducing any movement of the plate on the tie which might develop mechanical wear and damage thereto.

Another feature of the invention resides in the

provision of a novel rail fastening having a cushion of resilient and semi-abrasive material, such as rubber or a plastic, formed to fit over and preferably lock on to the end of the spring arm. Such a cushion, when used in the new fastening, insures a proper area of contact between the spring arm and the rail and increases the friction between these parts. Also, it prevents wear of the spring arm, dampens vibration and reduces impact shocks.

These and other features of the invention may be better understood by reference to the following detailed description taken in conjunction with the accompanying drawings, in which

Fig. 1 is a section through one form of the new rail assembly showing a double-shank fastening in the process of being driven;

Fig. 2 is a reduced plan view of the assembly shown in Fig. 1;

Fig. 3 is a reduced section on the line 3—3 in Fig. 1;

Fig. 4 is a plan view of a modified form of the assembly;

Fig. 5 is a sectional view of another form of the assembly;

Fig. 6 is a reduced plan view of the assembly shown in Fig. 5;

Fig. 7 is a reduced section on the line 7—7 in Fig. 5;

Fig. 8 is a sectional view of part of still another form of the assembly, and

Fig. 9 is a section on the line 9—9 in Fig. 5.

The assembly shown in Figs. 1 to 3, inclusive, comprises a tie plate 10 mounted on a tie 11 and preferably formed on the bottom with transverse ribs 10' which penetrate the tie and secure the plate against longitudinal displacement. The top of the plate is formed with a rail seat 12 which is canted or cambered, or both, in accordance with usual practice. At opposite sides of the rail seat 12 are vertical rail abutting shoulders 13 from which the plate slopes downwardly and outwardly to end portions 14 of reduced thickness. A rail 15 is mounted on the seat 12 and is held in position on the plate by the shoulders 13.

Outwardly from each of the shoulders 13, the tie plate is provided with conventional spike openings 17 through which extends a rail fastening designated generally by the numeral 18. As shown particularly in Fig. 3, the rail fastening includes a pair of prongs or shanks 19 extending through the tie plate openings and driven into the tie. The shanks 19 are formed on top with striking heads 20 and are connected together by a flexible part 21 which extends inwardly over the base of the rail. The flexible part 21 may take various forms but as illustrated is generally U- or V-shaped. More particularly, the flexible part extends laterally from each shank away from the other shank and generally parallel to the rail and then curves inwardly over the rail base to a depressed portion 22. The latter is somewhat wider at its base than the adjacent portions of the fastening and is formed with a rail contacting surface 23 which bears against the top of the rail base inwardly from its side edge, the surface 23 being normally inclined at an angle somewhat less than the angle of slope of the top of the rail base, as shown at the left in Fig. 1. The fastening may be formed with fillets 24 under the flexible part 21 where the latter joins the shanks, for the purpose of reinforcing and strengthening the fastening at these points.

Each of the rail fastenings 18 is preferably made with a spacing between the shanks 19 which is different from the spacing between the two openings 17 for receiving the shanks. The spacing between the shanks may be either greater or less than that between the corresponding openings in the tie plate, but in the rail assembly illustrated in Figs. 1 to 3 the adjacent side edges of each pair of openings 17 are spaced apart a greater distance than the adjacent faces of the two shanks, before the latter are driven into the tie. Accordingly, during the driving operation the two shanks 19 are spread further apart by the adjacent side edges of the tie plate openings and are cramped in the tie, as illustrated in Fig. 3.

In driving the fastenings 18, the shanks are placed in their corresponding openings in the tie plate and then driven into the tie either by striking the heads 20 of the shanks directly or by applying a suitable striking block to the shanks, such as the block 26. The latter may be made of metal and is formed with a striking head 27 and with recesses 28 in the opposite ends below the top of the block, the recesses being of such proportions that they snugly receive the upper parts of the shanks. The block 26 is placed over the two shanks, as shown at the left in Fig. 1, so that the parts of the block directly above the recesses 28 rest on the striking heads of the shanks. The shanks are then driven into the tie by striking the head 27 of the block. Preferably, the depth of the block is so proportioned that the shanks are fully driven to the desired depth in the tie when the bottom of the block strikes against the top of the tie plate. The block thus acts as a gage to insure uniform driving of the fastenings. After the shanks have been driven home, the block 26 may be easily removed and applied to another fastening. It will be observed that the block 26 is essentially T-shaped with the stem fitted between the adjacent faces of the two shanks and the arms resting on the heads 20.

During the operation of driving the rail fastenings 18, the adjacent side edges of each pair of tie plate openings 17 are engaged by the corresponding faces of the shanks and act to force the shanks slightly away from each other, due to the difference in spacing between the shanks and the plate openings. This biasing action on the shanks is progressive as the shanks are driven, so that when the rail fastening is in its final position, as shown in Fig. 3, the embedded ends of the shanks are cramped in the tie and are much more resistant to withdrawal. Also, when the inclined surface 23 engages the top of the rail base during the driving operation, further driving of the shanks causes the flexible part 21 to force the upper ends of the shanks outwardly, as shown at the right in Fig. 1. Thus, when the shanks are driven home, the upper ends thereof may be forced outwardly sufficiently to cause the shanks to engage the outer edges of the tie plate openings, whereby the shanks tend to fulcrum about these edges and force the embedded ends laterally in the tie toward the rail. This lateral force exerted by the shanks in the tie serves further to increase the holding force of the rail fastening so that the fastening is more effective in resisting forces tending to withdraw it from the tie.

By inclining the rail contacting surface 23 of the fastening at an angle somewhat less than the angle of slope of the top of the rail base, the

tendency for the flexible part 21 to force the upper ends of the shanks outwardly when the shanks are driven home is increased. That is, the surface 23 is flattened against the top of the rail base by the driving operation, as shown at the right in Fig. 1, and thereby exerts a turning force which urges the upper ends of the shanks outwardly. Since the shanks in their final positions are cramped both in a direction transverse to the rail and in a direction parallel thereto, the shanks are extremely resistant to withdrawal and loosening in the tie, and the rail, the tie plate and the tie are cramped or locked together so that abrasive movement or action of the plate with respect to the tie is prevented or greatly reduced.

During the final stage of the driving operation, the flexible connection 21 between the shanks is flexed by reason of its engagement with the rail base, this flexure occurring in the arms adjacent the shanks and also in the depressed portion 22 which flexes upwardly toward the plane of the arms. Accordingly, the fastening 18 exerts a downward force on the top of the rail base and holds the rail yieldingly on its seat. As the rail moves upwardly from its seat incident to the usual rail wave motion, the upward movement is resisted with an increasing force by the fastening 18, and the friction between the surface 23 and the top of the rail base effectively resists the tendency for the rail to creep longitudinally. Also, in the upward movement of the rail, the vertical force transmitted to the surface 23 is translated to a generally horizontal, outwardly directed force on the upper ends of the shanks, due to the spacing between the surface 23 and the shanks, and this outwardly directed force tends to fulcrum the shanks further around the outer edges of the plate openings 17. The fulcrum action thus produced increases the cramping action of the embedded ends of the shanks in the tie and thereby renders the shanks still more resistant to withdrawal from the tie.

In the rail assembly shown in Fig. 4, the rail fastenings are of a somewhat different form in that only a single shank is used in each fastening. The rail fastening 30 on one side of the rail is identical with the fastenings 18 shown in Fig. 1, except only one-half of the fastening is employed. Thus, the flexible part of the fastening is in the form of a spring arm 31 extending over the rail base and contacting the top of the base. With this construction, while the embedded end of the shank is cramped in the tie transversely of the rail by the biasing action of the arm 31, the spike will not be cramped in the tie in a direction parallel to the rail, as in the fastening shown in Fig. 1. The rail fastening 32 on the opposite side of the rail is similar to the fastening 30 except that a greater part of its spring arm 33 extends parallel to the rail.

In the rail assembly shown in Figs. 5 to 7, inclusive, the tie plate 10 is formed at the outer edge of each of the openings 17 with an upwardly extending projection 35 which serves as a backing for the rail fastening. The projections 35 are preferably formed by utilizing a portion of the metal originally contained in the openings 17, which metal, by means of appropriately formed punches and dies, is displaced upwardly and laterally, as shown in Fig. 9. Accordingly, the metal which heretofore has been wasted in forming the tie plate openings is now used to advantage to increase the support or backing afforded to the shank of the tie-penetrating fastening means. On each side of the rail is a rail fastening 36 including a pair of shanks 37 extending through the openings 17 and driven into the tie, each shank being formed on top with a striking head 38. Below their striking heads, the shanks of each fastening are connected together by a flexible part 39 which is generally U-shaped and extends laterally from each shank toward the other shank and then curves inwardly over the top of the rail base. The two arms of the part 39 converge and join at a point inwardly from the edge of the rail base, where the rail fastening may, if desired, be provided with a cushion 40 interposed between the rail base and the juncture of the arms. The cushion may be made of rubber, or the like, and is preferably fitted over the part 29, as shown, and locked on the fastening by a tab 40' fitted tightly in the crevice between the arms near their juncture.

The rail fastenings 36 may be driven in any suitable manner, as by striking the heads 38 of the shanks or the head of a block somewhat similar to the block 26. The spacing between the two shanks of each fastening is preferably different from that between the corresponding tie plate openings 17, so that the shanks are cramped lengthwise of the tie during the driving operation. In the assembly shown in Fig. 5, the spacing between the remote sides of the two shanks, before the shanks are driven, is greater than the spacing between the remote sides of the corresponding openings 17, and accordingly when the shanks are inserted through the plate openings and driven into the tie they are cramped inwardly toward each other. Also, when the cushion 40 engages the rail base, further driving of the shanks causes the flexible part 39 to force the upper ends of the shanks outwardly, as shown in Fig. 5. The outward force thus directed on the shanks, if sufficiently great, may force them toward the projection 35 and tend to fulcrum them about these projections as pivots, the embedded ends of the shanks thus being cramped inwardly toward the rail. In some instances, the shanks may be driven into the tie so that they engage and are flush with the outer walls of the openings 17, in which case the projections 35 serve to extend the area of contact between the outer faces of the shanks and the tie plate, since the shanks are backed not only by the metal extruded incident to forming the projections 35 but also by the side edges 35' which remain at the bottom of the plate in back of the openings 17 on completion of the extrusion. Since the support provided by each projection 35 is considerably nearer the top of the spike than the main body of the tie plate, it is more effective in limiting outward bending of the top of the shank.

In the assembly shown in Fig. 8, the rail fastening 41 is similar to the fastening 18 shown in Fig. 1, except that the shanks are formed on their outer faces with a series of barbs 42. These barbs, while not interfering in any way with the operation of driving the fastening, are effective in increasing the resistance of the shanks to withdrawal from the tie.

It will be apparent that the rail fastening of the invention is of a simple construction which may be manufactured at low cost in a single piece, since the flexible arm overlying the rail base may be integral with the shank or shanks. The arms of the fastenings serve not only to exert a downward force on the rail which holds

the rail yieldingly on its seat, but also to produce a reactive force tending to force the upper ends of the shanks outwardly and thereby place them under a stress which results in cramping the embedded ends of the shanks in the tie. By employing a double-shank fastening, such as the fastening 18 or 36, and forming the tie plate openings with a spacing different from the spacing between the shanks, the latter are cramped toward or away from each other during the driving operation, and this cramping action supplements the cramping action effected by the spring arms to resist forces tending to withdraw the fastening from the tie. The new fastening may be easily installed by the usual spike driving operation, whereby the plate and tie are drawn into proper locked relation with the rail and a definite yielding pressure is transmitted to the rail to restrain longitudinal movement thereof. Thus, the correct contact of the plate with respect to both the tie and the rail is assured and the contiguous parts are held locked together.

In the following claims, the expression "U-shaped" as applied to the part of the fastening adapted to overlie the rail base is intended to designate a form having two arms which may be parallel or non-parallel, as desired. Thus, the arms may be parallel, in which case the part is of a true U-shape, or they may diverge in a V-shape or converge, in which cases the part is generally U-shaped.

We claim:

1. In combination with a tie, a tie plate having a rail seat and a pair of spaced openings on one side of the seat, and a rail mounted on the seat, a member having a pair of spaced, resiliently interconnected prongs extending through the openings and driven into the tie and also having a part extending inwardly over the rail base and engaging the top of the base to urge the rail against its seat, the prongs being connected together with a spacing between them which is different from the spacing between said openings before the prongs are driven, whereby the embedded ends of the prongs are cramped when the prongs are driven into the tie.

2. In combination with a tie, a tie plate having a rail seat and a pair of spaced openings on one side of the seat, and a rail mounted on the seat, a member having a pair of spaced prongs extending through the openings and driven into the tie and also having a flexible, generally U-shaped part extending inwardly over the rail base and connecting the prongs resiliently with a spacing between them which, before the prongs are driven, is different from the spacing between said openings, said part bearing against the top of the base to urge the rail against its seat and bias the prongs outwardly toward the edges of the openings remote from the rail.

3. In combination, a rail, a tie, a tie plate on the tie for supporting the rail, and fastening means including a pair of resiliently interconnected members driven into the tie, and an intermediary rail engaging portion normally urging the rail against the plate, the plate having a wedging portion disposed between said members and of greater length than the spacing between said members before the members are driven into the tie, whereby said wedging portion forces the members apart and a cotter key action transversely of the tie and a cramping action longitudinally thereof is produced in the tie by said members to create a correlated resistive force tending to draw the rail, the tie plate and the tie together.

4. In combination, a rail, a tie, a tie plate on the tie for supporting the rail, and fastening means including a pair of resiliently interconnected members driven into the tie and an intermediary rail engaging portion normally urging the rail against the plate, the plate having portions disposed outwardly of said members and spaced apart a distance substantially less than the spacing between the remote sides of the two members before they are driven, whereby said plate portion forces said members together and cramps them in the tie when the members are driven.

5. In combination with a tie, a tie plate having a rail seat and a pair of spaced openings on one side of the seat, and a rail mounted on the seat, a member having a pair of spaced prongs extending through the openings and driven into the tie and also having a flexible, generally U-shaped part extending inwardly over the rail base and connecting the prongs, the arms of the flexible part converging from the prongs and bearing against the top of the rail base to urge said rail against its seat, and a resilient cushion disposed between the rail base and the ends of the arms and having a tab wedged between the arms to hold the cushion in position.

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