

Dec. 20, 1938.

W. S. BOYCE

2,140,891

RAIL FASTENING

Filed Dec. 21, 1934

2 Sheets-Sheet 1

FIG. 1

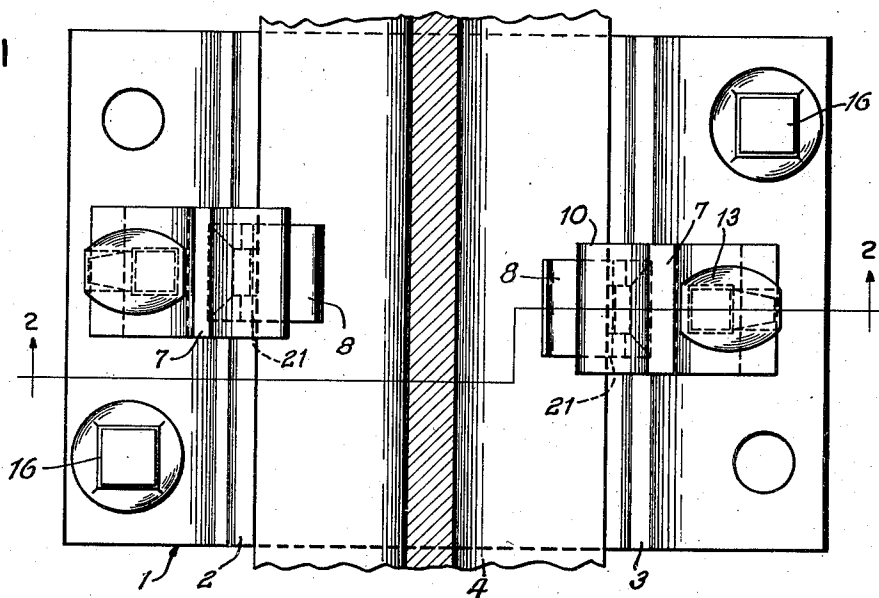


FIG. 2

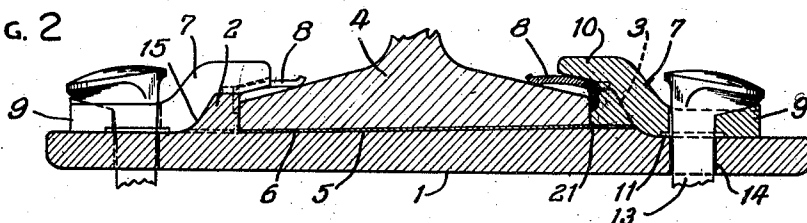


FIG. 6

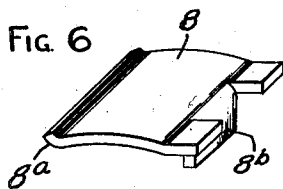


FIG. 3

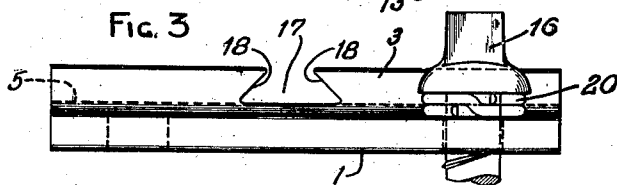


FIG. 4

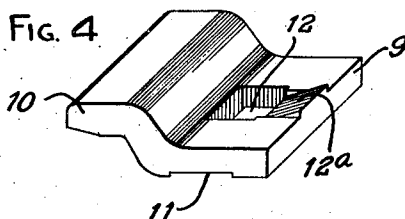
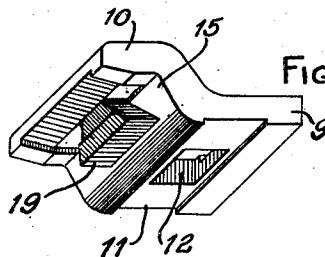


FIG. 5



INVENTOR
WILLIAM S. BOYCE

By *Fraser, Clapp, Evans & Pond*

ATTYS.

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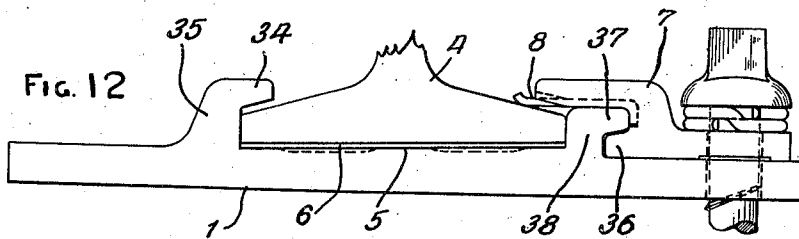
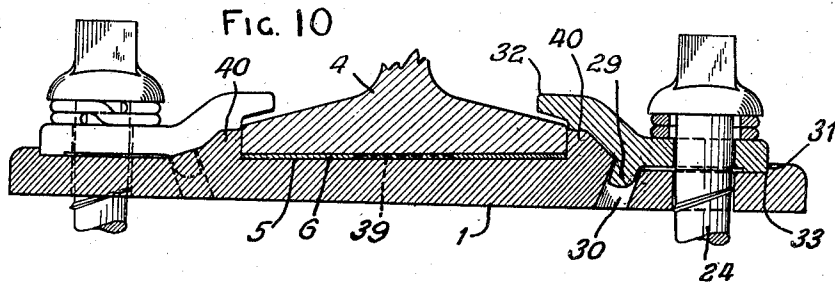
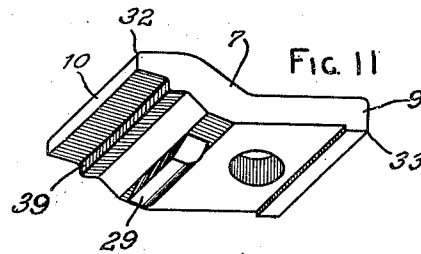
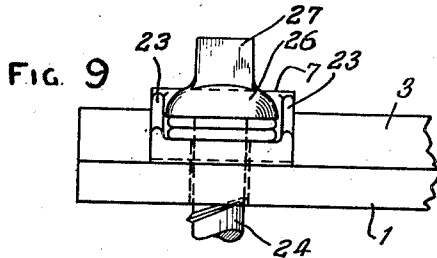
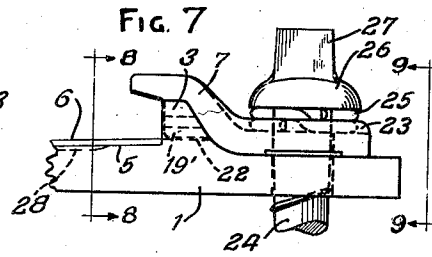
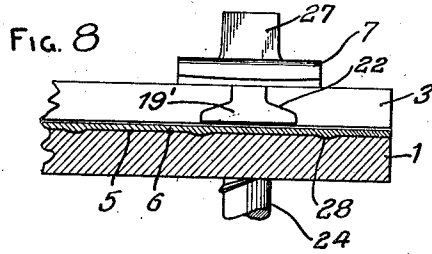
W. S. BOYCE

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2 Sheets-Sheet 2



INVENTOR
WILLIAM S. BOYCE

By *Fisher, Clapp, Soane & Bond*

ATTYS.

UNITED STATES PATENT OFFICE

2,140,891

RAIL FASTENING

William S. Boyce, Chicago, Ill.

Application December 21, 1934, Serial No. 758,569

18 Claims. (Cl. 238—351)

This invention has particular reference to an improved means for holding railroad rails in proper place.

The main objects of the invention are to provide a simplified, yet effective rail fastening which may be manufactured and applied at low cost; to provide a rail fastening of such a design that it will, in a large measure, be free from breakage or impairment as an incident to broken down or dragging parts of railroad rolling stock; to provide a rail fastening which will permit the normal wave motion of the rails incident to the passage of a train thereover; to provide a fastening means which will effectively retard and minimize abrasive action on the tie; to provide an arrangement wherein excessive upward movement of the rails will be transferred to the rail fastening structure over a wide area so that a plurality of materially spaced anchoring devices may be employed for resisting such excessive upward movement; to provide such means which contemplate in all of the fastenings for any given length of track, a definite, permanently uniform, and distributed, movement-retarding pressure on rail but insufficient to impair its normal wave motion; to provide a practical arrangement which may be easily and expeditiously assembled and applied in rail laying operations carried on in accordance with the prevailing method; to provide such a rail fastening means which may be easily disassembled or removed when occasion requires; and in general, it is the object of the invention to provide an improved rail fastening of the type referred to.

Other objects and advantages of the invention will be understood by reference to the following specification and accompanying drawings wherein there are illustrated several embodiments of rail fastenings employing the present invention.

In the drawings (2 sheets):

Fig. 1 is a plan.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is an end elevation of the tie plate element of the rail fastener.

Figs. 4 and 5 are perspectives of the clip element.

Fig. 6 is a perspective of a spring element.

Fig. 7 is a fragmentary side elevation of another form of the improved rail fastening.

Fig. 8 is a section on the line 8—8 of Fig. 7.

Fig. 9 is an end elevation of the structure shown in Fig. 7, as indicated by the line 9—9 of Fig. 7.

Fig. 10 is a section similar to Fig. 2 but showing still another form of the rail fastening.

Fig. 11 is a perspective of a clip element em-

ployed in the form of fastening illustrated in Fig. 10; and

Fig. 12 is a side elevation of still another form of rail fastening embodying the invention.

Referring now to the drawings, the form of rail fastening illustrated in Figs. 1 to 5 inclusive includes a tie plate 1 which, in this embodiment, includes a pair of transversely extending shoulders 2 and 3 which are spaced longitudinally of the plate for engaging the side edges of the base flange of a rail 4 which is seated on the rail seat portion 5 of the plate. Such shoulders are conventional in the practical art. For the purpose of this invention in certain of its forms, the shoulders may be made slightly higher than is ordinary, while for certain other forms the shoulders may be made of ordinary height.

As indicated in Fig. 2, the rail seat 5 is canted, and it is preferably cambered or crowned in accordance with the conventional practice or specifications of the railroad purchasing the plates. For the purpose of obtaining full seating of the rail on the plate, and as a medium for automatically adjusting or compensating for surface irregularities between the rail seat area of the plate and the corresponding bottom surface of the rail base, a wood shim 6 may be interposed between the rail base and rail seat of the tie plate. The wood shim is preferably of highly compressed wood such as is well known in the art and the shim brings about the desired result by reason of its compressibility or yieldability under the rail when subjected to the imposed loads. Such shims also tend to eliminate objectionable noises incident to the normal movement of the rail relative to the tie plate.

For effectively retaining the rail in the proper position on the tie plate but without preventing the normal wave motion of the rail, clip fasteners such as indicated at 7—7, and in this instance embodying springs 8, are employed. The clips 7 on opposite sides of the rail are substantially identical in formation, the only difference being a slight change in shape to conform the clips respectively to the contours of the end portions of the plate on which they are respectively seated. In material respects, the oppositely disposed clips and springs are of like construction and hence detailed explanation of one clip will be sufficient for the purposes of this specification.

The clip 7 includes a body portion 9 and a lip portion 10. The body portion 9 has its bottom surface provided with a transversely extending recess or channel 11 and an opening 12 extending vertically through the body portion for re-

ceiving a spike, as clearly shown in Fig. 2. In this instance, a cut spike 13 is employed and hence the spike hole 12 in the clip and a corresponding spike hole 14 in the tie plate, are of square form. It will of course be apparent that a screw spike or any other suitable form of fastening may be substituted to coact with the clip. When spikes such as 13 are employed, they are of course driven through the openings in the clip and tie plate into the usual tie, which is not shown. The recess or channel 11 in the bottom of the clip body facilitates seating of the clip on the tie plate end portion, in that it serves to receive any fin or similar protrusion formed around the periphery of the tie plate opening 14 incident to the punching of such opening.

The forward end portion 15 of the clip body is preferably shaped to snugly fit the outer and top surface of the rail abutting shoulder 2 or 3. The lip 10 extends inwardly into overlying relation to the adjacent portion of the base flange of the rail 4 and as shown in Fig. 2, is preferably spaced upwardly from the top surface of the rail base flange so as to permit limited vertical movement of the rail incident, for example, to the normal wave motion of the rail. The upward spacing of the lip 10 thus serves to permit limited vertical movement of the rail without exerting a corresponding lifting force on the clip and tie plate. This is advantageous in that it avoids an excessive amount of spike pulling action and permits a normal movement of the rail, which has never been successfully prevented in any practicable manner. Attempts to limit this action by rigid or semi-rigid rail engaging means result in the plate and tie participating with the rail in its vertical motion, developing thereby what is referred to in track parlance as "Pumping Track", an objectionable road-bed disturbing action which materially affects maintenance cost and riding quality of track structure.

However, for those who prefer to prevent relative movement between the rail and the tie plate, the clip may obviously be modified by lowering the lip to cause it to bear on the base flange of the rail.

The tie plate shoulders are each provided with an opening or notch 17 which has its sides 18, 18 undercut, as clearly shown in Fig. 3. The clip 7 is provided with a lug portion 19 formed integral therewith and shaped, within practicable limits, to snugly fit the undercut opening 17. It will be seen that the clip may be assembled with the tie plate by moving the clip endwise toward the rail so that the lug 19 of the clip enters and substantially fills the undercut opening 17. Thereupon, the spike 13 or other fastening is applied.

Excessive upward movement of the rail will of course cause the rail base flange to engage the lip portion 10 of the clip and the excessive upward movement will be transmitted from the clip to the plate through the interlocked connection formed by the undercut opening 17 and the lug 19. When lifting force is applied to the lip 10 of the clip, it will be apparent that there will be a tendency for the clip to fulcrum around its interlocked connection with the plate, so that the outer end of the clip body will be pressed into engagement with the tie plate. This upward movement of the rail will tend to cause lifting of the plate uniformly over its entire area.

If desired, the spike 13, which locks the clip against endwise displacement from its inter-

locked relation with the plate, may be relied upon to also hold the tie plate to the tie, and in that event, it would be preferable to use a screw spike (as illustrated in Figs. 7, 8, and 9) in the place of the cut spike 13. This follows, of course, from the fact that a screw spike will resist pulling with greater effectiveness than a cut spike.

The tie plate may advantageously be lagged to the tie (not shown) independently of the clip locking spike, by the application of "hold down" cut spikes or, as shown, screw spikes 16—16 adjacent diagonally opposed corners or other desired portions of the plate. In the structure shown in Fig. 1, the tie plate is provided with holes adjacent each corner and any selected holes, or all of them, may of course be employed for the indicated purpose.

By reason of the aforesaid tendency of the plate to be lifted uniformly over its entire area, no one fastening means is subjected to the entire lifting force and the combined anchoring power of all of the spikes is the better able to withstand such lifting force.

Excessive upward movement of rail may be resisted or retarded and the normal wave motion of the rail may be more or less controlled by means of the springs 8 inserted between the clip and rail flange. The springs 8 herein shown each embody an upturned free end portion 8a adapted to bear on the rail flange, and an intermediate downturned rear end portion 8b, and the under surface of the clip and forward portion of lug 19 thereof are recessed to receive the rear end portion of the clip as clearly illustrated. The clip, tie plate shoulder and rail flange cooperate, as best shown in Fig. 2, to house the rear end portion of the spring to thereby lock the latter in operative position.

The flattened spring is assembled with the clip and moved into engagement with the rail coincidentally with the positioning of the clip. It will be noted that while the spring is functioning against the rail base, the spaced relation between the clip and rail base still permits the normal vertical rail motion to take place.

The spring serves the further purpose of preventing the effect of shock on the clip by impact; insures constant firm engagement between the lug 19 and undercut sides 18—18 of the notch 17, thereby minimizing wearing action between the engaging surfaces. The spring also tends automatically to adjust or control the play or vibration of the rail between its seat and the clip.

It should be observed that the load application from rail affecting the tie plate is not when it is immediately over the plate but when it is approaching and receding from it. This causes a rolling shear action of the plate on the tie which develops the abrasive or mechanical wear on tie fibre affecting tie life. Therefore it is desirable to employ appropriate springs 20 with the "hold down" spikes 16 to absorb and reduce this rolling shear movement of plate. Such springs also tend to prevent plate lifting after the plate is embedded in the tie and hence clattering and other objectionable noise is avoided.

Thus the combination of clip-spring arrangement, and "hold down" spike with springs will counteract the forces tending to gradually pull or lift spikes out of tie.

Obviously the number of clips, "hold down" spikes and springs, as well as their positioning may be varied from the arrangements shown, to meet specified requirements.

An important advantage of the described construction is found in the fact that there is no likelihood of any objectionable binding action between the tie plate and rail or other undesirable relationship therebetween such as commonly occurs in the use of rail fastenings which require the exercise of human judgment in the required frequent or periodic manual adjustment for their proper maintenance. Also, a material advantage is gained by the use of fixed springs such as 8—i. e., springs not subject to individual adjustment of their bearing pressures on the rail base flange, since improper adjustment and impairment by tampering or attempted adjustment cannot readily occur.

Another important feature of the described construction is found in the fact that the clip fastening arrangement embodies no parts which project upwardly to any great extent. This is important for the reason that it is a very common occurrence on railroads that brake beams, brakes, axles, wheels and other parts, drop down from their normal positions and drag along and cause derailments or sometimes seriously damage various less sturdy forms of rail fastening devices which project upwardly materially beyond the base flange of the rail. In the arrangement shown in Figs. 1 to 6 inclusive, the heads of the clip locking spikes are in fact below the level of the top surfaces of the lip portion of the clips and the latter surfaces are not materially elevated above the base flange of the rail. Hence, any dragging part will readily pass over the rail fastening without damaging the same. Again, even though some part should strike the rail fastening, it is capable, due to its effective interlocked relation with the plate shoulder, of resisting very great forces, since there is no long lever arm through which such dragging part can operate to bend or break the rail fastening. It should also be observed that even though the head of the spike be sheared off, the rail fastening will remain effective so long as any part of the spike shank projects upwardly into the opening 12 of the clip to prevent its lateral movement which is necessary to disengage the interlocking portions of the clip and tie plate.

To facilitate the low seating of the spike head, the clip is provided with a seat portion 12^a for the outwardly extending head of the spike, an inner portion of said seat being countersunk below the top surface of the clip body and an outer portion being raised to afford full head support for the spike as clearly shown in Fig. 4. This arrangement avoids objectionable weakening of the clip body, provides maximum spike penetration in the tie, while also maintaining the spike head in such relation to the top surface of the clip that the usual claw bar may be applied for removing the spike when required.

Still another advantage results from the housed or, in effect, enclosed interlocked connection between the clip and tie plate, whereby the entrance between the parts, of abrasive and corrosive elements is largely prevented.

The shim 6 between the rail base and the tie plate seat may conveniently be anchored against lateral shifting transversely of the plate by means of edgewise projecting lug-like or lip portions such as indicated at 21, 21 which project into the openings 17 in the respective tie plate shoulders 2 and 3.

In the rail fastening arrangement shown in Figs. 7, 8, and 9, the clip 7 is interlocked with the

tie plate by means of an undercut opening 22 of inverted T-shape in the tie plate shoulder 3 and a correspondingly shaped boss or lug 19' on the clip. The clip is also modified in that it is provided with upwardly extending reinforcing ribs 23, 23 at its opposite sides. In this instance, the clip and tie plate are shown as being secured to the tie by means of a screw spike 24, and it will of course be understood that the spike receiving openings in the clip and tie are accordingly made round instead of square.

A suitable spring such as a coil spring 25 may also be used with the combined "hold down" and clip locking spikes as contemplated in Figs. 7, 8, and 9. This arrangement, while perhaps less secure than the independently lagged arrangement, is similarly effective while being less costly. If desired, a flat spring may be employed in this form also, between the lip of the clip and the base flange of the rail. Obviously since the holding power of the screw spike is manifestly greater than of the cut spike, this further spring action combined with that of the "hold down" spikes will tend to insure constant full seating of the plate on the tie in addition to materially contributing toward the elimination of plate movement above described as well as that incident to the tie plate becoming partially embedded in the tie.

In the last described form of construction, the square head 27 of the screw spike projects upwardly slightly beyond the top of the lip portion of the clip, but this is not seriously objectionable, since the ribs 23, 23 of the clip protect the spring and spike head and since the head of the screw spike and the sides of the square head portion 27 thereof are arranged at an angle to the vertical whereby there is a tendency for any striking object to be diverted without great danger of impairment of the fastening.

In the arrangement shown in Figs. 7 and 8, the compressed wood shim 6 is anchored against shifting over the surface of the tie plate by means of slight, transversely extending indentations or recesses indicated at 28 formed in the tie plate surface and into which portions of the shim are pressed when the shim is subjected to the compressive force of applied loads incident to trains passing over the supported rail.

In the form of construction illustrated in Figs. 1 to 9 inclusive, the tie plate may be rolled in the conventional manner, which is most desirable because of its economy, but the fastening clips probably cannot be completed by rolling operations because of the required lug and spike head formations. Such clips will probably require additional machining or punching, or they may be made by casting or forging operations.

In Figs. 10 and 11, there is illustrated an arrangement in which both the tie plate and clip may be formed in conventional rolling operations and in which the clips are anchored to the tie plate by means of undercut openings and tongues, in a manner differing slightly from that shown in Figs. 1 to 9 inclusive.

In the form of construction shown in Figs. 10 and 11, the clip 7 is provided with a downwardly and forwardly or inwardly projecting lug 29 and the tie plate is provided with an opening 30 which is disposed at a downward and inward inclination to the vertical. It will be seen that the clip may be assembled with the tie plate by inserting the lug 29 in the inclined, in effect undercut, opening 30 and such assembly will require a lateral, inward movement of the clip. Hence

the clip cannot be separated from the plate by vertical movement.

For locking the clip against displacement, the clip is provided with a spike-receiving aperture 5 which registers with a corresponding opening in the plate, and a cut or screw spike such as shown at 24 may be driven into the tie through such registering openings.

It should be observed that the lug 29 of the 10 clip and the spike 24 are in diverging relationship, forming a wedging lock or cotter-key anchorage for preventing displacement of the clip. The spacing and positioning of both the lug and spike may of course be varied and in fact, the 15 spike may be caused to extend through a portion of the lug so that there is no space between said parts, while still retaining the cotter-key or expanded bolt locking action just explained. The lug may be of any desired depth and thickness 20 so as to either partially or wholly fill the plate opening which receives the lug, and it may be observed that some strength advantage is gained by replacing as much as practicably possible of the punched out metal of the plate with the metal 25 of the lug.

To assist the spike 24 in holding the clip against outward lateral movement, the end portion of the plate may be provided with an upwardly extending shoulder 31 which engages 30 the rear edge of the clip body. Such a shoulder for preventing outward lateral movement of the clip may, of course, be employed with the forms of structure shown in Figs. 1 to 9 inclusive.

It will be observed that the shoulder or boss 35 31 serves to cooperate with the spike to resist lateral movement of the clip and thereby protects the spike against shearing action by the clip and tie plate as an incident to the sources which tend to effect lateral movement of the clip relative to the tie plate. Such lateral clip 40 movement is of course also resisted by engagement of the outer face of the lug 29 with the outer wall of the opening 30. Hence, the spike or like fastening is subjected to a minimum of 45 shearing action.

To avoid possible excessive weakening of the plate, the lug 29 may be made somewhat shorter than the full width of the clip and the opening 30 in the plate is of corresponding limited length. 50 The same consideration suggests the use of relatively short interlocking shoulders and openings in the structure illustrated in Figs. 1 to 9 inclusive, but it will be apparent that if desired, the side to side length of the lug may be made 55 the same as the side to side dimension of the clip body.

The clip structure shown in Figs. 10 and 11 is provided with a shoulder portion 39 which constitutes, in effect, a continuation or extension 60 of the rail engaging shoulder 40 of the tie plate. This arrangement facilitates the use of a lower tie plate shoulder with consequent metal saving, while still providing for freedom of wave motion of the rail or anchorage thereagainst. This 65 clip shoulder arrangement for permitting normal wave motion of the rail, while employing a tie plate shoulder of only normal height, is more fully disclosed in my Patent No. 1,902,615, and it may of course be embodied in the other clip 70 forms herein described.

In the form of construction shown in Figs. 10 and 11, the clip is securely locked to the plate against lifting forces which would tend to lift the plate bodily in a vertical direction.

75 However, as a practical matter, normal lifting

forces are applied against the underside of the lip 32 while the outer or body portion of the clip is held down by the spike 24 or other fastening means. Hence in actual operation, the lip end of the clip is urged to rock upwardly about an axis disposed adjacent the outer end portion of the clip.

The said upward rocking movement of the lip end of the clip causes the lip-end side of the lug to move upwardly in a more or less arcuate 1 path of movement and into engagement with the corresponding side of the lug receiving opening in the plate, thereby to resist such upward rocking movement and displacement of the clip.

The illustrated angular disposition of said side 1 of the lug and corresponding wall of the opening enhances the positiveness of said engagement but a lesser angle of inclination or any angular disposition of the lug to the clip body, and complementary disposition of the hole in the tie plate, 2 may be employed, it being important only that said sides of the lug and opening be so arranged as to engage one another as an incident to said upward rocking tendency.

The clip structure just described and shown in 2 Figs. 10 and 11, avoids any punching or cutting of the rail thrust resisting shoulder and hence permits retention in the plate, of the full normal strengthening effect of the said shoulder. The clip structure itself may be conveniently rolled 3 in long strips which are subsequently punched for spikes and sheared to form separate clips of the desired width. In cases where the lugs 29 are to be of less width than the clip body, suitable punching or other cutting operations may be employed 35 for removing end portions of the lug to leave a centered lug of the desired width and substantially as shown in Fig. 11. However, it may also be possible to roll the strip with centered lugs, certain practical considerations such as cutting of 40 the strip into separate lugs having a material bearing on the advisability and practicability of rolling such centered lugs. In other, probably most, instances, the lug may be of the same width as the clip body so that the only necessary operations in addition to the rolling of the strips, are 45 the common ones of spike hole punching and shearing the strips into appropriate lengths or clip widths.

In the arrangement shown in Fig. 12, one side 50 of the rail base flange is disposed under a bent over portion 34 of a shoulder 35 which is formed integral with the tie plate 1 and a clip 7 is interlocked with the tie plate through the agency of a lug or shoulder portion 36 which underlies an outwardly bent portion 37 of a shoulder 38 which is also formed integrally with the tie plate. This construction involves more difficult tie plate forming operations, especially in respect of the bending or rolling over of the shoulders 35 and 38, 60 but in other respects, it embodies some of the advantages above pointed out, especially in connection with Figs. 1 to 9 inclusive.

It will be apparent that any of the described clip constructions may be used on both sides of 65 the rail or on either side thereof in combination with a turned over, integral shoulder such as 35 on the other side.

In Fig. 10, the shim 6 is shown as being anchored to the tie plate against lateral shifting 70 movement by means of minor rib formations 39 projecting upwardly and formed integral with the tie plate. Such minor rib formations may be spaced transversely of the plate at any suitable distances and they will of course penetrate the 75

shim incident to the pressing down of the shim on the tie plate under passing trains. In Fig. 12, the shim 6 is shown as being anchored to the tie plate by means of transversely extending rows of minor recesses such as shown in Figs. 7 and 8. The recesses may be arranged either in transverse or staggered relationship, preferably the latter.

Other changes and modifications of the structure may be made without departing from the spirit of the invention, the scope of which should be determined by reference to the following claims, the same being construed as broadly as possible consistent with the state of the art.

15 I claim:

1. In a rail fastening, the combination of a tie plate having a rail abutting shoulder intermediate its opposite ends and provided with an undercut opening, a clip having a body portion seated on a portion of the tie plate outwardly of said shoulder and a lip portion projecting inwardly beyond said shoulder for overlying the base flange of a rail when seated on the tie plate, said clip having a shoulder portion constituting, in effect, a vertical extension of said tie plate shoulder and said lip extending into said overlying relation in upwardly spaced relation to such base flange, said clip having means integral therewith for entering said undercut opening to lock the clip to the tie plate against vertical displacement, the plate and clip when assembled having registering openings for receiving a spike or the like for locking the clip to the tie plate against lateral displacement to thereby prevent disengagement of said vertical locking means.

2. In a rail fastening, the combination of a tie plate having a rail abutting shoulder provided with an undercut opening, and a clip having on its under side a tie plate shoulder engaging portion and a lug formed integrally with the clip for entering said undercut opening to form an interlocked connection with the tie plate to prevent vertical displacement of the clip relative to the tie plate, said clip also having a portion projecting beyond said shoulder and adapted to overlie a base flange portion of a rail seated on the tie plate to hold the rail in operative relation to the plate, said interlocked connection being in effect housed under the clip whereby the entrance of abrasive and corrosive elements to said interlocked connection is retarded.

3. In a rail fastening, the combination of a tie plate having a rail abutting shoulder intermediate its opposite ends, said shoulder being provided with an undercut opening extending transversely therethrough, a clip having a body portion seated on said shoulder and on a portion of the tie plate outwardly of said shoulder and a lip portion projecting inwardly beyond said shoulder for overlying the base flange of a rail seated on the tie plate, said clip having means integral therewith for entering said undercut opening to lock the clip to the tie plate against vertical displacement, said means constituting, in effect, replacement of a major portion of the shoulder portion removed in the formation of said undercut opening, and means for holding the clip against lateral displacement to thereby prevent disengagement of said vertical locking means.

4. In a rail fastening, the combination of a tie plate provided with an undercut opening, a clip having a body portion seated on the top surface of an end portion of the tie plate and engaging said top surface adjacent said opening so as to obstruct access to said opening, said clip

having a lip portion projecting inwardly for overlying the base flange of a rail seated on the tie plate and having underlying means integral therewith and disposed inwardly from all sides of the clip for entering said undercut opening to lock the clip to the tie plate against vertical displacement, the clip body serving, when the clip is locked to the plate, to substantially cover said lug and opening to thereby further obstruct access to said opening, thereby to resist the entrance of abrasive and corrosive agents into said opening, and relatively independent means for locking the clip to the tie plate against lateral displacement.

5. In a rail fastening, the combination of a tie plate provided with a conventional rail thrust resisting shoulder and having an undercut opening, and a clip having a body portion shaped to substantially conform to the contour of said shoulder and the top of the adjacent end portion of the tie plate and having a lip portion projecting inwardly for overlying the base flange of a rail seated on the tie plate, said clip being seated on and supported by said shoulder and tie plate end portion, and having underlying means integral therewith for entering said undercut opening to provide an interlocked connection between the clip and plate to prevent vertical displacement of the clip from the plate, said plate and clip having registering openings for receiving a spike or the like for locking the clip to the plate against lateral displacement to thereby prevent disengagement of said vertical locking means.

6. In a rail fastening, the combination of a tie plate provided with a conventional shoulder and having an undercut opening, and a clip having a body portion shaped to substantially conform to the contour of said shoulder and the top of the adjacent end portion of the tie plate and having a lip portion projecting inwardly for overlying the base flange of a rail seated on the tie plate, said clip being seated on and supported by said shoulder and tie plate end portion, and having underlying means integral therewith for entering said undercut opening to lock the clip to the tie plate against vertical displacement, said underlying means constituting a replacement in the plate of a major portion of the metal removed therefrom to form said opening, the plate and clip having registering openings for receiving a spike or the like for locking the clip to the plate against lateral displacement to thereby prevent disengagement of said vertical locking means.

7. In a rail fastening, the combination of a tie plate having a rail abutting shoulder intermediate its opposite ends, a clip having a body portion seated on an end portion of the plate outwardly of said shoulder and a lip portion projecting inwardly beyond said shoulder for overlying the base flange of a rail seated on the plate, said plate having an inclined opening in said end portion, extending angularly downwardly and towards said shoulder, said clip having depending means integral therewith for entering said inclined opening and having an inclined portion for cooperating with a wall portion of said inclined opening, said plate end portion and said clip also having registering openings aligned at an angle to the inclination of said opening, and relatively independent locking means extending through said registering openings and cooperating with said depending means to form a cotter-key or expanded bolt lock for preventing vertical displacement of the clip.

8. In a rail fastening, the combination of a tie

plate having a rail abutting shoulder intermediate its opposite ends, a clip having a body portion seated on an end portion of the plate outwardly of said shoulder and a lip portion projecting inwardly beyond said shoulder for overlying the base flange of a rail seated on the plate, said plate having an inclined opening in said end portion, extending angularly downwardly and towards said shoulder, and said clip having depending means integral therewith for entering said inclined opening and having an inclined portion for cooperating with a wall portion of said inclined opening, said plate end portion and said clip also having registering openings aligned at an angle to the inclination of said opening, relatively independent locking means extending through said registering openings and cooperating with said depending means to form a cotter-key or expanded bolt lock for preventing vertical displacement of the clip, and means on the plate for engaging a portion of the clip to cooperate with said independent locking means to prevent displacement of the clip and serving to protect said independent locking means against shearing tendency incident to forces tending to effect lateral movement of the clip relative to the plate.

9. In a rail fastening, the combination of a tie plate having a rail abutting shoulder of substantially conventional proportions provided with an undercut opening, and a clip having on its under side a tie plate shoulder engaging portion and a lug formed integral with the clip for entering said undercut opening to form an interlocked connection with the tie plate to prevent vertical displacement of the clip relative to the tie plate, said lug and opening being interengageable by substantially horizontal movement of the clip towards said shoulder, said clip also having a portion projecting beyond said shoulder and adapted to overlie a base flange portion of a rail seated on the tie plate to retain the rail in operative relation to the plate, said lug and undercut opening being of less width than the width of the clip so that said interlocked connection is, in effect, housed under the clip to thereby resist entrance of abrasive and corrosive agents into said undercut opening.

10. In a rail fastening, a tie plate having a rail thrust resisting shoulder, a clip secured to an end portion of said plate and having a lip projecting beyond said shoulder to overlie the base flange of a rail seated on the plate, and a leaf spring having an end portion housed between said clip and tie plate for positioning the spring, and another portion interposed between said lip and flange and yieldingly urging the latter to its seat on the plate.

11. In a rail fastening, the combination of a tie plate having a rail seat intermediate its opposite ends, a clip having a body portion seated on an end portion of the plate outwardly of said seat and a lip portion projecting inwardly for overlying the base flange of a rail on said seat, said end portion of the plate having an inclined opening extending angularly downwardly and toward said seat, the clip having depending means entering said inclined opening and having an inclined portion cooperating with a wall of the inclined opening, said plate end portion and clip also having registering openings aligned at an angle to the inclination of said first opening and separate therefrom, and relatively independent locking means extending through said registering openings and cooperating with said depending means to form a cotter-key or expanded bolt

lock for preventing vertical displacement of the clip.

12. In a rail fastening, the combination of a tie plate having a rail seat intermediate its opposite ends, a clip having a body portion seated on an end portion of the plate outwardly of said seat and a lip portion projecting inwardly for overlying the base flange of a rail on said seat, said end portion of the plate having an inclined opening extending angularly downwardly and toward said seat, the clip having depending means entering said inclined opening and having an inclined portion cooperating with a wall of the inclined opening, said plate end portion and clip also having registering openings aligned at an angle to the inclination of said first opening and separate therefrom, relatively independent locking means extending through said registering openings and cooperating with said depending means to form an expanded bolt lock for preventing vertical displacement of the clip, and a shoulder on the plate for resisting side thrusts of said rail and engaging a portion of the clip to cooperate with said independent locking means to prevent displacement of the clip the shoulder serving to protect said locking means against the shearing action incident to forces tending to effect lateral movement of the clip relative to the plate.

13. In a rail fastening, a tie plate, a clip secured to an end portion of said plate and having a lip projecting toward the intermediate portion of the plate and adapted to overlie the base flange of a rail seated on the plate, and a leaf spring having an end portion clamped between the clip and tie plate for positioning the clip, and another portion extending under the lip for yieldingly urging said base flange against its seat on the plate.

14. In combination, a tie plate having a rail thrust-resisting shoulder, a rail seated on the plate and having a base flange, a clip secured to an end portion of the plate and having a lip projecting beyond said shoulder to overlie the base flange of the rail, and a leaf spring having an end portion clamped between said shoulder and the base flange of the rail for positioning the spring, and another portion extending under the lip and yieldingly urging said base flange against its seat on the plate.

15. In combination, a tie plate having a rail thrust-resisting shoulder, a rail seated on the plate and having a base flange, a clip secured to an end portion of the plate and having a lip projecting beyond said shoulder to overlie the base flange of the rail, and a leaf spring having a portion clamped between said clip and shoulder and another portion clamped between said shoulder and base flange of the rail, the leaf spring extending inwardly over the base flange and yieldingly urging the same against its seat on the plate.

16. A tie plate having a seat for a rail and a recess adapted to receive a portion of a leaf spring for yieldingly urging the base flange of the rail against its seat, the recess being so located that said portion of the spring is positioned therein by the side of the rail base flange when the rail is seated.

17. In combination, a tie plate having a rail seat and a rail thrust resisting shoulder, a rail clip seated on the shoulder and adapted to overhang the base flange of a rail on the seat, said shoulder and clip being formed to provide a recess therebetween, and a leaf spring having one end

clamped in said recess, the other end of the spring being adapted to yieldingly urge the base flange of said rail against its seat.

18. In a rail fastening, a tie plate having a rail seat and a rail abutting shoulder provided with an undercut opening in the side of the shoulder opposite said seat, and a clip seated on the tie plate and having a lug entering said undercut opening to form an interlocked connection with the tie plate to prevent vertical displacement of

the clip relative to the tie plate, said clip also having a portion projecting beyond said shoulder and adapted to overlie the base flange of a rail seated on the tie plate to hold the rail in operative relation to the plate, said interlocked connection being in effect housed under the clip whereby the entrance of abrasive and corrosive elements to said connection is retarded.

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