Dec. 15, 1931. W. S. BOYCE 1,837,183

TIE PLATE

Filed March 5, 1930 3 Sheets-Sheet 1

Fig. 1

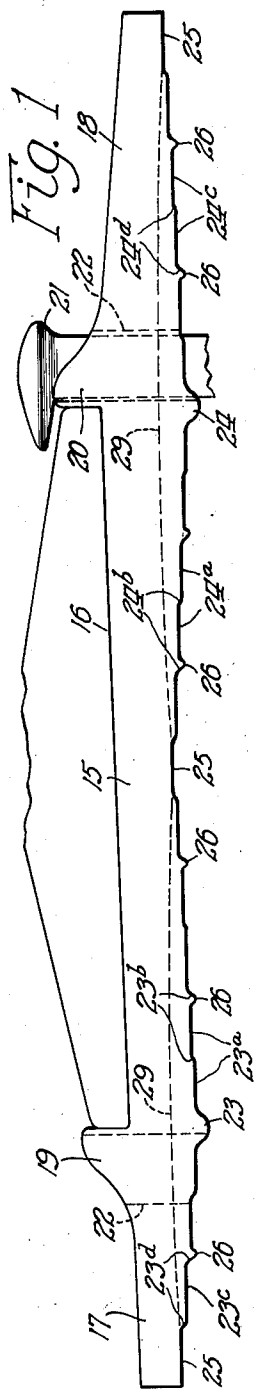


Fig. 3

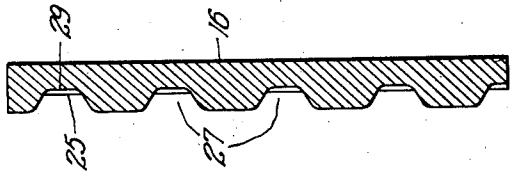
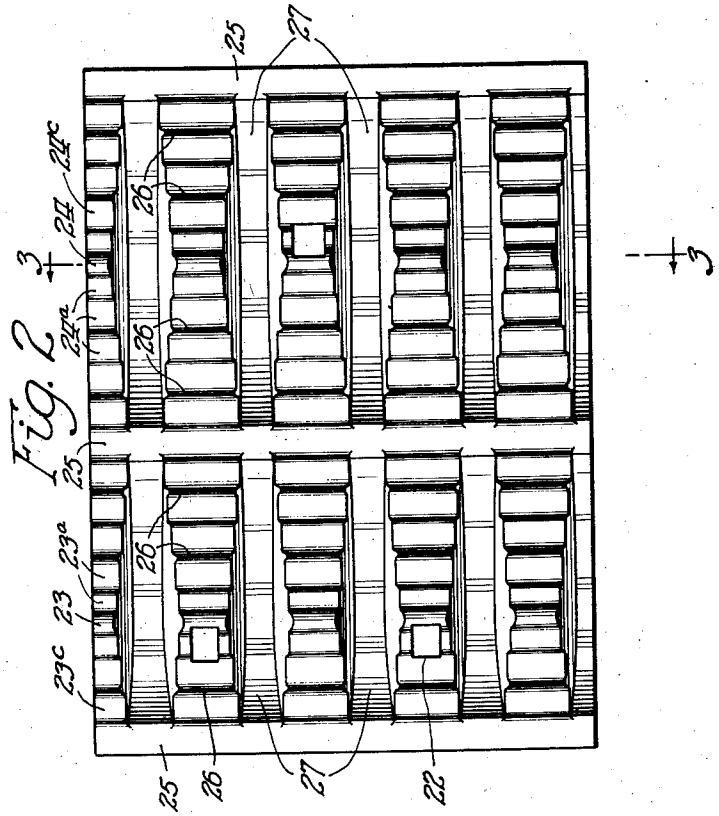


Fig. 2



Inventor
William S. Boyce
By Fisher, Cluett, Lovell & Ott Attys.

Dec. 15, 1931. W. S. BOYCE 1,837,183

TIE PLATE

Filed March 5, 1930 3 Sheets-Sheet 2

Fig. 5

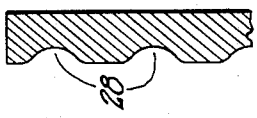


Fig. 6

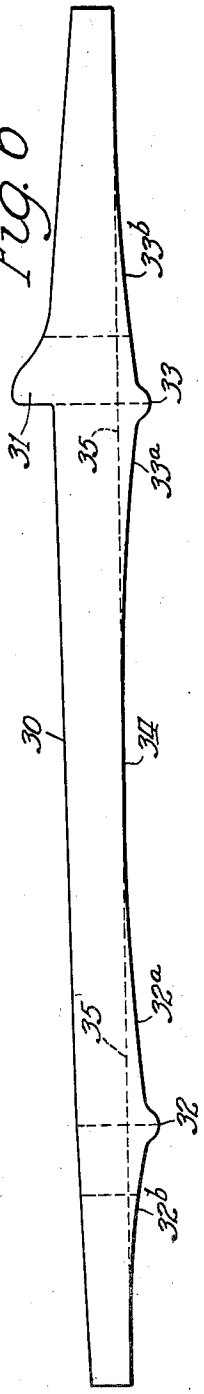


Fig. 7

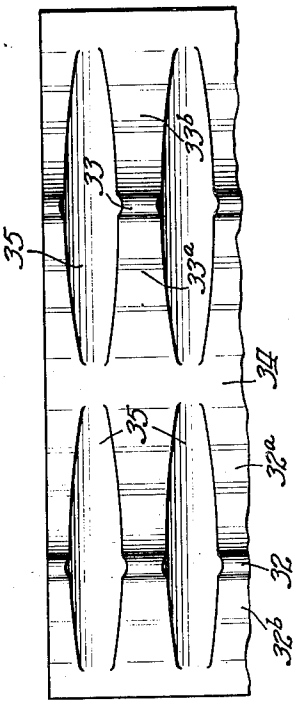
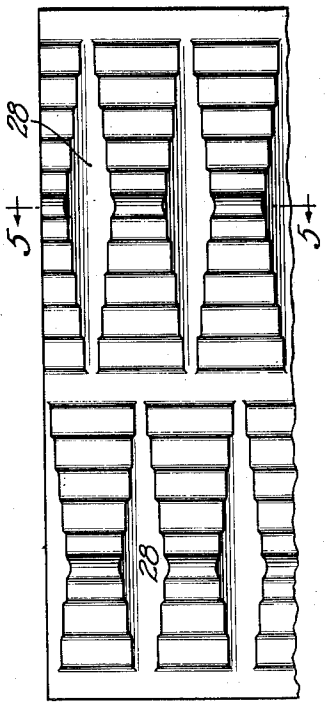


Fig. 4



Inventor
William S. Boyce
By Fisher, Cluff, Lewis & Pond. Attys.

Dec. 15, 1931. W. S. BOYCE 1,837,183

TIE PLATE

Filed March 5, 1930 3 Sheets-Sheet 3

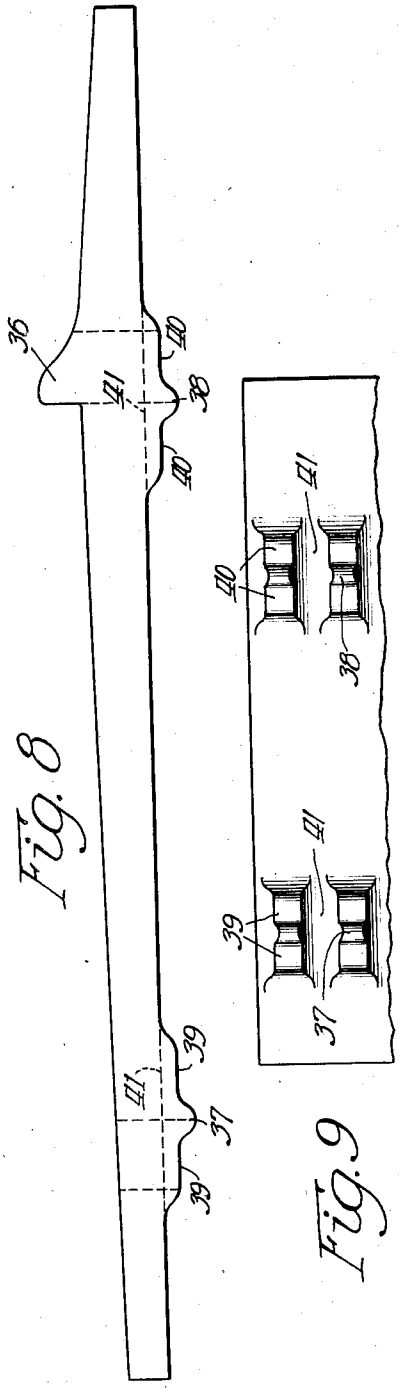


Fig. 8

Fig. 9

Inventor
William S. Boyce
By Fisher, Cluff, Soans & Pond Attys.

Patented Dec. 15, 1931

1,837,183

UNITED STATES PATENT OFFICE

WILLIAM S. BOYCE, OF CHICAGO, ILLINOIS

TIE PLATE

Application filed March 5, 1930. Serial No. 433,468.

My invention relates to tie plates and has for its principal object to provide a tie plate structure combining maximum strength with minimum weight. Another object is to provide a tie plate having means adapted to interlock with a tie without cutting the fibres thereof, so as to prevent shifting of the tie plate longitudinally of the tie.

Another object of my invention is to provide an arrangement whereby embedment or interlocking of the tie plate with the tie is accelerated so that complete embedment is effected after comparatively few trains or train-loads have passed over the tie plate.

Other objects and advantages of my invention will be understood by reference to the following specification and accompanying drawings (3 sheets) in which I have illustrated a tie plate embodying a selected form of my invention and also several modified forms.

In the drawings:

Fig. 1 is a side elevation.

Fig. 2 is a bottom plan of the structure shown in Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary bottom plan showing a modified arrangement of the structure shown in Figs. 1, 2 and 3.

Fig. 5 is a section on the line 5—5 of Fig. 4.

Fig. 6 is a side elevation of a simplified form of tie plate structure.

Fig. 7 is a bottom plan of the structure shown in Fig. 6 but on a reduced scale.

Fig. 8 is a side elevation of still another form of tie plate structure embodying my invention, and

Fig. 9 is a fragmentary bottom plan of the structure shown in Fig. 8 but on a reduced scale.

Tie plates have numerous functions, the principal ones being: first, to prevent cutting of the tie by the rail, this being accomplished by increasing the area of engagement between the rail and tie; and second, to prevent transverse shifting of the rail i. e. shifting of the rail lengthwise of the tie, or in other words, to prevent spreading or widening of the track gauge. The latter function may effectively be accomplished by the provision of initial or primary tie engaging parts which depend from the normal bottom of the plate and are adapted to be embedded in the tie as an incident to the passage of train-loads thereover.

Depending initial tie bearing parts such as above mentioned, may be in the form of one or more ribs or shoulders extending transversely of the tie plate and preferably located under the normal location of the edges of a rail base flange seated on the plate. Tie plates provided with such initial tie engaging parts have been found to be highly effective to accomplish their intended functions. However, by my present invention I have provided a tie plate structure having all of the advantages of such heretofore known plates, and having additional advantages of quicker embedment to final, seated position, and lighter weight and cheaper construction without impairing the required strength thereof.

Referring now to the drawings, and more particularly to Figs. 1, 2 and 3, my improved tie plate includes a median portion 15, the top surface 16 of which constitutes a seat for the base flange of a rail. End portions 17 and 18 extend in opposite directions from opposite sides of the median portion 15 and rail abutting shoulders such as 19 and 20 may be provided for positioning and maintaining the rail on the seat 16 of the tie plate. Either one or both of the rail abutting shoulders 19 and 20 may be omitted if desired, although there are comparatively few instances in actual practice where at least one such shoulder (usually the one indicated at 20) is not used.

In the practical use of tie plates, many railroads have found that certain advantages are obtained by increasing the height of the shoulders 19 and 20 so that the heads of spikes, such as shown at 21, passing through the tie plate into the tie, cannot be driven into contact with the rail base flange as indicated in Fig. 1. One such advantage is that the rail is permitted limited vertical movement without drawing the spikes.

It has also been found that if the spike holes indicated at 22 in the tie plate are spaced outwardly from the faces of the shoulders 19 and 20 substantially as shown in Fig. 1, the normal tendency of the rails to draw the spikes is further lessened.

In increasing the depth of the shoulders 19 and 20, an extra amount of metal is added to the tie plate, not only in the height of the shoulder but also in the width thereof, this being due to the requirements of good design. Hence, it will be seen that the shoulders 19 and 20 serve not only to position the rail on the rail seat, but also to reinforce the tie plate in the zones of greatest stress thereon, the said zones extending transversely of the plate and being located adjacent the normal location of the edges of a rail base flange seated on said plate. Such reinforcing may be said to be due to the presence of excess thickness of metal in the said zones.

While the addition of metal as above explained tends to strengthen the tie plate in the zone of greatest stress thereon, it is nevertheless somewhat objectionable in that it necessarily increases the weight of the tie plate and accordingly increases the cost thereof in respect to manufacture, application, handling and transportation of the same.

Further referring to Figs. 1, 2 and 3 of the drawings, initial or primary tie engaging parts, depending from the bottom of the tie plate are indicated at 23 and 24. These initial or primary tie bearing parts are, in effect, ribs, which extend transversely of the plate under the edges of a rail base flange seated on the plate as clearly shown. The depending primary tie engaging parts obviously serve to further strengthen the plate in the zones of greatest stress, while also adding weight to the plate. The bottom surface of the median portion of the plate, i. e. the portion between the primary tie bearing parts 23 and 24, is provided with a stepped arrangement which gives the plate, in effect, an arched median bottom portion. The steps are progressively recessed upwardly towards the middle of the plate and each step 23^a and 24^a constitutes a secondary tie engaging seat. Shoulders, such as indicated at 23^b and 24^b are, of course, formed by the stepped arrangement. On the bottoms of the outer end portions 17 and 18 of the plate, similar stepped secondary tie engaging surfaces are formed as indicated at 23^c and 24^c respectively, shoulders 23^d and 24^d being similarly formed.

The tie plate above described is adapted to be seated on the top of a railroad tie merely by positioning the plate as desired and then striking the same with sufficient force to cause the primary tie bearing parts 23 and 24 to be at least partially embedded in the tie. Of course, the tie may be initially provided with seats formed therein for receiving the parts 23 and 24 to position the plate on the tie. When the plate is positioned in this manner, the rail may be placed in position and the spikes driven to hold the parts in place. Thereafter, train-loads passing over the tie plate will gradually embed the primary tie engaging parts 23 and 24 further in the tie and also the secondary tie bearing seats 23^a, 23^c, 24^a and 24^c. When the plate has been embedded so that its normal bottom surface indicated at 25 rests upon the tie, there will be no further material embedment.

When the tie plate is embedded in the manner above described, it will be seen that the combined vertical dimension of the primary tie engaging parts 23 and 24 and the shoulders 23^b, 23^d, 24^b and 24^d will effectively serve to prevent shifting of the plate longitudinally of the tie. In this respect, the shoulders constitute, in effect, individual ribs depending from the bottom of the plate for locking the plate against longitudinal shifting relative to the tie. These shoulders may conveniently be increased in vertical width, if desired, by inclining the secondary tie engaging steps so as to increase the width of the shoulders or the rib effect may be made more pronounced by the provision of ridges such as indicated at 26. Such ridges may be provided at each shoulder or, if desired, at only some of the shoulders.

I have found that the strength of a tie plate embodying the arrangement of the above described plate is considerably greater in the zones of greatest stress than is required. I also have found that the weight of such plates, while being practically minimum for the strength provided, may be reduced considerably without reducing the strength of the plate below the normal strength requirement. One manner of reducing the weight without impairing the required strength is to provide recesses in the bottom of the plate extending longitudinally thereof and transversely through the reinforced zones, i. e. through the zones of excess thickness resulting from the provision of the shoulders 19 and 20 and the primary and secondary tie engaging parts. In Fig. 2, such recesses are indicated at 27, these recesses being of trapezoidal cross-sectional shape as clearly shown in Fig. 3. For convenience in manufacture, I find it desirable to arrange the recesses 27 in aligned relation as shown in Fig. 2, but if desired, the recesses may be arranged in staggered relation as indicated at 28 in Fig. 4. Also the recesses 28 may be of arched or other suitable cross-sectional shape as indicated in Fig. 5, instead of trapezoidal cross-sectional shape. The staggered arrangement is somewhat advantageous in that it avoids distortion and compression of the same fibres of the tie in two adjacent posi-

tions as is the case with the aligned recess arrangement shown in Fig. 2.

The dimensions and weight of tie plates depend upon the load they are intended to sustain. In some cases, the dimensions of the plate may be such that so much excess thickness is provided in the zones of greatest stress that I may conveniently extend or deepen the recesses 27 so that they enter the body of the plate above the normal bottom surface. In such instances, the bottoms of the recesses are preferably arched longitudinally as indicated at 29, the deepest part of the recesses being located under the edges of the rail base flange.

In Figs. 6 and 7, I have illustrated a somewhat simplified type of tie plate embodying certain features of my invention. The tie plate includes a rail seat 30 which is defined at one side by a shoulder 31 projecting upwardly from the plate. The bottom of the plate is provided with depending primary tie engaging parts 32 and 33 which are adapted to be initially embedded in a tie in the manner above described in connection with the primary tie engaging parts 23 and 24 of the tie plate structure shown in Fig. 1. In this instance, however, the secondary tie bearing surface is in the form of upwardly arched surfaces 32^a, 32^b, 33^a and 33^b which are adapted to be gradually embedded in the tie. The arched median bottom surfaces 32^a and 33^a may be of such length that a true arch is formed extending from the primary tie engaging part 32 to the primary tie engaging part 33. Or if desired, the said arched parts may be of such extent that a flat portion 34 of the desired length may be formed approximately centrally of the plate, this flat portion coinciding with the normal bottom of the plate.

The combined depth of the primary tie engaging parts and secondary tie engaging parts in tthe modified form of tie plate just described may be substantially equal to the combined depth of the primary and secondary tie engaging surfaces of the structure shown in Fig. 1. Accordingly, the anchorage of the plate against longitudinal shifting movement is approximately the same in both forms although there may be some slight advantage in providing the successive, more or less abrupt, stepped arrangement of Fig. 1.

For lightening the weight of the plate structure of Fig. 6 without reducing its strength below the normal requirement, recesses such as indicated at 35 may be formed in the bottom of the plate, these recesses extending longitudinally of the plate and transversely through the respective primary and secondary tie bearing surfaces. It will, of course, be understood that the primary and secondary tie bearing surfaces constitute reinforcements for the tie plate in the zone of greatest stress thereon by reason of the excess thickness of metal provided. The recesses 35 may be arched, trapezoidal or otherwise in cross-section and arranged in either aligned or staggered relation as above described in connection with Figs. 1, 2, 3 and 4. Also, the recesses may be of such depth that the bottoms thereof coincide with the normal bottom of the plate as indicated in Fig. 6, or they may be deeper or shallower to suit conditions surrounding the use of the tie plate.

In Figs. 8 and 9, I have illustrated another form of tie plate provided with a rail abutting shoulder 36 and having primary tie engaging surfaces 37 and 38, and secondary tie engaging surfaces 39 and 40 respectively associated with the primary tie engaging parts 37 and 38. In this form, the bottom of the plate is substantially flat and the primary and secondary tie engaging parts are defined by comparatively abrupt shoulders. Also, the secondary tie bearing parts 39 and 40 are of considerably less area so that embedment thereof is more readily accomplished due to said smaller area of tie engaging surface. As in the previously described forms, the primary and secondary tie bearing parts are formed by the addition of metal, whereby the plate is incidentally reinforced in the zones of greatest stress thereon. Recesses such as indicated at 41 may be formed in the reinforced zones to lighten the plate without reducing the strength thereof below the necessary strength. Of course, these recesses may be of any desired cross-sectional shape and formed to any depth permissible under the conditions attendant the use of the plate.

The reduction of weight of tie plates such as above described, occasioned by recessing the same in the manner described, is highly important inasmuch as the cost of tie plates depends largely upon the weight thereof. The weight of the metal removed or eliminated by the recessing is, of course, small compared with the total weight of a single plate, but the accumulated saving on thousands of tons of tie plates as purchased annually by many railroads would obviously constitute a material and substantial amount. Hence, the weight saving feature is of itself of material importance.

Another feature of importance is found in the fact that the embedment of tie plates of the type herein concerned is greatly accelerated by reason of the reduction of primary and secondary tie bearing area. This accelerated embedment is important for the reason that where the plates are slow to be embedded, a sharp and noticeable clatter occurs when a train passes over the rails seated on such tie plates. This clatter has been found to disappear when the plates are fully seated. Another element of importance is found in the fact that all railroad ties are not of uniform hardness, which causes a tendency to uneven or unequal seating or embed-

ment of the tie plates. Obviously, such unequal embedment of the tie plates tends to cause a wavy rail with its attendant disadvantages. By arranging the embedded portions of the tie plate in such a manner that there is less resistance to their embedment, quicker embedment occurs even in the hardest of ties. Hence, any temporary wavy track condition is quickly remedied inasmuch as the tie plates which are seated on comparatively soft ties come to a substantially final embedment where they remain until the tie plates seated on harder ties catch up.

In the claims, I have used the term "arched" in a broad sense to describe a true arch or any similar formation. Also, in the claims, I have used the expression "independent of the spike holes" in a broad sense to describe recesses not formed merely as a part of the spike holes but which are in addition thereto, and recesses which may intersect the spike holes are to be understood as recesses independent of the spike holes.

I am aware that changes and modifications may be made in the tie plate structures above described without departing from the spirit of my 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.

I claim as my invention:

1. A tie plate having a tie-engaging part depending from the bottom of the plate, said depending part extending transversely of the plate and constituting a reinforcement for the plate, said plate being provided with a spike hole and having a recess in said depending part, said recess being independent of said spike hole and serving to reduce the weight of the plate without proportionately reducing the strength thereof.

2. A tie plate according to claim 1 in which the recess is of such depth that it extends into the plate above the normal bottom surface thereof.

3. A tie plate having a tie-engaging part depending from the bottom of the plate, said depending part extending transversely of the plate and constituting a reinforcement for the plate, said plate being provided with an elongated recess in said depending part, extending transversely thereof and serving to reduce the weight of the plate without proportionately reducing the strength thereof.

4. A tie plate according to claim 3 in which the bottom of the recess is arched transversely of the plate.

5. A tie plate according to claim 3 in which the recess is of trapezoidal cross-sectional shape.

6. A tie plate according to claim 3 in which the recess is of such depth that it extends into the plate above the normal bottom thereof.

7. A tie plate having a plurality of tie-engaging parts spaced longitudinally of the plate and depending from the bottom thereof, said depending parts extending transversely of the tie plate and constituting reinforcements therefor, there being an elongated recess extending longitudinally of the plate in each of said depending parts for reducing the weight of the plate without proportionately reducing the strength thereof.

8. A tie plate having a plurality of tie-engaging parts spaced longitudinally of the plate and depending from the bottom thereof, said depending parts extending transversely of the tie plate and constituting reinforcements therefor, there being a plurality of elongated recesses spaced transversely of the plate and extending longitudinally thereof in said depending parts for reducing the weight of the plate without proportionately reducing the strength thereof.

9. A tie plate according to claim 8 in which the recesses in one of the depending parts are independent of but aligned with the recesses in the other depending part.

10. A tie plate according to claim 8 in which the recesses in one of the parts are arranged in staggered relation to the recesses in the other depending part.

11. A tie plate having its bottom surface provided with a pair of depending, longitudinally spaced, tie-engaging parts extending transversely of the tie plate and constituting reinforcements therefor, the bottom surface of the plate intermediate said tie-engaging parts being arched upwardly, said plate being provided with a plurality of recesses extending transversely through said depending parts and through the adjacent portions of said arched bottom surface for reducing the weight of the plate without proportionately reducing the strength thereof.

12. A tie plate according to claim 11 in which the arched intermediate bottom portion is provided with means forming shoulders for interlocking with a tie to prevent shifting movement of the plate longitudinally of the tie.

13. A tie plate having its bottom surface provided with a pair of depending, longitudinally spaced, tie-engaging parts extending transversely of the tie plate and constituting reinforcements therefor, the bottom surface of the plate intermediate said tie-engaging parts being arched upwardly and the bottom faces of the end portions of the plate outwardly of said depending parts being inclined upwardly and outwardly from the respective parts, said plate being provided with a plurality of recesses extending transversely through said depending

parts and through the adjacent portions of the bottom on opposite sides of said depending parts for reducing the weight of the plate without proportionately reducing the strength thereof.

14. A tie plate according to claim 13 in which the arched median bottom portion and inclined end bottoms are provided with means forming shoulders adapted to interlock with a tie to prevent shifting movement of the plate longitudinally of the tie.

15. A tie plate according to claim 13 in which the arched median bottom portion and inclined end bottoms are provided with a plurality of steps forming shoulders adapted to interlock with a tie to prevent shifting movement of the plate longitudinally of the tie and in which the bottoms of the recesses are arched longitudinally of the plate and at their deepest point extend into the plate above the normal bottom face thereof.

16. A tie plate having a spike hole extending therethrough, a rail-abutting shoulder on its top surface, and a depending tie-engaging part on the bottom thereof, said shoulder and depending part cooperating to reinforce the plate in the zone of greatest normal stress on the plate, said plate being provided with a recess independent of said spike hole and located in said reinforced zone for reducing the weight of the plate without porportionately reducing the strength thereof.

17. A tie plate having a spike hole extending therethrough, a rail-abutting shoulder on its top surface, and a depending tie-engaging part on the bottom thereof, said shoulder and depending part cooperating to reinforce the plate in the zone of greatest normal stress on the plate, the bottom of said plate being provided with a recess independent of said spike hole and located in said depending tie-engaging part for reducing the weight of the plate without proportionately reducing the strength thereof.

18. A tie plate according to claim 17 in which the recess is of such depth that it extends into the body of the plate above the normal bottom surface thereof.

19. A tie plate having a primary tie-engaging seat depending from its bottom surface, a plurality of secondary tie-engaging seats successively stepped upwardly from said primary seat to a point spaced longitudinally of the plate from said primary seat, said stepped secondary seats forming shoulders for interlocking the plate and tie to prevent shifting of the plate longitudinally of the tie, and ribs depending from some of said secondary seats, providing additional shoulder area for interlocking the plate and tie to increase the holding power of the tie plate on the tie against said longitudinal shifting movement.

20. A tie plate having a pair of longitudinally spaced primary tie-engaging seats depending from its bottom surface, and a plurality of secondary tie-engaging seats successively stepped upwardly and away from said primary seats in opposite directions, said secondary stepped seats forming shoulders intermediate the seats for interlocking engagement with a tie to prevent shifting of the tie plate longitudinally of the tie, and ribs depending from some of said secondary seats, providing additional shoulder area for interlocking the tie plate and tie to thereby increase the holding power of the tie plate on the tie against said longitudinal shifting movement.

21. A tie plate having a pair of longitudinally spaced primary tie-engaging seats depending from its bottom surface, and a plurality of secondary tie-engaging seats successively stepped upwardly and away from said primary seats in opposite directions, said secondary stepped seats forming shoulders intermediate the seats for interlocking engagement with a tie to prevent shifting of the tie plate longitudinally of the tie, ribs depending from some of said secondary seats, providing additional shoulder area for interlocking the tie plate and tie to thereby increase the holding power of the tie plate on the tie against said longitudinal shifting movement, and a plurality of transversely spaced recesses extending longitudinally of the tie plate and transversely through said primary and secondary seats for reducing the weight of the plate.

22. A tie plate having a primary tie-engaging seat depending from its bottom surface, a plurality of secondary tie-engaging seats successively stepped upwardly from said primary seat to a point spaced longitudinally of the plate from said primary seat, said stepped secondary seats forming shoulders for interlocking the plate and tie to prevent shifting of the plate longitudinally of the tie, and means associated with some of said seats forming additional shoulder area for interlocking the plate and tie to increase the holding power of the tie plate on the tie against said longitudinal shifting movement.

WILLIAM S. BOYCE.