April 28, 1936. W. S. BOYCE 2,038,919

TIE PLATE

Filed July 13, 1933

FIG. 1

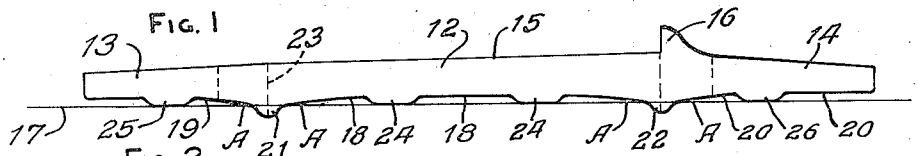


FIG. 2

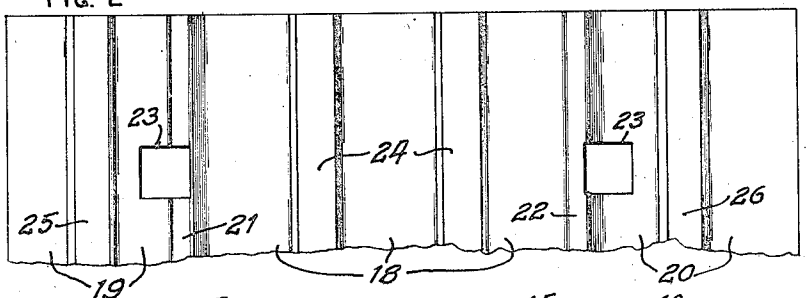


FIG. 3

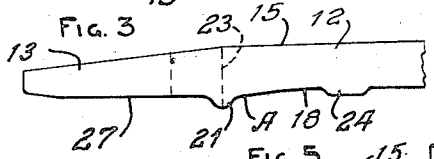


FIG. 4

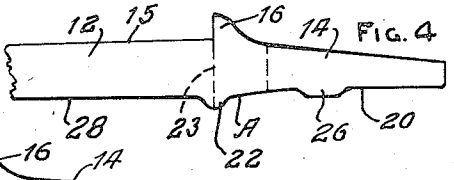


FIG. 5

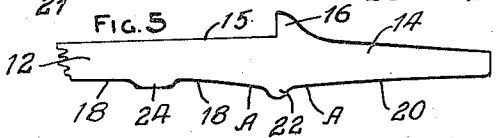


FIG. 6

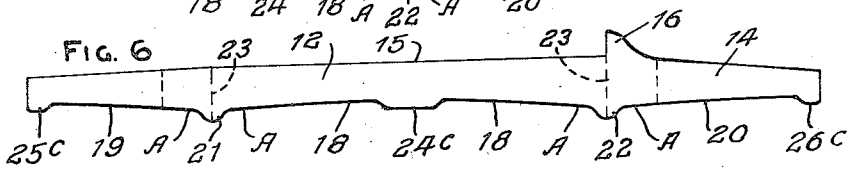
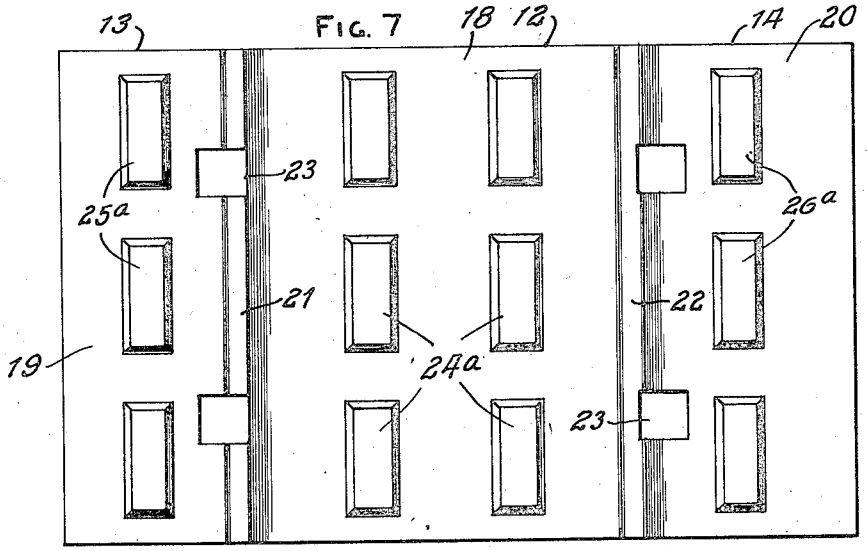


FIG. 7



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TIE PLATE

William S. Boyce, Chicago, Ill.

Application July 13, 1933, Serial No. 680,236

3 Claims. (Cl. 238—298)

This invention relates to railroad tie plates and has for its main objects the provision of a tie plate structure which is light in weight, yet strong and durable; to provide a structure which will have the strength and other characteristics of a flat bottom tie plate, but which will be considerably lighter in weight than a conventional flat bottom plate of the same size; and to provide a structure which is commercially and economically practical and which from the rolling-mill viewpoint, may be produced with a minimum expense for rolls.

Other objects and advantages of the invention will be understood by reference to the following specification and accompanying drawing wherein there are illustrated several forms of tie plates embodying the invention herein referred to.

In the drawing—

Fig. 1 is a side elevation;

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

Figs. 3, 4 and 5 are fragmentary side elevations showing modifications of the arrangement illustrated in Figs. 1 and 2;

Fig. 6 is a side elevation showing another modified arrangement; and

Fig. 7 is a bottom plan corresponding to Fig. 2, but showing a further modification.

Referring now to the drawing, the tie plate structure illustrated in Figs. 1 and 2 includes a median portion 12 and end portions 13 and 14. The top surface 15 of the median portion 12 constitutes a rail seat and is preferably a smooth, unbroken surface. The rail seat 15 may be perfectly flat or cambered and it may be disposed in a horizontal plane or canted, in accordance with the requirements of the particular purchaser. A shoulder such as 16 may be provided at the outside edge of the rail seat for positioning a rail on the plate and if desired, a similar shoulder may be provided at the inside edge of the seat. The provision of such shoulders is not essential to the present invention and is optional with the purchaser of the plate.

The normal bottom plane of the plate is indicated by the line 17. The median bottom surface of the plate, i. e., the bottom surface beneath the rail seat area 15, is offset upwardly in any suitable manner, for example, by being arched upwardly as indicated at 18. The arched shape of the upwardly offset surface is not an essential requirement, but it is considered preferable by many engineers because of the strength of the plate resulting from its use. Other shapes may, however, be utilized. The bottom surfaces 19 and 20 of the end portions 13 and 14 of the plate are also offset upwardly, for example, in an arched manner as indicated, or otherwise. When the surfaces 18, 19 and 20 are arched, they are so arranged that the plate is thickened in zones of greatest stress, which occur adjacent the edges of the rail seat 15, so as to effectively strengthen the plate in such zones. Tie embedding ribs such as 21 and 22 may be provided under the edges of the rail seat, if desired. Such ribs, which are preferably rounded so as to avoid tie fibre cutting, may be readily embedded in a tie either by pregrooving the tie to receive the ribs, or by otherwise forcing the ribs into the tie. These ribs serve to initially hold the plate in position on the tie. In some instances, these ribs are preferably omitted and ordinary track spikes are relied upon to maintain the plate in position. Suitable spike holes as indicated at 23, are of course, provided in the plates, in accordmance with conventional practice.

Bosses such as indicated at 24—24 are provided in the median bottom portion of the plate, and bosses such as indicated at 25 and 26 are provided in the bottoms of the end portions 13 and 14 respectively.

It has been determined that the stress at the line of the shoulder 16 is directly proportional to the square of its distance from the end of the other part of the plate which engages the tie at the same time that the plate portion immediately adjacent the zone of greatest stress, i. e., the edges of the rail seat, engages the tie. Correct positioning of the bearing bosses such as described, with relation to the zones of greatest stress, therefore accomplishes a proportional reduction and adjustment of stress.

The bosses 24, 25 and 26 have definite tie bearing bottom areas which may be flat or rounded but preferably flat and disposed substantially in the normal bottom plane of the plate so as to be effective to initially engage the tie to support the plate against any load tending to buckle the plate when it is first seated on the tie and before full seating of the plate in the tie is accomplished. By "full seating of the plate in the tie", is meant the embedment of the plate in the tie to the extent that the entire bottom area of the plate engages and rests on the tie. Embedment of the plate is the result of the passage over the plates of successive train loads which force the plate into the tie.

The bosses 24, 25 and 26 may conveniently extend transversely of the plate in the form of continuous bars, as indicated in Fig. 2. This ar-

rangement is especially desirable, in that the production of the plates requires a roll which may be easily and inexpensively produced. The production of the roll involves only simple lathe turning work, as distinguished from the various combinations of turning, planing and milling or other difficult machine operations or combinations of operations.

When a plate embodying the construction above described is to be placed in use, the preferred practice is to first groove the tie transversely to receive the tie-embedding ribs 21. These ribs are then initially effective to hold the plate against displacement longitudinally of the tie or crosswise of the rail, and hence they serve to prevent spreading of newly laid track. The bottom tie engaging areas of the bosses or pads 24, 25 and 26, and the areas of the bottom surface designated A immediately adjacent the ribs 21 and 22 and disposed under and adjacent the edges of the rail seat, where the stress on the plate is greatest, engage the tie to initially support the plate. Thus, the load on the plate is more or less uniformly distributed and transmitted to the tie over a wide area so as to effect delocalization of the stresses on the tie incident to the load imposed on, and the reacting forces tending to produce such stresses and longitudinal shifting of the plate. The growing tendency towards independently lagging the tie plate to the tie makes this uniform distribution and transmission of load to the tie all the more desirable and its effective accomplishment in applicant's structure is an important advantage thereof over other forms of tie plates.

If desired, the bosses or supporting pads 24, 25 and 26 in the median and end bottom portions of the plate may be separated into series of bosses aligned lengthwise of the plate, as indicated at 24^a, 25^a and 26^a in Fig. 7. This arrangement involves some additional machine work in producing the rolls, and to this extent is not so desirable as the arrangement shown in Fig. 2. However, the arrangement requires, in addition to the roll turning operation for producing rolls for the plate structure shown in Fig. 2, a transverse machine operation which can be accomplished at an expense not considered excessive. The bosses, whether continuous or interrupted, may be arranged diagonally instead of transversely of the plate, but because of the expense of producing rolls therefor, such arrangement is less desirable.

In Fig. 3 there is illustrated a modification in which the median bottom portion of the plate is substantially as that disclosed in Fig. 1, but wherein the end bottom portions 27 of the plate are flat and disposed in their entirety substantially in the normal bottom plane of the plate.

Fig. 4 discloses a modification wherein the bottom surface 28 of the median portion of the plate is substantially flat and located in the normal bottom plane of the plate and the bottoms of the end portions of the plate are offset upwardly and provided with supporting bosses, substantially as in the Fig. 1 arrangement.

Fig. 5 illustrates another modification in which the median bottom portion of the plate is offset upwardly and provided with supporting bosses 24, substantially as in the Fig. 1 form, but wherein the end bottom portions of the plate are offset upwardly but not equipped with any tie bearing bosses. This arrangement is desired by some on the theory that the median portion of the plate should be fully seated before load is transmitted to the entire end portions of the plate, to thereby avoid a tendency to buckle the plate intermediate the extreme end supporting portions thereof.

In Fig. 6, the arrangement is quite similar to that shown in Fig. 1, but only one transversely extending, depending tie bearing boss or pad 24^c is provided approximately midway between the tie embedding ribs 21 and 22 in the upwardly offset median bottom surface 18. The bottoms of the end portions of the plate are also offset upwardly and tie bearing portions depending therefrom and extending transversely of the plate are provided at the extreme outer ends of the plate, as indicated at 25^c and 26^c. It will, of course, be evident that the tie engaging portions 24^c, 25^c and 26^c may be either continuous or separated into series of bosses, as best suits the requirements for which the plates are made.

It will be evident that tie embedding ribs similar to the ribs 21 and 22 may be provided on the bottom of the transversely extending bosses.

It will be observed that because of the material depth of the bosses 24, 25 and 26, being substantially the depths of the upwardly offset bottom portions at 18, 19 and 20, their embedment in a tie will materially resist any force tending to shift the plate longitudinally of the tie. The holding power of the bosses against such longitudinal shifting is supplemented by the holding power of the ribs such as 21 and 22, when provided. As previously indicated, it is preferred to avoid any sharp, fibre cutting edges on the plate bottom. Therefore, all corners are preferably made blunt or rounded, as illustrated.

Also, it will be observed that the load on the plate is initially supported on the various tie bearing areas mentioned and that such load is gradually and uniformly distributed to the entire area of the plate as embedment proceeds, because of the symmetrical shape of the respective tie bearing bosses.

In the described structures. the strength of the plates is maintained under the edges of the rail seat where the severest strains are encountered and the metal utilized in making the plate is distributed to the best advantage to prevent buckling of the plates under load. By distributing the metal in the manner described, most efficient load distribution is obtained and less metal is required, so that weight is accordingly reduced, while obtaining maximum strength for such amount of metal as is employed.

In all of the described forms, the sides of the bearing bosses merge with rounded surfaces into both the tie bearing bottom area of the bosses and into the upwardly offset or secondary tie bearing bottom area of the plate. In the zones of greatest stress in the plate, the bottom areas are very gently upwardly inclined or rounded with large radii.

The provision of such rounded connections between the primary tie bearing area in the normal bottom plane of the plate and the secondary, upwardly offset tie bearing area avoids objectionable cutting of tie fibre incident to the embedment of conventional tie plates and substitutes a desirable tie plate compacting action.

Such compacting of uncut tie fibre serves to reduce the porosity of the tie under the plate, thereby obviating absorption and retention of moisture; and to harden the tie portion under the plate whereby embedment of the plate is limited, mechanical wear reduced and resistance to lateral shifting movement of the plate increased.

The advantageous effects just described may be said to be attained by avoiding, as far as prac-

ticable, abrupt changes in the tie bearing area of the plate bottom. Although gentle inclines or curves of large radii are preferable and give the best effect, small rounded corners are nevertheless highly effective and more practical in a plate of the present type where weight reduction is an important object.

Various other modifications may, of course, 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.

I claim:

1. A tie plate adapted to be seated on and embedded in a fibrous material tie and comprising intermediate and opposite end portions, the intermediate portion having a rail seat on its top surface, the bottom of the plate having tie-bearing areas adjacent the ends of said rail seat portion and outwardly thereof beyond the transverse center of the respective end portions to initially transmit load to the tie, the portions of the plate intermediate said tie-bearing areas and outwardly thereof having their bottom surfaces offset upwardly from the normal plane of said tie-bearing areas and extending continuously from side to side of the plate so as to be spaced from the surface of the tie when the plate is initially positioned thereon, and a boss depending from said intermediate upwardly offset bottom surface in spaced relation to said tie-bearing areas, said boss having tie-bearing area on its bottom surface for engaging the tie substantially at the same time that said first-mentioned tie-bearing areas engage the tie so as to be operative to adequately support said intermediate portion to prevent buckling of the plate incident to tie reaction on said outward end portion tie-bearing area when the plate is subjected to a load, all of said tie-bearing areas being connected to said upwardly offset bottom surface by inclined surfaces, so that upon normal embedment of the plate in the tie, the plate bottom effects maximum compacting and hardening of the tie under said tie-bearing areas with the degree of compacting gradually lessened to a minimum under said upwardly offset bottom surfaces, thereby avoiding cutting or breaking of the tie fiber and increasing the efficiency and life of the tie.

2. A tie plate adapted to be seated on a tie and comprising intermediate and opposite end portions, the top of the plate being provided with a transversely extending rail abutting shoulder adjacent the outer end of said intermediate portion, the bottom of the plate being provided with tie bearing area approximately beneath said rail abutting shoulder, said tie bearing area extending transversely of the plate from side to side thereof but not materially beyond said rail abutting shoulder lengthwise of the plate, the end portion of the plate outwardly of said tie bearing area having its bottom surface, continuously from side to side of the plate, offset upwardly from the normal plane of said tie bearing area so as to be spaced from the surface of the tie when the plate is initially positioned thereon, and a boss depending from said upwardly offset bottom surface in outwardly spaced relation to said tie bearing area and extending transversely of the plate substantially in parallelism with said shoulder, said boss being of such transverse section as to provide sufficient surface for engaging the tie to adequately resist embedment thereof in the tie to prevent rocking of the plate about the outer portion of said tie bearing area as a fulcrum.

3. A tie plate adapted to be seated on a tie and comprising intermediate and opposite end portions, the top of the plate having a rail seat on said intermediate portion, the bottom of the plate being provided with a pair of relatively narrow tie bearing areas extending transversely of the plate from side to side thereof adjacent the ends of said rail seat, the bottoms of the end and intermediate portions of said plate outwardly of and intermediate said tie bearing areas being offset upwardly from the normal plane of said tie bearing areas and continuously from side to side of the plate so as to be spaced from the surface of the tie when the plate is initially positioned thereon, and a transversely extending, relatively narrow boss depending from each of said offset bottoms in spaced relation to said tie bearing areas. said bosses being of such transverse section as to provide sufficient bottom surface for engaging the tie, the end-portion bosses to prevent rocking of the plate about said tie bearing areas as fulcrums as an incident to outwardly and downwardly directed thrusts of the plate and the intermediate portion boss to support the plate against buckling incident to reaction on said end portion bosses when the plate is subjected to a load.

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