June 18, 1940. C. G. ERICSON 2,204,849

RAIL RETAINING DEVICE

Filed Oct. 13, 1938 2 Sheets-Sheet 1

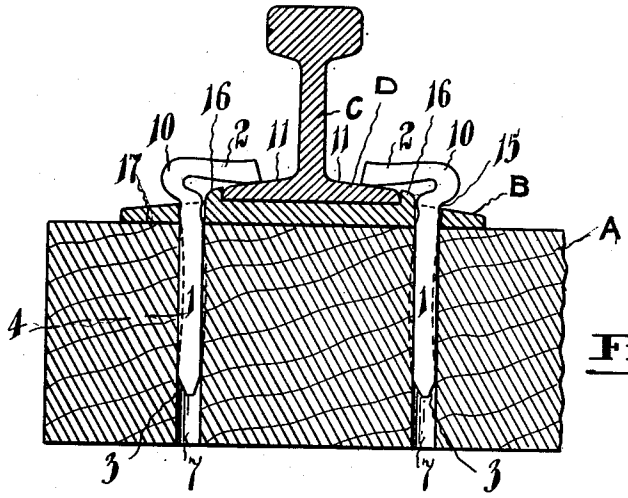

Fig. 1.

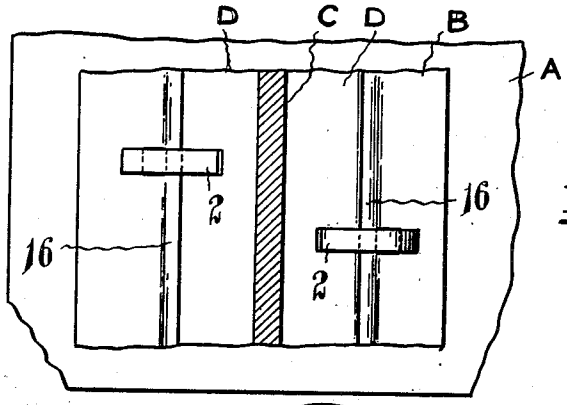

Fig. 3.

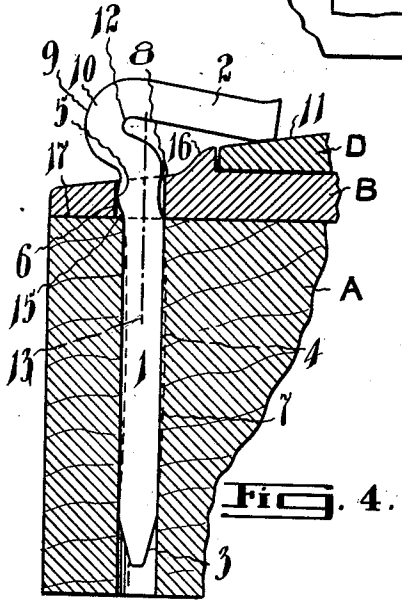

Fig. 4.

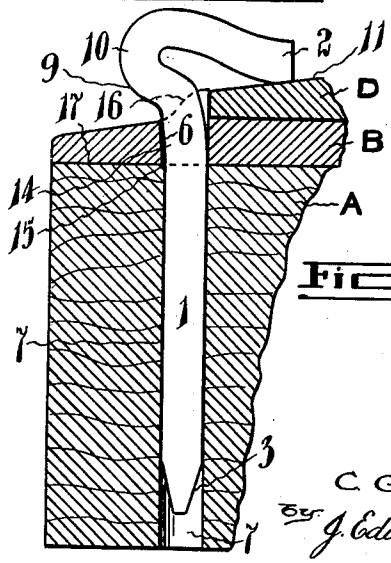

Fig. 2.

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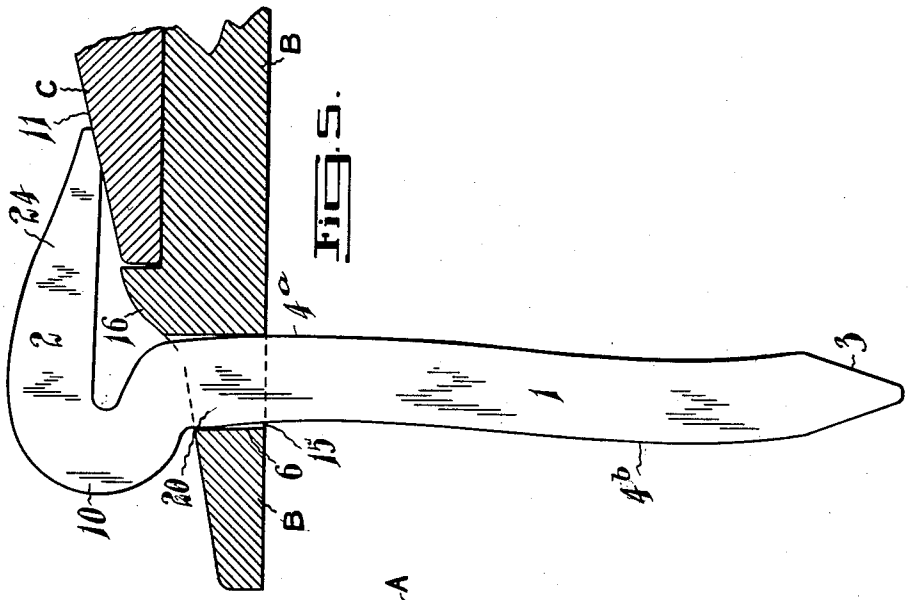

Fig. 5.

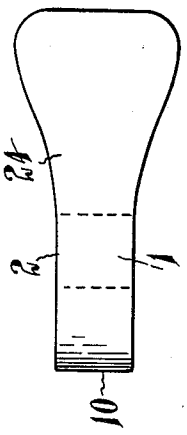

Fig. 7.

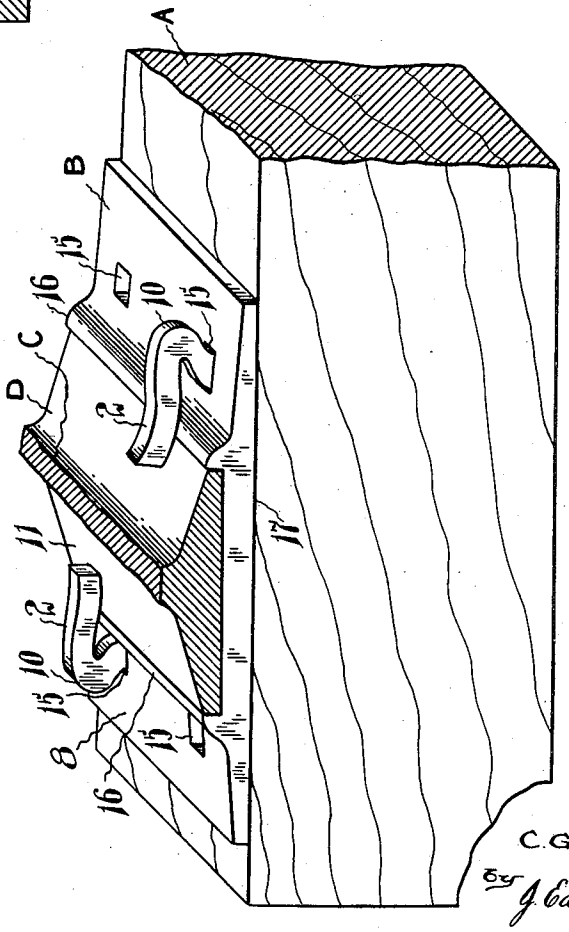

Fig. 6.

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Patented June 18, 1940

2,204,849

UNITED STATES PATENT OFFICE

2,204,849

RAIL RETAINING DEVICE

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Application October 13, 1938, Serial No. 234,774

2 Claims. (Cl. 85—10)

This invention relates to improvements in rail fastenings and flexib'e rail restraining means.

The present invention, although complete in its structural characteristics, is designed to function cooperatively with three other components comprising parts of the track structure, namely, the rail, the tie plate and the tie.

Various devices are now employed as track fastening means and, apart from the rail joint fastening the rail ends together, the conventional track spike, in combination with various types of tie plates, is still in general use. With the rapid changes now taking place in conditions such as higher speeds and heavier equipment, the urgent necessity of improvements in track fastenings is a well recognized fact, and it is also apparent that the old conventional spike will soon be out of date and other devices more in keeping with modern improvements will take its place.

Hitherto the term rail fastening has generally been looked upon as a means of fastening the rails to the tie either with or without some type of tie plate. Under practically all conditions the rail spike was depended upon to maintain the rail to gauge, that is to say, to prevent any lateral movement or spreading of the rails and also to prevent overturning of the rails under the impact of the traffic load.

Some thirty years ago another track condition arose in the form of track creepage, and I mention this because any modern means of rail fastening may be associated with track creepage preventatives either in combination with the said rail fastening, or separately applied. Most of the rail anti-creeping devices up to the present time have been applied separately and this has a direct bearing upon my present invention, as I aim to not only fasten the rail securely to the tie to prevent all lateral movement or tilting, but my object is also to prevent any longitudinal movement of the rail under the impact of the traffic load, by flexibly clamping the tie, the tie plate and the rail together and it should be understood therefore that my invention relates to rail fastening and anti-creeping means.

The adaptability of the present device to function as a rail fastening means, should at once be apparent in view of the constructions illustrated in the drawings and while it is one of the important objects of my invention, its adaptability to prevent rail creepage is perhaps less obvious, and in order to establish with clarity the conditions under which rail creepage takes place and the means employed in my present invention to prevent such creepage or longitudinal movement, the following explanation may be in order:

Under practically all traffic conditions the rail yields downwardly slightly from the impact of each wheel load and as the train moves, depending, of course, somewhat upon the speed of travel and the roadbed, these depressions of the rail assume the appearance of undulations, and it is in the return of the rail to its normal plane, which occurs with great rapidity and force, that the present standard track spike is gradually forced upwardly and out of its intimate contact with the rail. This lifting force, as exerted by the rail flange against the underside of the conventional spike head and transmitted directly into the axis of the spike shank due to the shortness of the overhanging portion of the spike head, is a peculiar phenomenon, and contrary to the belief of many, the rise of the rail above its normal plane is practically negligible but when the rails are depressed under the impact of the traffic load, the supporting ties, the tie plates and the spike are forced downwardly to approximately the same depth and are jerked upwardly automatically as the rails resume their normal plane, but the movement of the rails upwardly occurs with greater rapidity than that of the ties and the fastening means, with the result that the short overhanging portion of the conventional spike head, which happens to be the first obstruction to the free recovery movement of the rail flange, receives the full impact until the spike as a whole is forced out of its normal position to the extent of the maximum vertical movement of the rail. The rail, now unrestrained by any vertical compression force, tends to move longitudinally, due to the effect of the undulations propagated by the impulse of the traffic in motion and which longitudinal movement is recognized as rail creepage.

Various devices have been introduced to prevent creepage and its destructive results, some of which are known as anti-rail creepers and others of a more rigid type designed to prevent any vertical or longitudinal movements of the rail whatsoever under traffic. But the latter devices tend to develop serious ballast disturbances and one of my objects therefore is to provide a rail retaining device, of suitable cross sectional dimensions in the form of a solid square, rectangular or round bar, which is inexpensive to manufacture and which, in conjunction with the double shouldered tie plate of the conventional type, will function to clamp the tie, the tie plate and the rail together flexibly and yet having

ample compression capacity in reserve in its service position to absorb the destructive forces of rail undulations with the minimum disturbance of the ballast and without any appreciable separation of the track fastening components.

In view of the foregoing the importance of supplementing the present rail anti-creeping devices is becoming increasingly apparent. Greater uniformity in the application of means tending to prevent the longitudinal movement of the rail is an essential that must be recognized and one way of doing this is to distribute over a greater number of ties a holding force capable of preventing the longitudinal movement of the rails under the travelling deflections induced by the impact of the wheel loads.

One of the present means of preventing rail creepage, is to fasten the anti-rail creeping devices to the rail base and which, as a rule, function in pairs, one against each end of the tie, and in many cases when from four to eight anti-rail creepers are employed on each rail length, the ties against which the anti-creeping devices function are carried along through the ballast in the direction of the traffic, and it follows that as the ties are forced out of their normal position, the space between such ties and the adjacent ties becomes less in the direction of the traffic and proportionately greater in the opposite direction. This condition not only causes a serious disturbance of the ballast but also results in unevenly spaced ties, which is detrimental to the riding qualities of the track as a whole. In my invention the rail fastening means and the means essential to prevent the longitudinal movement of the rails are combined and as the device, in the form of a resilient spike, is employed on every tie, all ties must carry approximately the same load depending somewhat upon the ballast and the condition of the ties.

Practically all improvements in the line of rail fastening means either include some type of tie plate or rail support as a part of the invention, or are used with the conventional double shouldered tie plate but in any event the manufacture of both the track fastening device and the tie plate, whether the said tie plate happens to be a part of the invention or the conventional type, must be taken into consideration, not only as to the initial cost but also the cost of assembling the parts in the track. In the process of manufacture, especially with regard to the rolling and punching of the tie plate, certain allowable tolerances are in effect. The spacing of the spike holes may vary somewhat and the dimensions of the spike holes do vary with the wear in the punches and the dies. For instance, the spike holes, unless drilled, are not exactly vertical due to the fact that the holes are larger on the die side than on the punch side. It follows therefore that it is impracticable to attempt to employ close fitting parts, as for instance the use of a spike shank having the same cross-sectional dimensions as the dimensions of the spike hole on the punch side. Any such assembly is unfeasible as it relates to track work and on the other hand the jamming of the metals would prevent ready extraction of the spike from the tie and the tie plate which is an essential requisite in track fastening standards. This also applies to diagonally positioned holes in the tie plates or ties.

One of the principal objects, therefore, of my invention is to provide a resilient flexible spike of a type which in combination with the conventional double shouldered tie plate will function in the dual capacity of a rail fastening means and a rail anti-creeper and yet be simple as to its structural characteristics, presenting no manufacturing difficulties and which may be easily applied and extracted if necessary.

I attain my object by means of a device having a shank portion adapted to be driven through the perforation in the tie plate and into the pre-bored holes in the tie and, integral with the shank, an overhanging portion bent laterally of the shank portion in a direction away from the rail, then upwardly to form a curved portion from which the free end of the said overhanging portion extends inwardly in the direction of the rail to overhang the vertical shank portion in spaced relation thereto and to engage the upper sloped surface of the rail base flange in compression.

A further feature of my invention is the provision of the device with a shank member having two bowed surfaces of which the upper and shorter convex portion is restricted to engage the outer wall of the perforation in the tie plate, and the lower and longer convex curved portion resiliently engages the inner wall of the pre-bored hole in the tie so that when the device is driven to its operative position, the lower curved portion, in its efforts to resume the position from which it was sprung, will tend to retard any vertical movement of the shank as a whole, and the apex of the upper curved portion will constantly be in spring tension with the outer wall of the perforation in the tie plate and thereby, co-operatively with the upper overhanging portion, function to clamp into intimate contact the tie, the tie plate, and the rail.

Another feature of my invention is that I provide a device having certain balanced structural characteristics in that the shank is designed as to its length and formation, when driven to its service position, to develop ample tractive resistance against any vertical movement when the upper overhanging portion is being flexed to its service position.

Another important feature of the invention is that I provide a device of simple construction and inexpensive to manufacture, yet of such suitable physical properties and cross-sectional dimensions that a predetermined flexibility shall be one of its inherent characteristics, and at the same time comprising certain structural embodiments due to its formation, to provide ample rigidity to function co-operatively with the tie and the tie plate as a rail fastening and as a rail restraining means in relation to rail creepage.

Another important feature of the invention is that I provide a device involving no manufacturing difficulties as to design but comprising certain structural characteristics and physical properties whereby definite and novel compression means may be obtained of ample proportions and intensity to retain in intimate contact and in spring tension, the rail, the tie plate, and the tie.

Another important feature of my invention is that I provide a device having certain novel structural characteristics whereby the upper rail engaging portion of the device in its relation to the shank portion engaging the tie and the tie plate, extends laterally from the said shank, then upwardly and inwardly to engage with its free end the upper sloping surface of the rail base flange, and in connection with which the axis of the laterally extending portion is approximately at right angles to the axis of the shank, and the axis of

the upwardly extending portion is approximately at right angles to the axis of the laterally extending portion, and the axis of the rail engaging portion is approximately at right angles to the axis of the upwardly extending portion.

A more specific embodiment of the invention comprises a shank suitable in cross-sectional area and length to engage the tie and the tie plate and which shank extends upwardly clear of the tie plate; the said upwardly extending portion being bent laterally at a point in spaced relation to the upper surface of the tie plate and which portion being offset in relation to the axis of the shank is then carried upwardly and inwardly in the direction of the rail base, the formation being such that the inner throat of the upwardly curved portion is clear, in a direction outwardly, of the axis of the vertically positioned shank, whereby when the upper rail engaging portion is flexed in the process of application the fulcrum point is shifted and the resultant stresses are eccentrically transmitted in relation to the axis of the shank with the result that, while greater flexibility is provided, the rail undulations as propagated by the impact of the wheel loads will have the effect of tilting the shank portion into firmer contact with the outer wall of the tie plate perforation against which the said shank rests, rather than to exert any lifting or pulling force which would tend to loosen or pry the device from its service position.

An important feature of the construction described is that the rail engaging portion of the device is limited as to its length to the extent that the shank portion, when driven to its full depth through the perforations in the tie plate and the pre-bored holes in the tie will tend to flex the said overhanging member into spring tension against the upper sloping surface of the rail base flange and, when so positioned, will retain the tie, the rail and the tie plate in compression so that no independent movement of either can take place under the impact of the passing wheel loads or temperature changes.

Another important feature of the present invention is that I provide a flexible rail retaining means adapted, when the rail yields downwardly under the impact of the wheel load, to follow through in intimate co-ordination, but so that in the vertical recovery of the rail to its normal plane between the wheel load impacts the said flexible rail retaining means offers ample rigidity and compression resistance to cause the tie, the tie plate and the rail to synchronize in their movement upwardly to their normal plane.

With the foregoing and other objects in view the nature of the invention will be more fully understood with respect to the novel features of construction and the combination of and arrangement of the components, as will be hereinafter fully described and illustrated in the accompanying drawings and defined in the appended claims.

Referring to the accompanying drawings:

Fig. 1 is a transverse section through a conventional double shouldered tie plate and rail illustrating in elevation one practical embodiment of the present invention co-operatively with the tie, the tie plate and the rail.

Fig. 2 is a fragmentary view similar to Figure 1 showing an alternative of the embodiment of the invention.

Figure 3 is a plan view of the combination of components as illustrated in Fig. 1.

Fig. 4 is a fragmentary view similar to Fig. 1, illustrating more in detail the curved portion of the shank and the relation thereto of the upper curved portion which is intermediately connected to the upper overhanging portion engaging the rail base flange and the vertically positioned shank.

Fig. 5 is a fragmentary view similar to Fig. 1 illustrating another modified form of the invention.

Fig. 6 is a perspective view of the invention in service position, and,

Fig. 7 is a plan view showing the flared end of the upper overhanging portion of the device as shown in Figure 5.

Referring to the drawings in detail: A designates generally the tie upon which the tie plate and the rails rest, which is provided with pre-bored holes 7 into which the shank of the present invention is driven with a spike maul or some other suitable tool, B designates the conventional double shouldered tie plate, C designates the rail and D designates the flanges of the rail base.

The tie plate B, may be of the conventional type, having two shoulders 16, spaced as may be required for the rail section used and the bottom of the said tie plate, which is herewith shown as having a flat surface 17, may be ribbed or otherwise formed as may be preferred by the railroads.

The device comprising the present invention consists generally of a shank 1, a connecting portion 10 and an upper overhanging portion 2. The shank portion is preferably chamfered at the entering end 3, and the body of the shank has two bowed portions 4 and 5, the lower 4 of which extends and is effective for the greater part of the length of the shank. The upper curved portion or neck 5 is much shorter and is restricted to engage with its outwardly disposed surface the substantially vertical wall 6 of the hole 15 in the tie plate B, so that the said curved portion 5 shall be in constant spring tension against the adjacent wall 6 when the device is driven to its service position. When the shorter curved portion 5 is in frictional and spring contact against wall 6 of the tie plate hole 15, it should be understood that the lower bowed portion 4 in its operative position, has been forced practically into alignment perpendicularly with the walls of the pre-bored holes 7 in the tie and thus the shank 1 with its curved portion 4 sprung out of its normal bowed position will have its tractive power supplemented and its resistance against any vertical movement augmented by the resultant forces of the bowed portion 4 tending to resume the position from which it was sprung. To further explain this most important feature of the present invention, it should be understood that the pre-bored holes 7 in the tie plate B are bored round and smaller in size than the cross-sectional dimensions of shank 1, and it is a generally accepted theory that a conventional spike for instance, driven into a pre-bored hole of the proper smaller dimensions develops a greater resistance against a vertical movement or pull under traffic undulations than the conventional spike cutting its own course into a railway tie as is the practice with many railroads at the present time.

In the present invention, with particular reference to the upwardly extending connecting portion 10 and inwardly extending portion 2, the part 10 extends upwardly clear of the upper surface 8 of the tie plate B, and in spaced relation

thereto after which it projects outwardly from the shank in a direction away from the rail to form a heel 9 and an upwardly extending portion connected with the overhanging arm 2, which engages the upper sloping surface 11 of rail C clear of the shoulders 16 of the tie plate when the device is driven to its operative position. It is important also to note that the upwardly and outwardly extending portion 10 is offset in its relation to the shank 1 to the extent that the inner throat 12, in its relation to the axis 13 of the shank is outwardly disposed thereto. It follows then that a shifting of the pivotal point about which the part 2 springs occurs so that when, after the impact of a passing wheel load, the rails react or resume their normal plane, the resultant stresses are automatically diverted from a force tending to loosen or lift the shank vertically in the pre-bored hole in the tie, and converted to a force so disposed as to tilt the curved portion 5 of the shank into greater frictional contact against the adjacent vertical wall 6 of the tie plate hole 15. The heel 9 has a further important function in that the conventional track tool may be employed to extract the device from its service position as may become necessary from time to time.

In Fig. 2 the upper portion of the shank is shown as inclined out of the perpendicular so that the inclined portion 14 takes the place of the curved part 5 and engages the substantially vertical wall 6 of the tie plate perforation. This form of the present invention may function to replace the conventional spike more or less satisfactorily and it would seem that while the upper overhanging portion 2 is shorter and therefore less flexible than in the form illustrated in Fig. 1, yet its capacity and qualifications to function as a resilient spike or rail retaining means as compared with the conventional spike must be obvious.

In Fig. 5 another good form of the present invention is illustrated. In this form the upper overhanging portion 24 has been flattened or flared considerably, as illustrated in Fig. 7, so that in the event of a derailment the rail will be saved from damage. It is intended that this thinner overhanging portion 24 would be pushed outwardly in a direction away from the rail base flange 11, in the event of a derailment until the rail contacting end flattened portion 24 would shear from the impact of the derailed wheels, rather than damage the rail since its cross-sectional area or thickness is appreciably less than that of the rail base flange upon which it rests.

In the form illustrated in Fig. 5, having special reference to the shank portion, an initial compound curve is shown of which the upper portion is designated as 4^a and the lower part as 4^b. It will be seen in Fig. 5 that the upper portion 20 of curve 4^a extends into the aperture 15 in the tie plate to engage the wall 6 in its service position after which it extends downwardly and inwardly in the direction of the rail base, whereas the lower curved portion 4^b extends in the opposite direction away from the rail, but both being in the direction of the grain structure of the wooden tie.

In Fig. 4, the relative positions of the axis 13 of the shank 1, the heel or offset portion 9, the upwardly extending curved portion 10, and the rail engaging portion 2 are clearly shown.

In applying the present device, the entering end of the shank 3, which is preferably pointed, is first manually inserted into one of the apertures 15 in the tie plate B of which there is one on each side of the rail and their location relatively may be staggered transversely or the two may be positioned in exact alignment but the location is more or less governed by the standards in effect on the various railroads. After the shank has been inserted into the apertures in the plate B the whole device is driven into the pre-bored hole 7 in the tie A until the overhanging portion 2 engages initially the upper sloping surface 11 of the rail base flange D. It should also be understood that more than two flexible spikes may be used especially on curves and in which case the double shouldered tie plate would be punched in accordance with the number of holes and spacing desired. The pre-bored holes 7 in the tie are somewhat smaller in diameter than the cross-sectional dimensions of the shank as explained in the foregoing, which is necessary in order that the shank 1, after having been driven to its first depth in relation to the initial contact of the upper overhanging portion 2 against the rail flange D shall have the essential resistance against any vertical movement out of the tie to withstand the force involving the flexing of the upper overhanging portion 2 to its service position.

In this connection, following the initial contact of the overhanging and rail engaging member 2, the upper portion of this member is struck another two or three blows with a spike maul or any suitable tool with the result that as the shank portion 1 is driven to a slightly greater depth into the tie A, the upper overhanging portion 2 is flexed proportionately and it is in this operation that the rail base flange D of rail C and the tie plate B are forced into a state of compression with the tie A as the underlying structure, and the overhanging free arm 2 of the present invention as the overlying structure, and thus it follows that all four components, namely, the tie, the tie plate, and the rail, co-operatively in the present invention, are clamped together in intimate spring tension so that, when rail undulations occur due to the impact of the passing wheel loads, the injurious effect of the resultant intermittent depressions and recovery movements will be neutralized, in that no independent movement of any of the components will take place. It follows therefore, due to the peculiar phenomenon of rail undulations under the traffic load, which are not exactly longitudinal or vertical in their effect, when the components are thus united by flexible means, that the heights of the undulations or wave motions will be minimized and the force responsible for the longitudinal movement of the rail, commonly known as creepage, will be obviated in so far as that is possible by mechanical means.

The construction as shown and described is simple and inexpensive, yet highly efficient and as stated in the foregoing may be considered as preferred.

What I claim as my invention is:

1. A resilient retaining device for rails with flanged bases comprising a solid shank of suitable dimensions in length and cross-section and adapted for use in a vertical position, and an upper portion bent outwardly in a direction away from the rail with which it is used and laterally of the vertically disposed shank to form a heel shaped projection and which upper portion is curved upwardly and inwardly in the direction of the rail to overhang in spaced relation the shank portion and extend inwardly with its free end in

position for engagement with the upper surface of the rail base flange at a suitable distance inwardly of the vertically disposed shank so that the flexing of the said upper portion may take place when the shank is driven into a sufficiently tight fitting hole in a tie, the shank being formed with two reversely bowed portions, a short outwardly convex bent portion for engagement with the outer wall of a spike hole in a tie plate and a longer bent portion bowed in its initial condition so as, when driven, to press with its convex side against the rail side of a pre-bored hole in a tie on which the tie plate is superimposed.

2. A resilient retaining device for rails with flanged bases comprising a shank of suitable dimensions in length and cross-section and adapted for use in a vertical position, and an upper portion extending laterally towards the rail with which it is used and adapted to engage with its free end the upper surface of the rail base, the shank being formed with two reversely bowed portions, a short, outwardly convex, bent portion forming the contact of the neck with the outer wall of the spike hole, and a longer bent portion bowed, in its initial condition, so as, when driven, to press with its convex side against a side of a pre-bored hole in a tie on which the tie plate is superimposed.

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