

June 11, 1946.

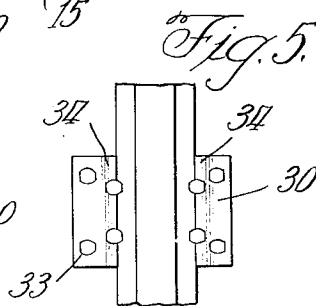
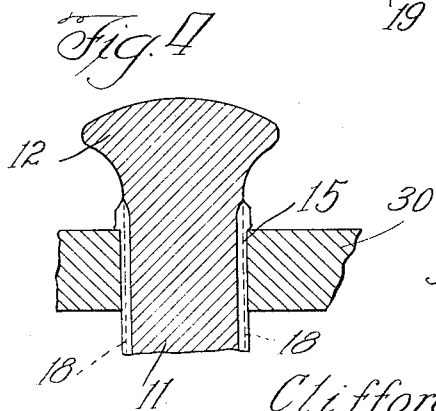
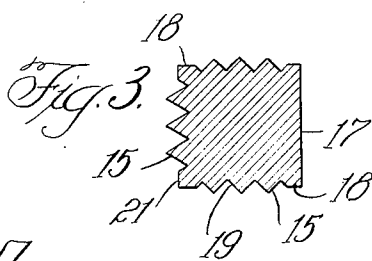
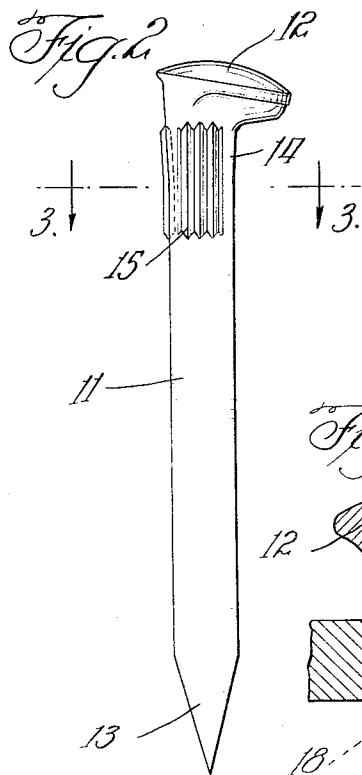
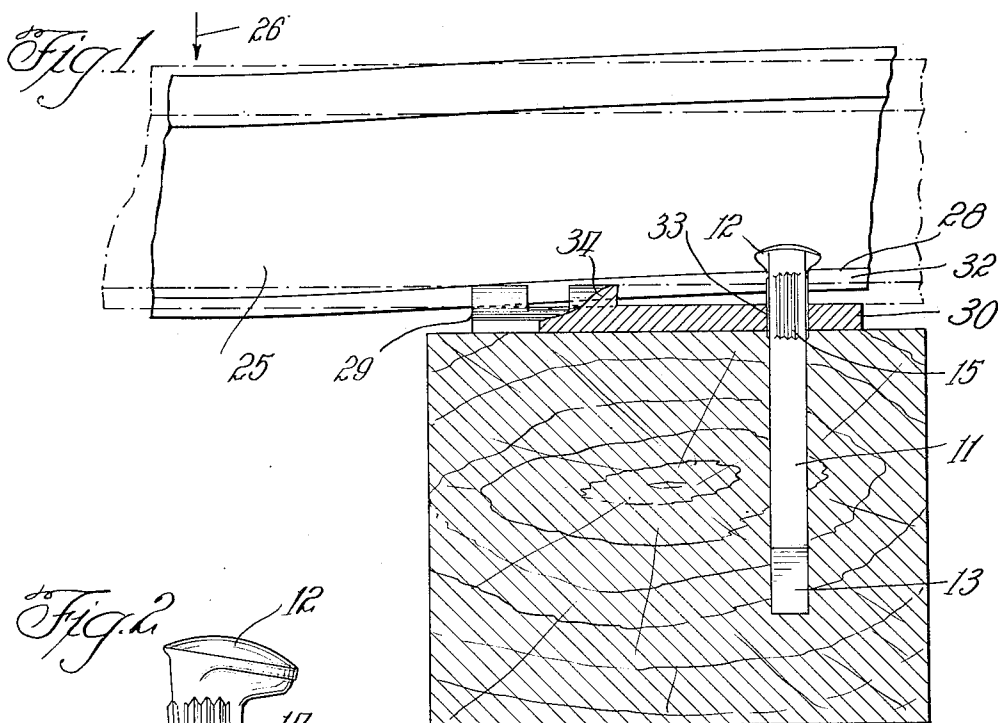
C. H. SANDBERG

2,401,967

TRACK SPIKES

Filed Feb. 19, 1946

3 Sheets-Sheet 1



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June 11, 1946.

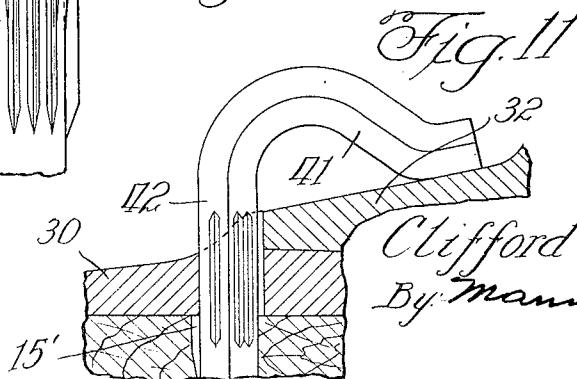
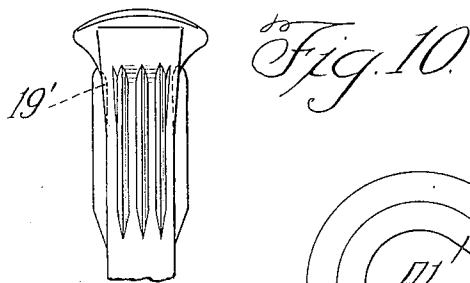
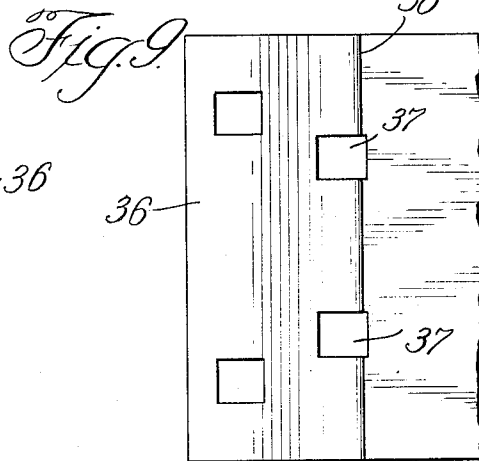
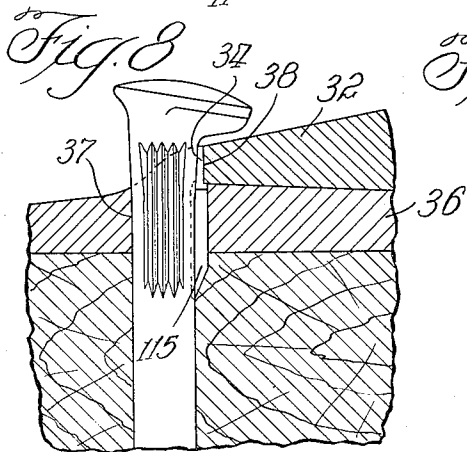
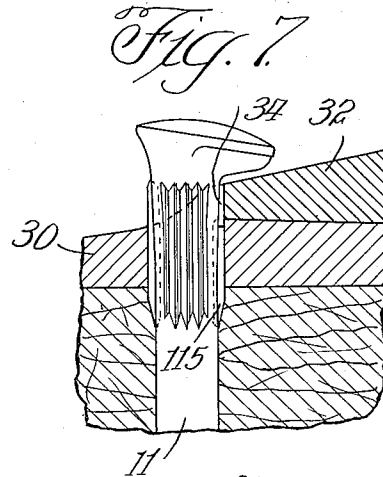
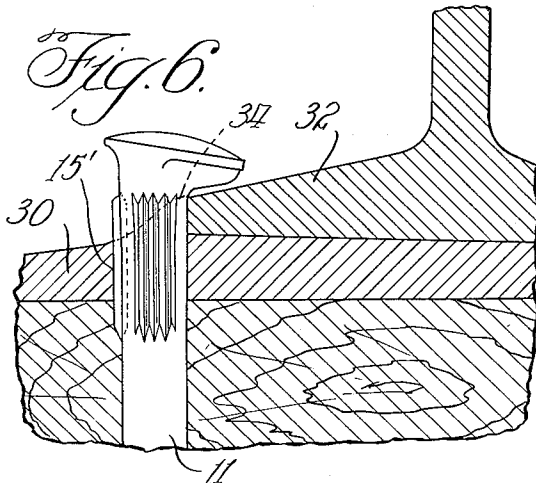
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TRACK SPIKES

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3 Sheets-Sheet 2



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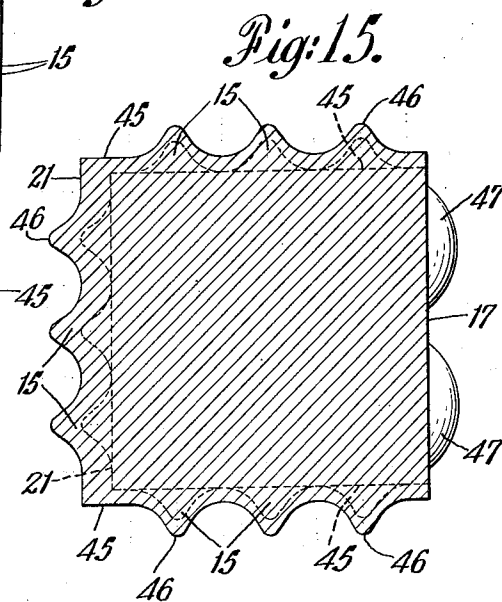
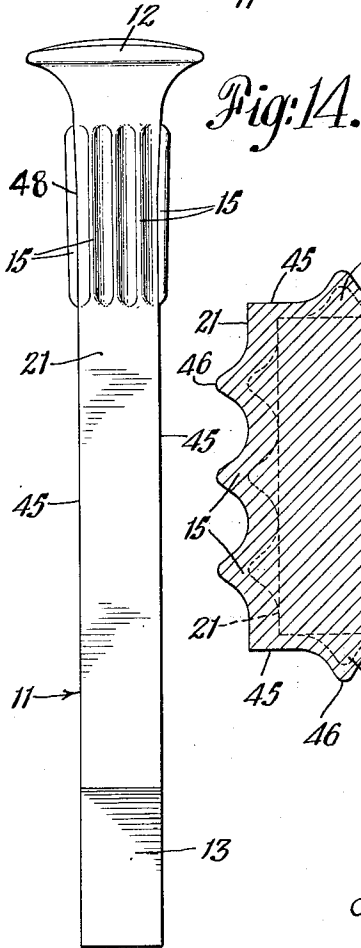
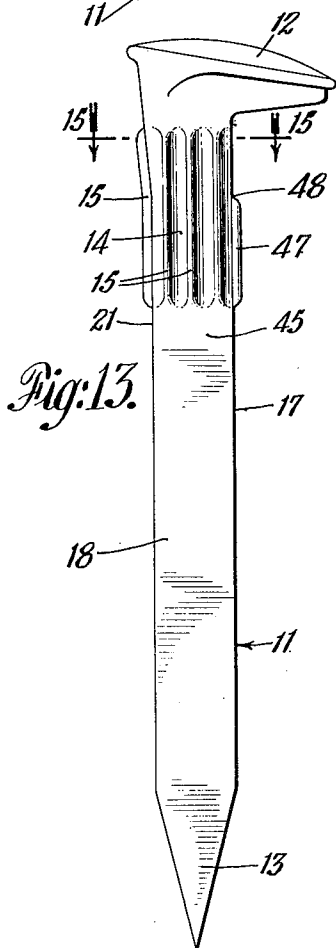
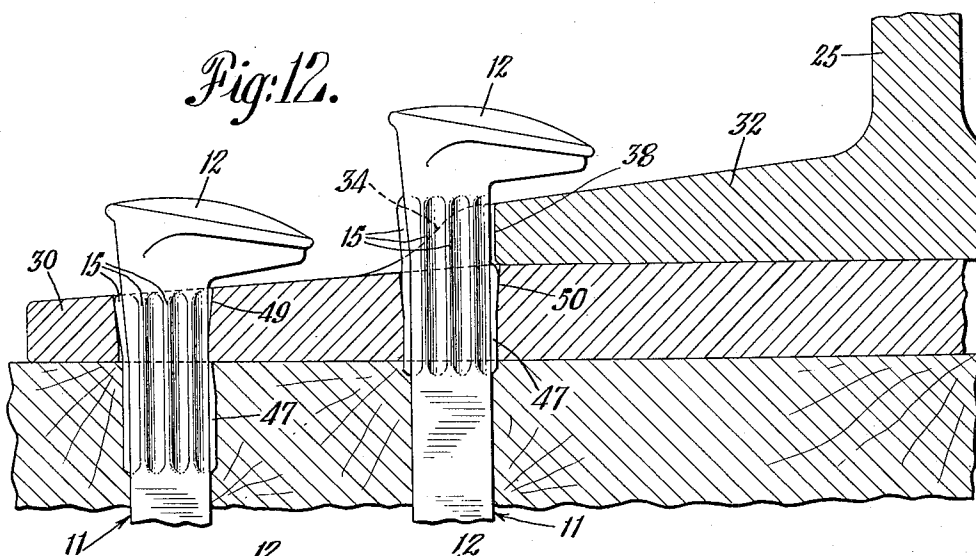
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2,401,967

TRACK SPIKES

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,401,967

TRACK SPIKE

Clifford H. Sandberg, Glenview, Ill.

Application February 19, 1946, Serial No. 648,604

24 Claims. (Cl. 238—366)

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This application is a continuation-in-part of application, Serial No. 464,039, filed October 31, 1942.

For many years, a great deal of attention has been given in the railroad industry to preserving the life of ties and holding the rails thereon in their proper positions. With modern high speed trains, the gauge or accurate spacing of the rails becomes all the more important and with high speed movement of freight trains and heavy locomotives, the forces to be resisted are increased.

It is the universal practice to place a tie plate between the rails and the ties to reduce the wear of the rail on the tie and to help withstand the forces involved. A train exerts lateral thrusts on a rail which may be either outwardly or inwardly, and there are also longitudinal forces involved. The lateral forces are mostly transmitted through the flange or base of the rail to a shoulder on the tie plate, thus tending to thrust the tie plate outwardly or inwardly, though there are some tilting forces also. At the present time, the better tie plates extend considerably beyond the rail and are provided with two spikes on each side of the rail so that theoretically four spikes would act in unison to hold the tie plates in place. Their acting in unison, however, is dependent upon their properly fitting the spike holes in the tie plate, for if three of them are loose while one of them is tight, only the tight one will initially resist the force tending to move the tie plate.

In an effort to provide proper fits between the spikes and holes, the spikes are tapered at the throat near their heads. It is a rare occurrence when this results in a proper fit between the spike and the hole for the tolerances allowed in manufacture of the plates and in manufacture of the spikes are such that the spike will usually be loose in the hole even when driven down to take full advantage of the increased size resulting from the taper.

It is impossible for the line spikes, namely those spikes adjacent to the rail, to remain driven all the way down. As the train runs over the rails, there is a "localized wave motion" in the rails which tends to rock the rail on each tie. Thus, as the wheels of the train approach the tie, they press the rail down on one side of the tie and inevitably cause the rail ahead of the tie to flex upwardly. It might be explained that this "localized wave motion" is not the simple up and down movement that nearly everyone has on occasion observed when a train goes by, and in which the whole rail and tie assembly is pushed down. The wave motion is a localized flexing of the rail

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and, when the downward motion is present also, might be said to be superimposed on this main downward motion. The forces involved in this localized wave motion are such that there seems to be no hope of enabling the spikes to resist it. In fact, one type of spike has been made with a shoulder on it so as to prevent the spike from being driven all the way home against the flange of the rail. With this spike, the head of the spike is spaced perhaps an eighth of an inch above the rail when it is driven as far as it will go. This is supposed to permit wave action of the rail without heaving the spike. Quite often, however, the spike is raised nevertheless by frictional contact between the edge of the rail flange and the front side of the spike (the side adjacent the rail). When the spike has thus been raised, the section crew must pound it down again. If the old type of spike is used, they will pound it all the way down and it will be raised about an eighth of an inch the first time a train goes by. The repeated raising and pounding of the spikes will "kill" the tie to the extent that a spike in that position becomes useless. The general practice has been to put spikes in only half of the spike holes in a tie plate so that after the wood adjacent these spike holes has been "spike-killed," the spikes could be shifted to the other holes.

According to the present invention, the raising of the spikes except by the amount necessary to accommodate the wave action, is prevented, and at the same time, a perfect fit between each spike and its hole is assured so that the lateral force exerted by trains through the rail to the tie plate is divided between all of the spikes in the tie plate. In this way, the tie plates can be effectively held against motion with respect to the tie and accordingly the gauge of the track may be accurately maintained and wear on the tie may be substantially eliminated or at least greatly reduced. Furthermore, the fit of the spikes in the tie plates is such that each spike is more effective in resisting movement of the tie plate than it would be if it were simply bearing against the appropriate side of the hole through which it extends. By maintaining the upper portion of the spike vertically disposed, a more severe flexing of the spike is required in order to permit the tie plate to move a given amount than if the upper portion of the spike would simply tilt to one side as the spike is flexed.

All of this is accomplished by the exceedingly simple and inexpensive change of providing flutes along the upper portion or throat of the spike, these flutes projecting far enough from the spike

to be sure to engage the opposite side of the spike hole and yet being deformable so that even with a tighter than ordinary fit, the spike can be driven through the hole. Preferably the flutes on the side of the spike adjacent the rail are rounded to eliminate any possible danger of nicking or otherwise injuring the rail and are shortened to facilitate driving the spike and to space the spike from the rail. The flutes not only enable the spikes to act in unison in resisting movement of the tie plate, but they also cause the spikes to be bound so firmly in the hole that they will not be pulled outwardly by the rubbing action of the flange of the rail up and down along the side of the spike. Of course the wave action of the rail will exert such a tremendous force on the spike head if it were initially driven down that the spike will be raised by the amount of the wave movement at the position of the spike. If it is not raised further, however, there will be no need to pound it down, and hence the wood will not be spike-killed.

Additional advantages and objects will become apparent from the following description and from the drawings in which

Fig. 1 represents the wave action of the rail when it is pressed downwardly at the left and consequently flexed upwardly at the right;

Fig. 2 illustrates one form of spike chosen for illustration of this invention;

Fig. 3 is a cross section taken approximately on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary cross sectional view on an enlarged scale showing the coaction of the ribs and the tie plate;

Fig. 5 illustrates the general track combination or assembly in which the spike of this invention may be used, showing one of the many suitable tie plates;

Figs. 6 to 8 show modified forms of the spike in use;

Fig. 9 shows an old style tie plate;

Fig. 10 shows another modified form of the spike;

Fig. 11 illustrates one application of this invention to a different type of track spike;

Fig. 12 is a transverse section taken through a track assembly, illustrating the preferred form of spike, the section being taken through both line and anchor positions, and indicating somewhat diagrammatically the manner in which the splines may be deformed when the spike is driven to position;

Fig. 13 is an elevation of the preferred form of spike viewed from the side;

Fig. 14 is an elevation of the preferred spike viewed from the rear; and

Fig. 15 is a cross section through the preferred spike taken on the line 15—15 of Fig. 13.

Preferred forms of the invention have been chosen for illustration and description, in compliance with Sec. 4888 of the Revised Statutes, but persons skilled in the art will readily perceive other means for accomplishing the same results, and the claims are, therefore, to be construed as broadly as possible, consistent with the prior art.

In the form of the invention chosen for illustration, the spike is a conventional standard cut track spike except as illustrated and described. Thus, it has a shank 11 and a head 12, the shank being tapered at its end as seen from the side to form the point 13. Above the tapered portion, the shank is preferably of uniform cross section except for the conventional taper at the upper portion 14 thereof and the provision of the flutes

or ribs 15 at the throat of the spike in accordance with this invention.

As best seen in Fig. 3, only three sides of the spikes are fluted, the front side 17 being left smooth. This is the side which faces the rail and it is left smooth so that there will be no danger, nor even an appearance of danger, of injuring the rail. Furthermore, it is desirable not to do anything more to increase the friction between the rail and the spike as the rail slides up and down along the spike as a result of the wave action in the rail previously described.

In fluting the spike, it is not necessary to add metal as compared to the present spike, although in the preferred form described below metal is added. As a result, the ribs 15 will project out from the normal surface 18 of the spike and channels 19 between the ribs will extend inwardly beyond the surface 18 an approximately equal degree. The ribs may extend approximately $\frac{1}{2}$ of an inch beyond the side surfaces 18 and the channels $\frac{1}{2}$ of an inch inwardly from the plane of the surfaces 18. In the case of the ribs 15 at the back 21 of the spike, however, when no corresponding ribs are provided on the front 17 of the spike, the ribs and channels may be twice as deep as on the side.

As the spike is driven through the tie plate into the tie it will, as at present, fit loosely in the hole in the tie plate until it is driven nearly all the way in. As it reaches the throat or point where the ribs 15 enter the hole in the tie plate, however, these ribs will usually cause the spike to engage all sides of the tie plate hole. In the case of the extreme tolerances permitted, this may not occur until the spike is approximately driven home to take advantage of the taper at 14, it being observed that the ribs follow the taper so that they take advantage of the increased cross section of the spike.

Usually, the ribs will be considerably deformed in the course of being driven through the tie plate since the fit will be much too close to accommodate them. Part of this deformation will be a permanent deformation either by pressing the ribs back in to fill the channels 19 or by shearing the ribs. Part of the deformation, however, will be a resilient deformation with the result that the ribs will be under compression within the tie plate hole and will firmly grip the tie plate. Because of being under compression within the holes, the part of the ribs which projects slightly below the tie plate will expand infinitesimally and will have a tendency to lock the spike against being drawn from the tie plate or at least to increase the force required to draw the spike.

As a result of this firm gripping of the spike by the tie plate, the mere friction of the rail rubbing on the front of the spike will not be able to raise the spike. Of course as illustrated in Fig. 1 when the car wheels depress the rail 25 to the left of the tie as indicated by the arrow 26, this will produce what is known as the wave action of the rail in which the portion of the rail at 28 will be raised, the rail flexing so as to permit this portion of the rail to rock as illustrated about a fulcrum zone in the vicinity of the edge 29 of the tie plate 30. Some tie plates are crowned to shift the fulcrum zone toward their center. The force of this wave action is great enough to raise the spike slightly unless the spike is left in a slightly raised position to allow for the wave action. With the spike in the slightly raised position, however, the con-

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tinued wave action rubbing on the front side 17 of the spike will not exert enough upward force on the spike to overcome the gripping action of the tie plate on the spike resulting from the provision of ribs 15 and hence the spike will not be further raised.

As a matter of fact, it is definitely preferred that these line spikes (the spikes adjacent the rail) be not driven quite all the way down against the rail but that a $\frac{1}{8}$ " space be left between them and the rail flange 32. To this end, they could, if desired, be so shaped that a shoulder thereon will strike the tie plate while the head is still say $\frac{1}{8}$ or $\frac{1}{4}$ of an inch above the flange. Such a spike, however, is less desirable for the hold-down positions 33 than a spike with the standard head. Accordingly, it is preferred that the illustrated spikes be used and that the snap or removable driving head of the air hammers which are conventionally used for driving spikes be recessed to receive the head of the spike. The recess should be deep enough so that the snap would come to rest on the rail flange 32 or the shoulder 34 of the tie plate while the spike head is still the desired $\frac{1}{8}$ or $\frac{1}{4}$ of an inch above the flange 32. The construction of this snap or driving head should preferably be such that when driving a spike in the anchor or hold-down position 33, it will not strike the tie plate but will drive the spike home.

It is not necessary that the spike bear against the rail at all and if it is found that under any particular conditions, the friction of the rail rubbing on the front of the spike is enough to raise the spike, this may be avoided by positioning the spike holes slightly spaced from the face of the shoulders 34 outwardly from the rail, so that the rail will bear against the shoulders 34 while it is still spaced slightly from the front of the spike.

With spikes made in accordance with this invention, all of the spikes which are used will cooperate to hold the tie plate 30 against movement, since all of them will have a tight bearing with the tie plate at all times. As a matter of fact, they will have such a tight engagement with the tie plate that the upper portion of the shank of the spike, the portion within the tie plate and slightly below the plate will be held in a vertical position. In order for the tie plate to move, the rigidly held portion of each spike projecting below the plate will have to move laterally in the tie and compress a substantial amount of the wood of the tie. With the upper and lower portions of the spike held vertically by the tie plate and tie, respectively, a compound flexing, or inflection point, must be induced between the vertical portions.

It has been common practice heretofore to use only half of the holes in the tie plate initially. In accordance with this invention, however, it is preferred, at least at curves and other places where the lateral forces are exceptional, that spikes be used in all of the holes. Thus with the larger tie plate such as shown in Fig. 5, this will permit the use of eight spikes. Tests indicate that the use of as many as six spikes, all of them fully effective in holding the tie plate in position, will so completely prevent lateral movement of the tie plate that there will be substantially no wear on the tie. Furthermore, there is no danger of "killing" the wood by driving the spikes repeatedly since in accordance with this invention, the wave action of the rail will never raise the spikes high enough to require their being re-

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pounded (and will not raise them at all if they are left $\frac{1}{8}$ " up.)

It is not necessary that any change be made in the steel now used for the spikes or the tie plates. According to the present practice on some railroads, the spike is about .4 per cent carbon steel and the plates (and the rail) are about .6 per cent to 1.0 per cent carbon steel. With this relationship, the ribs on the spike will be deformed by the plate as the spike is driven, rather than cutting into the plate. This works satisfactorily although it would also be satisfactory to have the ribs cut into the tie plates.

A standard spike with which this invention may be used is $\frac{3}{8}$ of an inch square in cross section below the taper and the taper is $\frac{1}{4}$ of an inch on each side in the upper one-half inch of the shank. A tolerance of $\frac{1}{16}$ inch plus or $\frac{1}{16}$ inch minus is permitted. The ribs may be 1" long as this will permit them to project slightly below the bottom of the tie plate even when they are in the line position. It is preferred not to have the ribs extend any further into the tie than is necessary in order to have them extend slightly beyond the tie plate.

Although the ribs may follow the taper at the head of the shank of the spike, this is not essential so long as the ribs extend far enough out to be sure to firmly engage the sides of the holes when the holes are in the ranges that can result from the allowed tolerances. As a matter of fact, there may be some advantage in having the ribs extend straight down from their upper portions so that they will project further at their lower portions as at 15' in Fig. 6. This would insure their engaging the tie plate firmly throughout the depth of the tie plate.

Although a standard spike shape except for the ribs may be used, partly for the purpose of facilitating adoption by the railroads, the taper at the top of the shank may be omitted, at least at the front of the spike, so as to minimize the tendency of the rail to raise the spike by rubbing on the front side of the spike.

Although as previously stated, that part of the front side of the spike which contacts the rail may be smooth, there is really no danger that the ribs on the spike will damage the rail if, as here contemplated, the rail is considerably harder than the spike. Accordingly, it may be desired to provide ribs 115 on the front face of the spike as shown in Figs. 7 and 8. Preferably these ribs will be positioned entirely below the rail, as shown in these figures, so as to tend to leave a little clearance between the rail and the front side of the spike. Fig. 7 illustrates this type of spike as used in a tie plate of the type now being purchased by some railroads in which the front edge of the spike hole is flush with the front face of the shoulder 34.

Fig. 8 illustrates a similar spike used with tie plates 36 which are still in use in large numbers in which the line-spike holes 37 extend slightly beyond the face 38 of the shoulder 34, as seen in Fig. 9. For use in this type of tie plate, the spike may be provided with ribs 115 on its front face which have twice the height of projection of the ribs on its side faces. In this case, it will be observed that the ribs extend slightly under the rail but that a little clearance is nevertheless left between the rail flange and the front side of the spike. Since the holes in these tie plates are a little oversize in the front and back direction, it may be desirable to have ribs on the back side of the spike of the same height of projection as those

on the side of the spike in addition to the ribs of twice the height of projection on the front side of the spike.

Fig. 10 illustrates a slightly different form of spike in which there are no indentations within the $\frac{5}{8}$ " cross section of the spike. When the spikes are made from $\frac{5}{8}$ " bar stock, it is probable that they can be formed more readily, or at least with simpler forging dies if no indentations have to be formed into this $\frac{5}{8}$ " bar stock. It will be observed that the channels 19 extend inwardly from a tapered portion of the spike sides, but this is possible without indenting the $\frac{5}{8}$ " bar. With this form of spike, it is believed that the ribs can be formed without any additional steps at the same time that the head 12 and tapered portion 14 are formed. The provision of channels, at least to the extent shown in Fig. 10, is in some cases desired in order to be sure that the spikes do not jam in a close fitting hole to prevent their being driven the proper depth. Shop and field tests indicate that there is no danger of jamming until the ribs have been so sheared off or deformed that their heavy bases directly engage the walls of the hole.

It will be observed that in all of Figs. 6-8 and 10, the ribs are more gradually tapered at their lower portions than in Fig. 2. This will insure smooth entry of the ribs into the spike holes and will tend to provide better equalization of the distortion of the ribs on opposite sides of the spike. Of course the ribs may be of any shape desired.

The invention can be used with other types of spikes, as for example, the type known as the "elastic" spike shown in Fig. 11 in which the upper portion 41 of the spike, which could be considered the head, extends upwardly from shank 42 and curves over and down to the rail flange so as to provide a resilient portion that bears on the rail flange. The ribs on this spike would not only hold it tight but also provide an indication of how far it should be driven. The ribs may be the same as illustrated heretofore. Fig. 11, however, illustrates a somewhat different application of this invention to the elastic spikes. In this figure, the back ribs 15 terminate with horizontal upper ends just below the tie plate. The reaction of the spring portion 41 tends to thrust the shank of the spike outwardly so that these back ribs lock under the tie plate. It is important for this latch to be fluted in cross section, as in the case of the ribs in Fig. 3 so that in the case of a close fitting hole, they may be deformed or sheared off to the extent necessary to pass through the hole.

Referring now to Figs. 12 to 15 which illustrate the preferred form of spike, it will be noted that the ribs or flutes 15 on the side faces 45 and on back face 21 have relatively thick bases with relatively sharp ridges 46 with rounded tops, the valleys between the flutes being of a gentle concave nature. The flutes 47 on the front face 17 are two in number as against three on each of the side and back faces. The front flutes 47 have gently rounded ridges and extend along the lower portion of the throat 14 only, terminating at the midpoint 48 of the throat. The length of the front flutes 47 and the length of the smooth part of the front face above the flutes preferably correspond to the thickness of the tie plate 30 so that, when in the line position, the front flutes 47 bear against the walls of the tie plate hole while, when in anchor position, they lock under the tie plate, both as shown in Fig. 12.

In the preferred form, the body of the spike throat at the front face 17 is straight and the front flutes 47 are also straight. Both body and flutes at the back face 21 are straight up to the midpoint 48 of the throat and then tapered, the flutes being tapered at the same angle as the body surface. The body at the side faces 45 is straight to the midpoint 48 of the throat and then tapered, while the flutes at the side faces taper for the entire extent of the throat. The angle of body taper of the back face is twice that of the side faces. The flutes are formed entirely above the surface of the shank body 18, there being no indentation into the body.

The holes in conventional tie plates are usually somewhat larger at the top than at the bottom, as illustrated in Fig. 12. This difference in size is caused by the punching operation during manufacture. The tie plate holes are punched from the bottom, the punching operation tearing the metal at the top a little more than at the bottom of the hole. The taper usually does not extend the entire depth of the hole but the hole is usually of more or less uniform size from the bottom of the tie plate to a point midway the thickness of the plate from which point the taper starts and continues to the top of the plate. The holes 50 for the line spikes, passing through the tie plate shoulder 34 and therefore being somewhat longer, naturally have more flare than the anchor spike holes 49. The front face 38 of tie plate shoulder 34 is in line with the bottom of line spike hole 50.

Thus the upwardly flaring spike holes 49 and 50 further facilitate the entry of the splined throats when the spike is driven. In the line spikes the upper portions of the back splines and the smooth front face do not play any part in the gripping of the spike in the hole but the upper portions of the side splines are available to grip the walls of the part of the hole passing through the tie plate shoulder 34. The splines on all four faces are available to grip the walls of that part of the hole passing through the body of the plate. In other words, in line position the main gripping action takes place between the parts of the splines below the midpoint of the throat with the assistance of those parts of the side splines above the midpoint engaging the part of the hole passing through the tie plate shoulder 34.

The main gripping action of the spike in anchor position takes place between those parts of the splines above the midpoint of the throat and the walls of the hole. The parts of the splines below the midpoint do not directly engage the walls of the hole but due to their resilience, tend to spring out elastically under the lower surface of the tie plate to provide a locking effect, this effect being emphasized by the shortened front splines which provide a positive shoulder engaging under the tie plate.

The thicker bases of the flutes provide additional material to compensate for looseness of the spike in the tie plate hole due to manufacturing tolerances and also provide increased strength. The cross sectional area of the spike at the flutes is greater than the normal area of the body of the spike. The relatively sharp flutes, on the other hand, facilitate deformation or shaving off of the flutes as the spike is driven home and the rounded tops of the ridges provide substantial material to bear against the tie plate hole even when the hole is relatively large and there is comparatively little deformation or shaving off of the flutes.

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The rounded ridges on the front face flutes 47 minimize possible nicking of the rail although, as stated above, damage to the rail even with sharp flutes is remote because the spikes are of softer material. The shorter length of the front flutes provides clearance at the upper part of the throat where both the body and the side and back flutes flare somewhat. These short front flutes 47 facilitate driving the anchor spikes all the way down and provide increased locking effect on the anchor spikes by their upper ends engaging under the tie plate as shown in Fig. 12.

The front flutes help space the line spikes from the rail and provide increased engagement with the tie plate hole when used in this position. The line spike has positive engagement between its flutes and the bottom of the tie plate hole, even if the hole be slightly oversize, and has a more solid fit in the hole even if the flutes on the side faces should not in some cases bear at the top of the tie plate shoulder 34.

The increase in depth from the front face to outside of the back flutes at the top of the throat compensates for absence of front flutes at the top of the throat, thus helping to provide firm engagement of the spike on all walls of the hole in anchor position.

The exact dimensions of the spike will, of course, vary with the requirement of the several railroads and with different conditions. In the preferred form which is based upon a standard spike and which has been found satisfactory, the standard shank dimensions of $\frac{5}{8}$ of an inch square in cross section below the throat are retained. A tolerance of $\frac{1}{32}$ of an inch plus and $\frac{1}{44}$ of an inch minus is commonly permitted for these dimensions. Spikes of this size are commonly used with tie plates whose square spike holes have a nominal dimension of $\frac{11}{16}$ of an inch square with a tolerance of $\frac{1}{32}$ of an inch plus and $\frac{1}{32}$ of an inch minus. However, the holes will usually run from nominal to large tolerances. These measurements are taken at the bottom of the holes.

The back and side splines of the preferred form may be of about $1\frac{1}{4}$ inches full height length while the front splines may be $\frac{5}{8}$ of an inch in full height length. The side taper of the body may run $\frac{1}{32}$ of an inch on either side. The back taper of the body may run about $\frac{1}{16}$ of an inch. The front face of the body at the throat is straight. The dimensions across the sides of the throat measured from the ridges of the splines—at the bottom of the throat may run $\frac{12}{16}$ of an inch, at the top of the throat may run $\frac{13}{16}$ of an inch. The dimension across the throat from the front face to the back face—measured from the ridges of the splines at the bottom of the throat, may run $\frac{12}{16}$ of an inch, measured from the smooth front face to the ridges of the back splines at the top of the throat may run $\frac{12}{16}$ of an inch. These spline dimensions are minimum dimensions.

It is common practice to pre-bore wooden railway ties, both soft wood and hard wood. It is preferred that all of the forms of spike discussed above be used with ties having pre-bored holes. It is not necessary, however, for the holes to be pre-bored since tests have shown that these spikes may be driven into solid wood of a hard wood tie.

From the foregoing, it is seen that I have provided an improved track spike which is firmly gripped by the tie plate so that if slight clearance is left between the spike head and the rail, the

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friction resulting from the wave action of the rail and consequent rubbing of the rail against the front face of the spike will not raise the spike. Furthermore, the gripping of the spike by the tie plate makes the spike more effective in holding the tie plate in position. This is especially true with regard to a plurality of spikes since all will cooperate to resist the initial movement of the tie plate. Also due to the fixed condition of the spike in the tie plate, a compound flexing is induced on movement of the tie plate which gives the spikes more power to resist movement of the tie plate in any direction. The spike can incorporate all the features of conventional spikes and it can be made with little or no additional cost.

What is claimed is:

1. A track spike including a shank, a head, and a plurality of ribs extending longitudinally along the portion of the shank below the head and projecting from the shank to ensure firm engagement between the spike and the tie plate, the side of the spike shank which is adapted to lie against the rail being free of said ribs, most of that portion of the shank adapted to engage the tie also being free of said ribs.

2. A track spike including a shank, a head, and a plurality of ribs extending longitudinally along the portion of the shank below the head and projecting from the shank to ensure firm engagement between the spike and the tie plate, the side of the spike shank which is adapted to lie against the rail being free of said ribs, the adjacent sides both being ribbed and the fourth side being provided with ribs of approximately twice the height of projection of the ribs on said adjacent sides, the metal in said ribs being softer than that of conventional .6% carbon steel tie plates.

3. A track spike including a shank, a head, and a plurality of ribs extending longitudinally along the throat portion of the shank below the head and projecting from the shank a sufficient distance to ensure firm engagement between the spike and the tie plate, that portion of the shank below said throat portion being free of said ribs.

4. A track spike including a shank and a plurality of deformable projections projecting laterally beyond the main body of the shank at the top portion thereof and adapted to engage a tie plate to ensure gripping of the spike by the plate, and rail engaging means carried by the spike above the projections and adapted, when the projections are properly engaged in the hole of a tie plate, to retain a rail approximately flat on the tie plate but to permit it to rise slightly therefrom, the side of the shank of the spike adjacent the rail being smooth.

5. A track spike including a shank and a plurality of deformable projections projecting laterally beyond the main body of the shank at the top portion thereof and adapted to engage a tie plate to ensure gripping of the spike by the plate, and rail engaging means carried by the spike above the projections and adapted, when the projections are properly engaged in the hole of a tie plate, to retain a rail approximately flat on the tie plate but to permit it to rise slightly therefrom.

6. A track spike including a shank and a plurality of deformable projections projecting laterally beyond the main body of the shank at the top portion thereof and adapted to engage a tie plate to ensure gripping of the spike by the plate, one side of the spike shank being smooth for facing the rail.

7. A track assembly including a tie, a tie plate

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resting thereon and having a shoulder, a rail resting on the tie plate against the shoulder, and a plurality of spikes each extending through a hole in the tie plate and each having a plurality of projections thereon squeezed against the side of the hole, whereby all of said spikes cooperate to resist any movement of the tie plate along the tie.

8. A track spike including a shank and a plurality of deformable projections projecting laterally beyond the main body of the shank at the top portion thereof and adapted to engage a tie plate to ensure gripping of the spike by the plate, said shank having indentations extending into its main body adjacent to said projections and the portion of one side of the shank adapted to be beside the rail flange being smooth.

9. A track spike including a shank and a plurality of deformable projections projecting laterally beyond the main body of the shank at the top portion thereof and adapted to engage in a tie plate hole to ensure gripping of the spike by the plate, said shank having indentations extending into its main body adjacent to said projections, said shank being sufficiently small below said projection to pass freely through said hole.

10. A track spike including a shank, a head, and a plurality of ribs extending longitudinally along the portion of the shank below the head and projecting from the shank to ensure firm engagement between the spike and the tie plate, the portion of one side of the spike shank which is adapted to lie adjacent to the rail flange being free of said ribs, most of that portion of the shank adapted to engage the tie also being free of said ribs.

11. A track spike including a shank portion, a resilient rail-engaging portion extending upwardly from the shank portion and curving around to bear on the rail and a plurality of deformable projections on the side of the shank portion opposite from the rail having substantially horizontal top faces adapted to lie just below the tie plate so that, under reaction of the resilient portion bearing against the rail, the portions of the ribs remaining after being forced through the tie plate hole will tend to slip under the tie plate to lock the spike in the tie plate.

12. A track spike including a shank portion and a projection on one side having a substantially horizontal top face so positioned longitudinally of the spike that in use it will lie just below the tie plate, and means tending to shift the spike relatively to the tie plate in the direction of said projection to push the projection under the tie plate whereby it will lock the spike therein.

13. A track spike for tie plates in which manufacturing tolerances permit certain maximum and minimum dimensions for the spike holes therethrough including a shank, a head, and a plurality of ribs extending longitudinally along the portion of the shank below the head and projecting from the shank, a transverse dimension of the spike and its ribs corresponding to the location of the tie plate exceeding the corresponding of said maximum dimensions of the tie plate hole to insure firm engagement between the spike and the tie plate, transverse dimensions of the spike corresponding to the location of the tie being no greater than the minimum dimensions of the tie plate hole to insure free passage through the tie plate hole.

14. A track assembly including a tie, a tie plate thereon having a hole, a fluted spike of metal softer than the tie plate, the fluted portion of said spike having greater transverse dimensions than

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said hole, said spike being firmly gripped at its fluted portion by the walls of the tie plate hole and positioning the tie plate on the tie, and a rail resting on the tie plate with its flange under the spike head.

15. A track assembly including a tie, a tie plate thereon having a spike hole, a fluted spike of metal softer than the tie plate, the fluted portion of said spike having greater transverse dimensions than said hole, said spike being firmly gripped at its fluted portion by the tie plate by being held in a state of elastic compression by cooperation between said flutes and the opposite walls of said hole and positioning the tie plate on the tie, and a rail resting on the tie plate with its flange under the spike head.

16. The combination of a tie plate having a hole therethrough and a spike of metal softer than the tie plate extending through the hole, projecting downwardly from the tie plate for engagement with a tie and having ribs projecting from the spike and extending longitudinally thereof, said spike ribs, before the spike is driven into the hole, extending beyond the edges of the hole whereby said spike is firmly gripped by the tie plate by being held in a state of elastic compression by opposite walls of the hole, at least one of which walls bears on the ribs, said ribs expanding above and below the top and bottom edges of the hole.

17. A track spike including a shank and a plurality of deformable projections projecting laterally beyond the main body of the shank at the top portion thereof and adapted to engage a tie plate to insure gripping of the spike by the plate, the dimensions of the spike adapting it to be firmly gripped by engagement of said projections and the opposite spike wall with opposite walls of the hole of a tie plate and adapting the main body of the shank below said projections to pass through said hole without substantial resistance.

18. A track assembly including a tie, a tie plate resting thereon and having a spike hole, a rail resting on the tie plate, a spike of softer metal than the tie plate extending through said hole, said spike having a head, a throat with longitudinal ribs and a shank, said ribbed throat having greater transverse dimensions than said hole before the spike is driven, said spike being firmly gripped at its ribbed throat by the walls of the tie plate hole so as to fixedly position the tie plate on the tie, said head being spaced above the base flange of the rail to allow for wave motion of the rail with respect to the tie plate, the gripping of said spike by said tie plate preventing lateral movement of said spike in said hole, the gripping of said spike by said tie plate and the spacing of said head above said base flange operating to prevent said wave motion from raising said spike in said hole.

19. A track assembly including a tie, a tie plate resting thereon having a spike hole, a rail resting on the tie plate, a spike having a head, a throat with yieldable projections thereon and a shank, said throat having greater transverse dimensions than said hole before the spike is driven, said spike being firmly gripped at its throat by the walls of the tie plate hole so as to fixedly position the tie plate on the tie, said head being disposed over the base flange of the rail, said assembly having provision to accommodate wave motion of said rail with respect to said tie plate, the gripping of said spike by the tie plate preventing lateral movement of said spike in said hole and operating to prevent upward movement

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of said spike in said hole under normal track movement.

20. A track spike including a shank, a head and a plurality of ribs with curved edges extending longitudinally along the throat portion of the shank below the head and projecting from the shank a sufficient distance to insure firm engagement between the spike and the tie plate, that portion of the shank below said throat portion being free of said ribs, said ribs having gently concave valleys therebetween of substantially greater radius of curvature than that of said rib edges to provide relatively thick bases and relatively sharp ridges.

21. A track spike including a shank, a head and a plurality of ribs extending longitudinally along the throat portion of the shank below the head and projecting from the shank a sufficient distance to insure firm engagement between the spike and the tie plate, that portion of the shank below said throat portion being free of said ribs, the ribs on at least one face extending throughout the entire length of the throat, the ribs on another face extending throughout the lower portion only of the throat so that their upper edges are engageable under the tie plate.

22. A track spike including a shank, a head and a plurality of ribs extending longitudinally along the throat portion of the shank below the head and projecting from the side, back and front faces of the shank a sufficient distance to insure firm engagement between the spike and the tie plate, that portion of the shank below said throat portion being free of said ribs, the back and side ribs extending throughout the entire length of the throat, the ribs on the front face extending throughout the lower portion only of the throat, said front ribs being engageable in the tie plate hole to relieve the smooth front face from the base flange of the rail when the spike is in line position, said front ribs having their upper ends engageable under the tie plate and acting as locking ribs when the spike is in anchor position.

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23. A track assembly including a tie, a tie plate thereon, a rail comprising a web and a base flange resting on the tie plate, said tie plate having a plurality of rectangular holes for line and anchor spikes, a plurality of spikes each extending through one of said rectangular holes, each spike having a head, a rectangular shank having a throat and a plurality of ribs extending longitudinally along all faces of said throat, the back and side ribs extending throughout the entire extent of the throat, the front ribs extending throughout the lower portion only of the throat, each line spike having its head disposed above the base flange and its side and front and back ribs tightly engaging against the walls of its tie plate hole, each anchor spike having its side and back ribs engaging the walls of its tie plate hole and the upper edges of its front ribs disposed under the tie plate.

24. A track assembly including a tie, a tie plate thereon and having a shoulder, a rail comprising a web and a base flange resting on the tie plate with one edge of said base flange against the shoulder, said tie plate having a plurality of rectangular holes for line and anchor spikes, a line spike hole passing through said shoulder, a plurality of spikes each extending through one of said rectangular holes, each spike having a head, a rectangular shank having a throat and a plurality of ribs extending longitudinally along all faces of said throat, the back and side ribs extending throughout the entire extent of the throat, the front ribs extending throughout the lower portion only of the throat, each line spike having its head disposed over and spaced above said base flange and its side and front and back ribs tightly engaging against the walls of its tie plate hole, each anchor spike having its side and back ribs engaging the walls of its tie plate hole and the upper edges of its front ribs disposed under the tie plate.

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