Nov. 27, 1962 H. J. M. RIGBY 3,065,914

SUPPORTING OF RAILWAY AND LIKE RAILS

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Fig. 1.

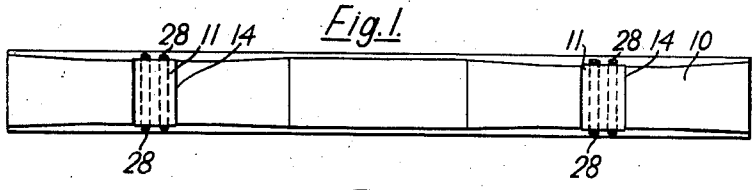


Fig. 2.

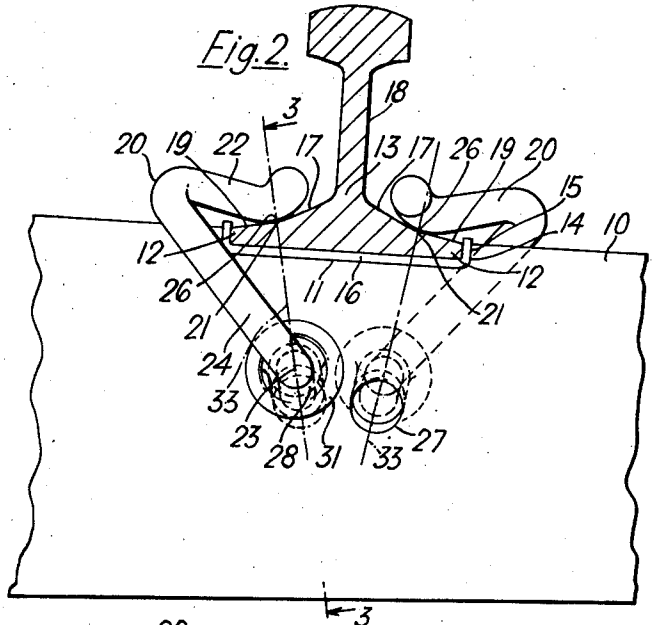
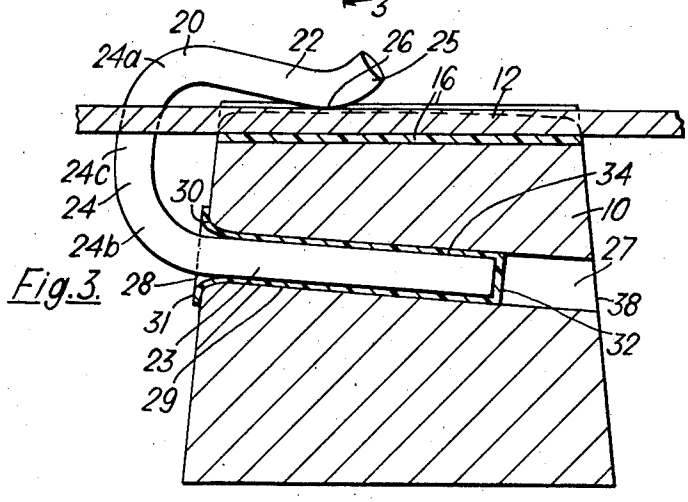


Fig. 3.



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Fig. 5.

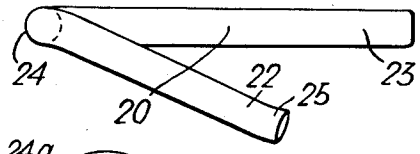


Fig. 4.

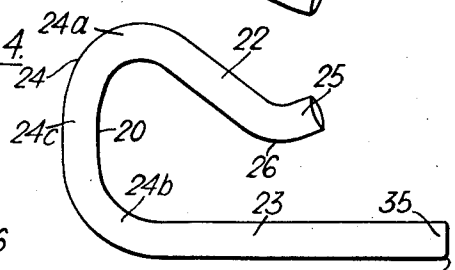


Fig. 6.

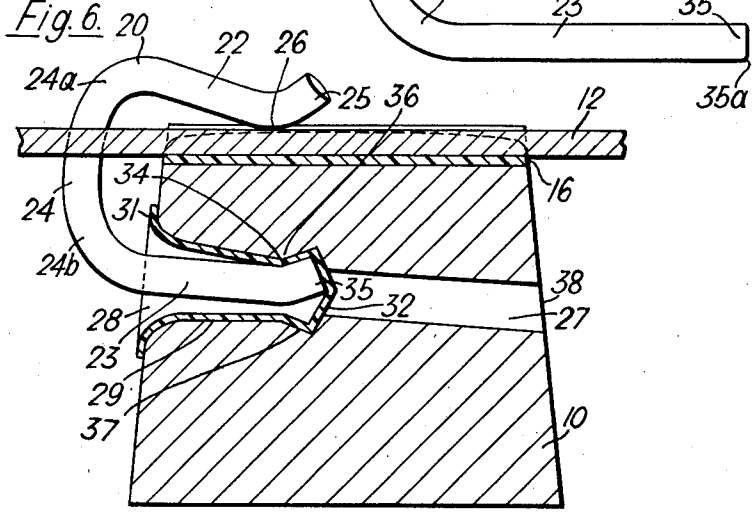
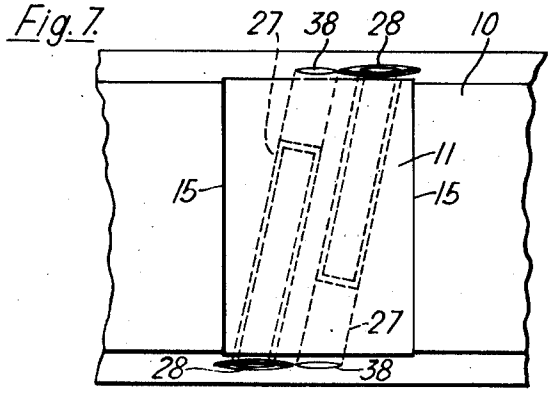


Fig. 7.



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Fig. 8.

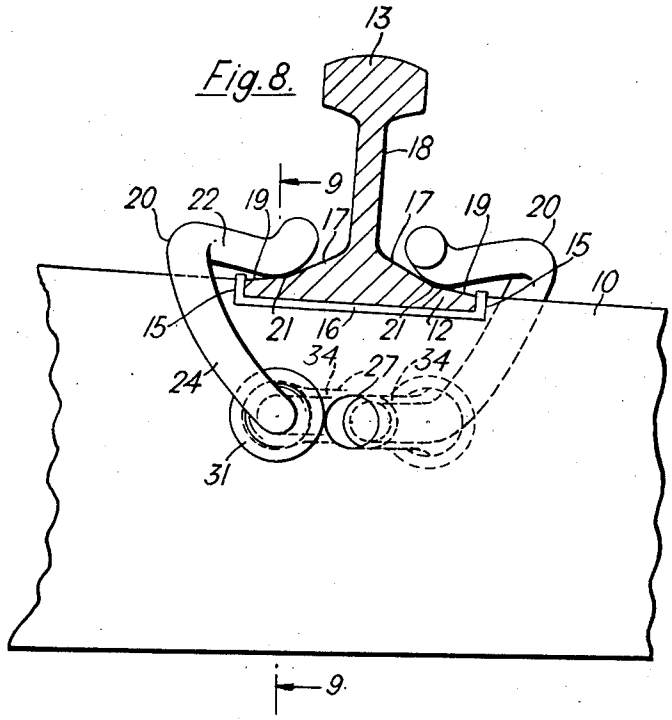
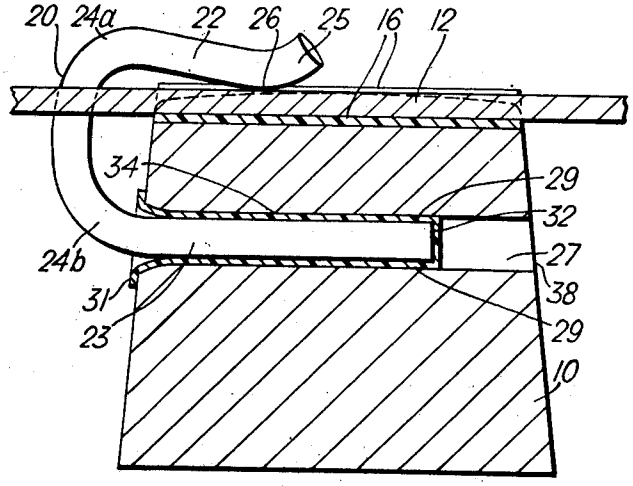


Fig. 9.



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By Kurt Kelman

Agent

United States Patent Office 3,065,914 Patented Nov. 27, 1962

3,065,914

SUPPORTING OF RAILWAY AND LIKE RAILS

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Filed May 24, 1961, Ser. No. 112,361
8 Claims. (Cl. 238—349)

This invention relates to a new or improved support for flange footed railway and like rails, for example, tramway rails, all hereinafter referred to and included within the term "rails."

The invention has been developed primarily for the supporting of rails on concrete sleepers, but in its widest aspect the invention is considered to be applicable to hardwood and other timber as well as steel sleeper rail supports.

The invention is concerned with that kind of rail support, herein referred to as "the kind specified," in which the support embodies a resilient clip comprising upper and lower arms connected resiliently together, so that the two arms are spaced relatively apart, the lower arm of the clip being adapted for pressure engagement with the sleeper and the upper arm being adapted resiliently to apply holding down pressure to a rail flange to secure or assist in securing the rail to the sleeper, the arrangement being such that the clip can be displaced relative to the sleeper between a rail securing and a release position, to permit of rail removal when required.

Railway rail supports of kind specified as hitherto proposed or constructed, have usually been adapted to be positioned into their rail securing position by driving them in a direction transverse to the length of the rail, i.e. in a direction parallel or substantially parallel to the length of the sleeper and in order that the clip may be effectively and simply retained in its rail securing position, it is further necessary that the clip should be driven in a more or less horizontal direction substantially parallel to the underside of the rail foot formed by the flanges at each side of the rail web, and in consequence of the foregoing it is usually necessary in the case of a concrete or timber sleeper for this to be provided with a separate base plate having a hole or other opening extending in a substantially horizontal direction, substantially parallel to the length of the sleeper to receive the lower arm of the substantially horizontally driven clip, the upper surface of which opening provides an abutment for engaging with the upper side of the lower arm of the clip to retain this effectively in rail securing position.

Such an arrangement is described, for example, in the specification of my prior United States Patent No. 2,954,-169.

The present invention has for its object to provide a new or improved form of rail support of the kind specified, which enables the separate base plate to be dispensed with, especially in the case where the sleeper is formed of concrete or hardwood timber, so that an important saving in manufacturing cost of the rail support may thereby be effected.

According to the present invention, I provide a rail support of the kind specified which is characterised by comprising the following features in combination, namely:

(*i*) The sleeper is provided with a lower clip arm receiving opening which extends from a lateral, i.e. side face of the sleeper in a direction transverse to the length of the sleeper, the upper side of which opening constitutes a lower clip arm engagement abutment.

(*ii*) The clip is so shaped as during both its positioning and removal movement as well as in its rail securing position, as to have its connecting portion spaced transversely of the so engaged rail flange.

(*iii*) The lower clip arm engaging abutment is so formed in relation to the configuration of the upper face

of the engaged rail flange, and the upper and lower clip arms are so relatively shaped, as to effect displacement of the two clip arms relatively apart, stressing the connecting portion of the clip as the clip is driven into rail securing position.

(*iv*) The upper clip arm is spaced out of engagement with the upper surface of the sleeper so as to be adapted to apply holding down pressure only to the rail flange.

(*v*) The lower clip arm abutment of the sleeper opening is disposed to one side of, namely on the rail web side of, a vertical plane parallel to the length of the rail and passing through the position of engagement between the upper clip arm and the rail flange, by a distance from such vertical plane as to ensure that any disengaging movement of the upper arms in a direction away from the rail web, is accompanied by relative movement apart of the two clip arms so that the upper clip arm is effectively retained in the desired rail securing position, irrespective of the downward sloping of the rail flange in a direction away from the rail web.

A rail support in accordance with the foregoing broadest aspect of the present invention possesses the following advantages:

(1) Feature (*i*) permits of the clip being readily engaged with the sleeper without the necessity of providing a separate base plate, since a lower clip arm receiving opening can readily be provided at a lateral side face of the sleeper, permitting of the clip being driven into position by movement which is substantially horizontal or which has its major component horizontal.

(2) Feature (*ii*), namely that the clip has its connecting portion spaced transversely of the rail flange, permits of the clip being freely driven and removed.

(3) Feature (*iii*) ensures that the rail securing pressure is achieved principally by subjecting the clip to simple bending stress, although the clip may be subjected to some torsional stress as well, the arrangement permitting of the clip being formed in a simple manner from a length of resilient metal bar, preferably of round section.

(4) Feature (*iv*) ensures that the whole of the stress developed in the clip can be employed in securing the rail in position.

(5) Feature (*v*) ensures that the clip is stable when in the fully driven position and there is no tendency for the clip to disengage from the rail flange by moving out of the designed rail securing position in a direction away from the rail.

With a rail support as above described, there will be a considerable frictional resistance between the lower arm of the stressed clip and the said sleeper opening abutment which usually will be fully effective in retaining the lower arm of the clip against any tendency for disengaging movement relative to the sleeper, but if desired, that part of the opening which receives the free end or extremity of the lower clip arm may have its abutment surface recessed or sloped upwardly in the direction of driving so as to provide a downwardly directed shoulder past which the free end of the lower arm of the clip must be displaced to effect clip withdrawal with consequent expansion of the clip beyond the already expanded rail securing position, whereby any tendency for the lower arm of the clip to withdraw in this way, is effectively resisted.

Generally, however, it will be found satisfactory for the abutment provided by the upper side of each opening to be straight throughout the length of the opening, for example, by forming each opening as a plain hole.

In this last arrangement, each hole would preferably be inclined to the horizontal in a downward direction from a position adjacent the connecting portion of the clip towards the free end of the lower clip arm so as thereby to assist in expanding the clip as this is driven into position.

In such an arrangement, for convenience in manufacture, as well as to facilitate the removal of any liner provided for the hole, this may extend between opposite lateral faces of the sleeper.

In the case where the sleeper is formed in concrete, each of the said holes are preferably provided with a liner to protect the surface of the concrete, which liner would be formed of an electrically insulating material where track circuiting of the rails is provided. The mouth or entry end of such liner may be outwardly flared to facilitate the initial positioning of the lower clip arm within the hole.

The invention further comprises a clip for securing a railway rail to a sleeper, said clip being formed from a single length of resilient metal bar shaped to provide spaced apart upper and lower sleeper and rail flange engaging arms, joined integrally together at one end by a connecting portion, said two arms extending on the same side of the connecting portion and being disposed closer together adjacent their free ends than adjacent their connecting portion, said connecting portion adjacent to the junction with the upper arm of the clip and the upper arm at a position adjacent said junction being each disposed to one side of a plane which passes through the central longitudinal axes of the two arms at a position adjacent the rail and sleeper engaging portions near the free ends of the two clip arms, the arrangement being such that the clip is adapted to be driven in a direction substantially longitudinally of the rail with the lower arm engaging within an opening extending through the lateral face of the sleeper to a position beneath the rail seat, with the upper free end of the arm in engagement with the rail flange and with the remainder of the upper arm and the said connecting portion spaced away from, so as to be out of contact with, the upper face of the sleeper and rail flange respectively.

Preferably the connecting portion is of substantially straight configuration medially of its length, being of curved configuration where it merges at each end thereof into the adjacent end of the upper and lower arm respectively.

Such a form of connecting portion as opposed to a simple semi-circular connecting portion, ensures that for a given loading between the free ends of the two arms, the maximum bending moment in the connecting portion is less assuming that all other factors remain the same. Such preferred configuration of connecting portion may further provide a straight or relatively straight driving face to enable the clip to be driven efficiently by means of a suitable impact tool.

The invention is illustrated in the accompanying drawings wherein:

FIGURE 1 is a plan view of one form of sleeper adapted to have secured thereto in accordance with this invention, a pair of flange footed railways rails.

FIGURE 2 is a side elevation of part of the sleeper depicted in FIGURE 1 showing a flange footed railway rail secured thereto by a pair of rail securing clips in accordance with this invention.

FIGURE 3 is a sectional view on the line 3—3 of FIGURE 2.

FIGURES 4 and 5 are side elevation and plan views respectively of one of the clips depicted in FIGURE 2.

FIGURE 6 is a view similar to FIGURE 3 but showing a modification.

FIGURE 7 is a plan view of part of a sleeper similar to that shown in FIGURE 1 but provided with a modified arrangement of clip receiving holes.

FIGURE 8 is a view similar to FIGURE 2 but applied to the construction of sleeper depicted in FIGURE 7.

FIGURE 9 is a sectional view on the line 9—9 of FIGURE 8.

Referring firstly to FIGURES 1 to 5 of the drawings, there is there depicted a construction specifically adapted for the securing of flange footed railway rails to concrete sleepers wherein the sleeper 10 is provided at each rail supporting position with a rail seat 11 formed by recessing the upper face of the sleeper to a depth at least equal to the thickness of the edge of each of the two flanges 12 of the railway rail 13, the so formed sleeper recess 14 having a width corresponding to the overall width of the rail foot formed by the two flanges 12, so as thereby to provide relatively deep shoulders 15 in the upper surface of the sleeper 10, which serve to hold the rail 13 to gauge.

Preferably, a rubber or other resilient pad 16 is provided between the rail flanges 12 and the rail seat 11. This pad may be of flat configuration so as to be disposed wholly beneath the underside of the rail foot or it may be as shown, of shallow channel configuration with its two sides extending around the edges of the rail flanges between the same and the sides of the recess in the upper face of the sleeper. Such latter form of pad 16 serves in the known manner to electrically insulate the rail flanges 12 from the adjacent part of the sleeper 10.

In the preferred arrangement illustrated, two clips are provided for securing each rail to each sleeper.

The upper face of each rail flange 12 slopes downwardly to the horizontal in the known manner. Such downward slope may be at the same angle over the entire width of each flange 12 but more usually the downward slope is, as shown, at two different angles, namely, a greater angle of slope of the flange upper face 17 nearer the rail web 17 and a lesser angle of slope of the flange upper face 19 nearer the adjacent rail flange edge.

Two rail securing clips 20 are provided for securing each rail to each sleeper, these clips being each adapted to apply holding down pressure to one of the two rail flanges 12 at a position adjacent the line of intersection 21 of the two upper sloping faces 17, 19 thereof.

Each clip 20 is formed from a length of spring steel or other suitable resilient metal bar of round section, and in one preferred example, having a diameter of ⅞".

The bar forming each clip is bent initially to generally wide U configuration, so as to provide upper and lower arms 22, 23, joined integrally together by a connecting portion 24, the lower arm 23 being of straight configuration throughout its length, with this lower arm 23 and the connecting portion 24 being both disposed in the same common plane as shown in FIGURE 2.

The connecting portion 24 at its two ends 24*a*, 24*b*, merges smoothly with the adjacent end of the corresponding arm 22, 23 by bending the metal at each of these positions through substantially a quarter of a circle, with the medial part 24*c* of the connecting portion 24 intermediate these two part-circular parts 24*a*, 24*b*, being of only slightly curved configuration.

As shown in FIGURE 4, the upper arm 22 adjacent its junction with the quarter circular part 24*a* where it merges into the connecting portion 24, is bent in a downward direction towards its free end, conveniently at an angle which, considering the clip unstressed as in FIGURE 4, may be of the order of 30° to 35° in relation to the lower arm 23, and is further bent (see FIGURE 5) at an angle of about 30° away from the said plane common to the lower arm 22 and the connecting portion 24, with the extremity 25 of the lower arm extending at the same inclination to the plane aforementioned, but being bent upwardly, conveniently of the order of 30°, in a direction towards the free end of the upper arm so that the upper arm 22 of round circular form in cross section, adjacent to where it commences to be bent upwardly, presents a domed or convex abutment face 26 on its underside, convex in two mutually perpendicular planes, so as to be adapted to engage over a comparatively small area with the rail flanges 12 at the intersection 21 between the two differently sloping upper faces 17, 19, thereof. Such abutment face 26 is disposed near the free end of the upper arm 22 and constitutes a rail engaging portion.

The upper side of the lower arm 23 of the clip con-

stitutes a sleeper engaging portion of the lower arm.

Preferably the lower arm **23** has a length of the order of 6" to 8", and the upper ram **22** has a length which is some 2" shorter than the length of the lower arm, and the distance between the two arms, considering the clip unstressed, may vary between a maximum of about 4" adjacent the connecting portion, to a minimum of about 2" adjacent the rail flange engaging face **26** of the upper arm.

The sleeper is formed at a position beneath the rail seat thereof with a pair of through holes **27** constituting lower clip arm receiving sleeper openings. Each such hole **27** is of plain circular configuration, the two holes being spaced symmetrically on opposite sides of a vertical plane extending longitudinally of the rail medially of the rail web **18**, with each hole **27** extending from an entrance end **28** provided one at one side and the other at the other side of the sleeper, each hole **27** sloping downwardly from the entrance at the one side face of the sleeper, to the opposite side face, the degree of sloping being conveniently of the order of 1:16.

Each of these through holes is provided throughout part of its length with a liner tube **29** of bore corresponding to the diameter of the bar forming the clip **20** and the outer end, i.e. the clip arm receiving mouth **30** of each of these tubes, is flared outwardly to facilitate the positioning of the clip arm therein, as well as to avoid sharp corner contact between the mouth of the liner tube and the lower clip arm in the driven position, which could product a stress raising indentation in the adjacent part of the lower clip arm **23**. The liner tubes are removable to permit of replacement without damaging or destroying the sleeper.

Each liner tube **29** is preferably formed of a tough plastic material such as that sold under the trademark "Akulon," such plastic material serving to electrically insulate the clip **20** from the sleeper **10** to permit of track circuiting of the railway track. To provide for this more effectively, the liner mouths are flanged outwardly at **31** in abutment with the adjacent sleeper face. Such flanges **31** serve to limit the distance by which the liner tube can be inserted into the hole **27**.

Each liner tube **29** has a length corresponding to the lower clip arm **23** and has its inner end **32** closed so as effectively to electrically insulate the lower clip arm at its inner end as well as to provide a stop for limiting the distance through which the lower clip arm can be driven into the sleeper hole **27**.

The two lower clip arm receiving holes **27** provided as above described are so disposed as to slope at the inclination aforementioned in planes **33** which are each inclined to the vertical so that each plane containing the central axis of the corresponding hole is co-planar with the line of intersection between the two relatively slopping faces **17, 19,** on the upper side of the corresponding rail flange **12.**

The arrangement is such that when the clip is in the fully driven position, the convex face **26** of the upper or rail engaging arm **22** also lies in this inclined plane **33** which contains the axis of the lower arm **22.**

At the same time, the upper side of each lower clip arm **23** is in tight pressure engagement with the upper side of each hole **27** as provided by the liner tube **29** therein and such upper side constitutes a lower clip arm engaging abutment **34** through which the pressure applied by the lower clip arm **23** is transmitted to the sleeper **10.**

The inclination of each of these two planes containing the axis of the lower clip arm is further so chosen in relation to the angle of slope to the upper sleeper face of the outermost sloping rail flange faces **19** that the angle between each of these outer faces **19** and the adjacent inclined plane extending therefrom to the adjacent sleeper hole, is not less than 90°.

The importance of this last mentioned feature of the above described construction is that any tendency for the rail flange engaging arm **22** of the clip to become disengaged therefrom by movement of this, i.e. upper arm **22** of the clip, in a direction away from the rail web **18**, is resisted in the following three ways:

(*i*) A simple bodily displacement of the upper arm **22** in a direction laterally away from the rail web **18** must necessarily be accompanied by an increase in the distance between the extremities of the two clip arms **22, 23,** so that such movement is necessarily resisted by the increased stress thereby applied to the connecting portion.

(*ii*) Any tendency for the clip as a whole to rock about the axis of the lower arm **23** in a direction such that the upper arm **22** moves away from the rail web **18,** is again resisted by the fact that such rocking movement must necessarily be accompanied by an increase in relative spacing between the two clip arms.

(*iii*) Any tendency for the upper arm **22** of the clip **20** to move angularly away from the rail **13** about a purely horizontal axis passing through the junction between the connecting portion **24** and the lower arm **23** of the clip, is further resisted by the fact that the lower arm **23** is inclined in a downward direction towards its free end **35** in the inclined plane **33** aforementioned and consequently the lower arm **23** is not free to turn about a horizontal axis without the development of some torsional stress, which assists further in resisting any such disengaging movement of the upper arm in a direction away from the rail web.

In other words, considering the clip in the fully driven position, and as will be apparent from FIGURE 2 of the drawing, the upper side of each sleeper hole **27** and which forms the lower clip arm engaging abutment **34** is disposed to one side of, namely to the rail web side of a vertical plane parallel to the length of the rail and passing through the position of engagement, namely intersection line **21** between the upper clip arm **22** and the rail flange. The said lower clip arm engaging abutment **34** is further disposed by a distance from such vertical plane which, having regard to the inclination of the rail flange upper surface **19** to the horizontal, ensures that any disengaging movement of the arm **22** from such flange surface in a direction away from the rail web **18** is accompanied by an expansion, i.e. relative movement apart of the two clip arms so that the clip is thereby effectively retained against angular movement about the axis of the lower clip arm **23** and the upper clip arm is thus effectively retained in the desired rail securing position.

With the arrangement above described, each clip **20** would be driven in a substantially horizontal direction more or less parallel to the length of the rail **13** with the connecting portion **24** inclined at an angle of roughly 40° to 50° to a vertical plane parallel to the length of the rail **13,** driving being effected by means of a hammer or other suitable impact tool applied to the upper part of the connecting portion **24** near where it merges at **24*a*** into the upper clip arm **22.**

The height of the lower clip arm receiving end **28** of each sleeper hole **27** would be so chosen, having regard to the relative spacing between the extremities of the two arms **22, 23,** and the distance between the upper side of the rail flange and the lower clip arm receiving end **28** of said sleeper hole, that as the driving operation commences the convex rail engaging face **26** of the upper clip arm **22** is broupht into light pressure engagement with the two differently sloping faces **17, 19,** of the rail flange adjacent their line of intersection **21.**

Thus, as the driving operation progresses, by virtue of the downward slope of the lower clip arm receiving hole **27,** the two arms **22, 23,** are forced relatively apart, stressing the connecting portion **24** in so doing, until when the clip is fully driven the two arms **22, 23** of the resilient clip **20** have been forced relatively apart by a distance sufficient to provide the desired rail holding down pressure.

With the angle of slope aforementioned of each lower clip arm receiving hole **27**, a relative opening between the two clip arms **22**, **23**, i.e. deflection of the clip of the order of ⅜", may be obtained, if the lower clip arm is driven through a distance of approximately 6" from an initial position in which, with the free end of the lower arm **23** just engaged within the mouth **28** of the sleeper hole, the upper arm **22** exerts a hand tight pressure on the rail flange **12** at the position indicated above.

During the foregoing movement, the two clip arms will move relatively apart in the inclined plane **33** aforementioned, and which passes through the intersection **21** between the two differently sloping faces of the engaged rail flange.

Since the connecting portion **24** of the clip **20** is not disposed in the same plane as that containing the upper clip arm **22**, the stresses in the clip developed during driving will be torsional stresses as well as simple bending stresses, the torsional stresses being developed principally adjacent the junction **24***a* between the upper clip arm **22** and the connecting portion **24**.

Thus the metal of the clip is utilised in a more efficient manner than if it were subjected merely to simple bending.

With the particular example above described, the clip in the fully driven position, when driven through a distance of approximately 6", will apply a holding down pressure of more than 5 cwts. and, if properly designed, of the order of 15 cwts. to the rail flange.

The frictional engagement between the lower clip arm **23** and particularly the upper side thereof and the liner tube, over the substantial length of the lower clip arm therein, i.e. of the order of 6", will usually be fully effective in retaining the clip in this fully driven position against movement in the reverse direction longitudinally of the rail, even under the effect of rail creep. Increased resistance to withdrawal may be obtained by so forming the interior and exterior surfaces of the liner—as by coating them with a resin bonded flint grit—as to have a greater coefficient of friction relative to steel or concrete than that obtaining between two steel surfaces.

Thus, if rail creep occurs, the rail slips longitudinally relative to the clip without the latter itself slipping relative to the liner or the liner sliding out of its hole **27**.

Additionally or alternatively, as shown in FIGURE 6, the free end **35** of the lower clip arm **23** may be bent upwardly relative to the remainder of the lower arm and the upper side of the sleeper hole **27** adjacent to where it is adapted to receive the free end **35** of the lower clip arm may be formed with a shoulder **36** past which the free end **35** of the lower clip arm must be driven as the clip moves into its final position, the arrangement being such that the free ends **25**, **35**, of the two clip arms are forced relatively apart by a greater distance than that obtaining with the clip fully driven as the free end **35** rides over the shoulder **36**, so as thereby to retain the lower arm of the clip positively within the sleeper hole **27**.

As the sleeper hole is again provided with a liner tube **29**, to facilitate the formation of this liner tube, the shoulder **36** is provided by forming the hole **27** with an enlarged part **37** of frustoconical configuration which extends completely around the axis of the hole **27** with the adjacent end of the liner tube shaped to correspond.

In FIGURES 7 to 9 a further construction is shown in which, instead of the sleeper hole **27** being inclined downwardly to the horizontal in a direction inwardly from its entrance end **28**, it extends in a horizontal direction, i.e. at the same horizontal level as that of the line of intersection **21** between the two sloping faces **17**, **19**, of each rail flange.

Stressing of the clip with this alternative arrangement is ensured by arranging for each of the two sleeper holes **27** in a direction inwardly from their clip receiving end **28** to be inclined in a horizontal direction towards a vertical plane passing through the centre of the rail web **18**.

The arrangement is such that as each of the two clips are driven they are progressively displaced in a horizontal direction towards the adjacent side of the rail web **18**, and thus the rail flange engaging abutment face **26** of each upper clip arm is caused progressively to ride up the aforementioned rail flange face **19** which slopes upwardly in a direction towards the adjacent web. Thus the clip is progressively tensioned until it reaches the fully driven position depicted in FIGURE 8 in which its abutment face **26** engages with the corresponding rail flange **12** adjacent the line of intersection **21** between the two differently sloping rail flange faces **17**, **19**.

With this alternative construction depicted in FIGURES 7 to 9 in which each sleeper hole **27** is inclined in a horizontal direction towards a vertical plane passing through the centre of the rail web, the lower clip arm engaging abutment **34** provided by the inner surface of the liner tube **29** extends, as clearly shown in FIGURE 8, to the rail web side of the vertical plane parallel to the length of the rail and passing through the aforementioned line of intersection **21** between the two flange surfaces **17**, **19**. Thus, at least part of the lower clip arm engaging abutment **34** of this alternative arrangement is disposed to one side of, namely on the rail web side of this vertical plane so as thereby effectively to retain the upper arm of the clip against disengagement from the adjacent rail flange by turning of the clip away from the rail web and about the axis of the lower clip arm **23**.

With each of the above described constructions, in order to prevent the free end **35** of the lower clip arm damaging the liner tube **29** as the clip is driven into position the edges of the free end of the lower arm are slightly chamfered or rounded as shown for example at **35***a* in FIGURE 5.

Whatever particular construction is employed, the precise configuration of the upper arm **22** of the clip is in no way material, so long as the upper arm engages with the rail flange **12** adjacent the junction between the two sloping faces **17**, **19**, thereof.

For example, in one alternative configuration to that above described, the upper arm **22** may, in the fully driven position, lie parallel throughout its length in the inclined plane **33** containing the lower arm **23**, and the connecting portion **24** may, when viewed in a direction longitudinally of the rail, be of generally **C** configuration, with the two limbs of the **C** extending substantially at right angles to the length of the respective clip arms to which they are integrally connected. Such **C** shaped connecting portion ensures that this is clear of both the edge of the rail flange and also of the upper surface of the sleeper.

In each of the arrangements illustrated, the effect of driving the clip **20** is merely to expand the clip at a constant rate, so that the deflection of the clip arms and the holding down pressure applied to the rail can readily be adjusted as required by driving the clip through the precise distance required to give a predetermined deflection and holding down pressure.

Extraction of the clip can be easily effected either by use of an extracting tool engaging between the connecting portion and the adjacent lateral face of the sleeper, or by applying an impact tool to the free end face of the upper clip arm.

If desired, a further resistance to withdrawal of the clip in a direction longitudinally of the rail beyond that above described may be obtained by arranging for the extremity **35** of the lower clip arm to project beyond the end **38** of the sleeper hole opposite to the extrance end **28**, such extremity of the lower arm being bent somewhat in relation to the length of the rest of the arm so as to be adapted for wedging or other abutting engage-

ment against the face of the sleeper or mouth of the hole at such end **38**.

Although the present invention enables a separate base plate to be dispensed with and for the rail to be supported directly from the sleeper with or without a resilient pad between the underside of the rail foot and the upper face of the sleeper, there is not excluded from the ambit of the specification cases where base plates are provided between the upper side of the sleeper and the underside of the rail, for example, for the purpose of holding the rail to gauge, even though their provision is considered unnecessary. The presence of such base plates in no way changes in any essential the form and mode of operation of the invention as above described.

Further, although in the above described constructions the lower arm **23** of each clip is received within a hole **27** in the sleeper, it is within the scope of the invention in its broadest aspect that the hole **27** may be replaced by some other form of opening, for example, a recess of inverted substantially U section extending upwardly from the underside of the sleeper, such a construction being employed, for example, more particularly in the case of a composite sleeper built up from metal and timber or concrete sections and being provided possibly also in the case of a steel sleeper.

In a further alternative, the lower arm **23** of the clip may be formed of non-circular, for example, square configuration in cross section, as by forming the clip throughout its length from bar of such non-circular section, and each lower clip arm receiving hole in the sleeper may be of corresponding non-circular configuration, as by providing a liner tube of such, for example, square configuration to each hole.

In such an alternative, either the lower clip arm or the liner tube, or both of these parts, would be of slightly twisted configuration so as to have a configuration similar to that of an Archimedean screw, but having a pitch which is extremely large in relation to the bar diameter, the arrangement being such that as the clip is driven, the lower clip arm is caused to turn slightly about its longitudinal axis in a direction to displace the upper clip arm towards the adjacent rail web, and thereby apply to the rail flange an additional load over and above that which would result merely from the simple expansion of the clip arising from the relative slope between the lower clip arm receiving hole and the upper surface of the rail flange.

Such non-circular configuration of the lower arm and corresponding sleeper hole also serves to prevent the clip from turning relative to the sleeper about the axis of the lower arm in a direction tending to displace the upper clip arm away from the rail web and may, if desired, be provided solely for such latter purpose without also forming the lower clip arm and/or liner tube of twisted configuration as above described.

Although in each of the foregoing constructions a pair of clips are provided for securing each rail to each sleeper, it is within the scope of the invention in its widest aspect that as applied for example to light railways only a single clip should be provided as above described for securing one of the two rail flanges, the other of which flanges would be adapted to engage beneath the underside of a shoulder provided on the upper side of the sleeper.

What I claim then is:

1. A support for a flange footed rail wherein each rail flange on its upper side slopes downwardly to the horizontal in a direction away from the rail flange at two different inclinations to the horizontal, with the greater inclination nearer to the rail web, said support comprising a sleeper having a rail supporting seat, said sleeper having a pair of holes, each extending from a lateral side of the sleeper below the rail seat with each hole extending in the general direction of the rail, a pair of rail securing clips, each having upper and lower arms joined resiliently together at one end by a connecting portion, each lower clip arm being drivable within one of said sleeper holes so as to extend therein, the upper arm of each clip adjacent the free end thereof having a rail flange engaging part in pressure engagement with the upper surface of one of the two rail flanges at a position adjacent the line of intersection between the two rail flange slopes, which, in relation to a vertical plane containing the central axis of the lower clip arm, is on the opposite side of said plane to the rail web, each of said clip upper arms intermediate their flange engaging parts and the clip connecting portion being spaced out of contact with the rail flange and sleeper.

2. A support for a flange footed rail wherein each rail flange on its upper side slopes downwardly to the horizontal in a direction away from the rail flange at two different inclinations to the horizontal, with the greater inclination nearer to the rail web, said support comprising a sleeper having a rail supporting seat, said sleeper having a pair of holes, each extending from a lateral side of the sleeper below the rail seat in a direction downwardly inclined to the horizontal and in a plane parallel to the length of the adjacent rail, a pair of rail securing clips, each having upper and lower arms joined resiliently together at one end by a connecting portion, each lower clip arm being drivable within one of said sleeper holes so as to extend therein, the upper arm of each clip adjacent the free end thereof having a rail flange engaging part in pressure engagement with the upper surface of one of the two rail flanges at a position adjacent the line of intersection between the two rail flange slopes, which, in relation to a vertical plane containing the central axis of the lower clip arm, is on the opposite side of said plane to the rail web, each of said clip upper arms intermediate their flange engaging parts and the clip connecting portion being spaced out of contact with the rail flange and sleeper.

3. A support for a flange footed rail according to claim 2 wherein each lower clip arm receiving hole in the sleeper is so disposed in relation to the line of intersection between the two slopes of the corresponding upper rail flange that a plane containing the line of intersection between said two rail flange slopes and extending therefrom to the central axis of the adjacent lower clip arm is inclined at an angle of at least 90° to that rail flange slope which is furthest from the associated rail web.

4. A support for a flange footed rail wherein the upper surface of each rail flange is downwardly inclined to the horizontal in a direction away from the adjacent side of the rail web, said support comprising a sleeper having a rail supporting seat, said sleeper having a pair of holes, each extending from a lateral side face of the sleeper and below the rail seat, with each hole extending in a plane parallel to the rail seat which, in a direction from the mouth of the hole, is inclined towards a vertical plane passing through the centre of the rail web, a pair of rail securing clips, each having upper and lower arms joined resiliently together at one end by a connecting portion, each lower clip arm being drivable within one of said sleeper holes so as to extend therein, the upper arm of each clip adjacent the free end thereof having a rail flange engaging part in pressure engagement with the upper surface of one of the two rail flanges at a position which, in relation to a vertical plane containing the central axis of the lower clip arm, is on the opposite side of said plane to the rail web, each of said clip upper arms intermediate their flange engaging parts and the clip connecting portion being spaced out of contact with the rail flange and sleeper.

5. In a rail support of the kind specified a rail securing clip comprising a single length of resilient metal bar having spaced apart lower and upper arms joined integrally together at one of their ends by a connecting portion, the other ends of said two arms being free and extending on the same side of the connecting portion and being disposed closer together adjacent their free ends than

adjacent their connecting portion, said upper arm adjacent its free end having a rail flange engaging portion, said connecting portion adjacent to its junction with the one upper arm end and said one upper arm end being each disposed to the one same side of a plane which passes through the longitudinal axis of the lower arm and the rail flange engaging portion of the upper arm.

6. In a rail support of the kind specified a rail securing clip comprising a single length of resilient metal bar having spaced apart lower and upper arms joined integrally together at one of their ends by a connecting portion, the other ends of said two arms being free and extending on the same side of the connecting portion and being disposed closer together adjacent their free ends than adjacent their connecting portion, said upper arm adjacent its free end having a rail flange engaging portion, said connecting portion adjacent to its junction with the one upper arm end and said one upper arm end being each disposed to the one same side of a plane which passes through the longitudinal axis of the lower arm and the rail flange engaging portion of the upper arm, said clip connecting portion being of substantially straight configuration at a position medially of its length.

7. A support for a flange footed rail comprising a sleeper having a rail supporting seat, said sleeper having a hole extending from a lateral side of the sleeper below the rail seat in the general direction of the rail, a rail securing clip having upper and lower arms joined resiliently together at one end by a connecting portion, the lower clip arm being drivable within said sleeper hole so as to extend therein, the upper arm of the clip adjacent the free end thereof having a rail flange engaging part in pressure engagement with the upper surface of one of the two rail flanges, said clip upper arm intermediate its flange engaging part and the clip connecting portion being spaced out of contact with the rail flange and sleeper, said upper side of the sleeper hole being spaced from that upper surface of the rail flange engaged by the upper clip arm, by a distance less than the spacing of said upper side from said upper flange surface which is adjacent the edge of such flange, and the lower clip arm receiving hole being formed with a shoulder and the free end portion of the lower clip arm received therein being bent upwardly in relation to the remainder of such arm, the arrangement being such that in the driving of the clip said upwardly bent portion rides over and past said shoulder to engage with the inner side of the shoulder directed away from the lower clip arm receiving end of the hole so as positively to retain the clip in its fully driven position.

8. A rail support comprising a sleeper having a rail supporting seat, a flange footed rail having its flanges resting on said seat, said sleeper having a pair of holes extending beneath said seat one from each of two opposite lateral sides of the sleeper in a direction transversely of the direction of the sleeper, a pair of clips each securing one of the two flanges of the rail to the sleeper, each clip comprising a single length of resilient metal bar having spaced apart lower and upper arms joined integrally together at one of their ends by a connecting portion, the other ends of said two arms being free and extending on the same side of the connecting portion and being disposed closer together adjacent their free ends than adjacent their connecting portion, the two clips having their respective lower arms extending in opposite directions from opposite lateral sides of the sleeper with the lower arm of each clip extending within one of said two sleeper holes, the upper arm of each clip adjacent its free end having a portion which engages with one of said two rail flanges, each of said clip connecting portions adjacent to its junction with the one upper arm end and said one upper arm end being each disposed to the one same side of a plane which passes through the longitudinal axis of the lower arm and the rail flange engaging portion of the upper arm.

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