

N<sup>o</sup> 901



A.D. 1914

*Date of Application, 13th Jan., 1914*

*Complete Specification Left, 13th July, 1914—Accepted, 15th Feb., 1915*

PROVISIONAL SPECIFICATION.

**Improvements in and relating to Electric Railway, Tramway  
& like Systems.**

I, JOHN AUDLEY FREDERICK ASPINALL, of Gledhill, Mossley Hill Drive, Liverpool, in the County of Lancaster, Engineer, do hereby declare the nature of this invention to be as follows:—

5 This invention relates to improvements in the construction of electric conductor rails and safety guards for the rails in electric traction systems including railways, tramways and the like.

According to the present invention the contact shoe or collector engages with the conductor rail on the side of one or more of its flanges in contradistinction to the web of the rail.

10 Any known section of rail, of course, can be used, several novel sections have, however, been devised as being more particularly suitable for the arrangement according to the present invention.

The rail is preferably of such a cross-section that its centre of gravity lies so low that the normal pressure of the collector shoe upon the side of one of its 15 flanges will not over-turn it about its base even when this rail is not secured to the track. By this construction it is obtained that less strain is placed upon the track and particularly upon the connections supporting the conductor rail.

Hitherto in electric traction systems it has been usual for the contact shoes 20 to bear on the top or upper surface of the conductor rails. In certain cases also engagement has been made on the underneath surfaces of the flanges of the conductor rails and also contact has been made with the web portion of a conductor rail. In contradistinction to these known methods, according to the present invention, contact is made with the side of one or more of the flanges of the conductor rail.

25 The flange of the conductor rail which co-operates with the collector or contact shoe is preferably thickened to allow for wear of the rail. A single conductor rail may be used or in certain constructions it may be desirable to arrange a pair of conductor rails adjacent to one another. In this case also it is preferable to provide a single collector or contact shoe bearing on flanges on both rails.

30 In certain cases it may be desirable to provide contact with one or both flanges simultaneously of a dual flanged rail, such for instance as a single channel rail having a top and bottom flange or a double channel rail having two flanges on both top and bottom, or again for instance a T section rail having two flanges and a web.

35 One preferred form of rail is of channel section preferably having a thickened upper flange to co-operate with the collector or contact shoe. A rail of this type can be provided with a broad or thick base flange if desired which section would further have the advantage of lowering the centre of gravity of the rail.

40 In an alternative section the rail may be of an inverted T-form with a thickened portion on one side at the base of the web which will then be uppermost to form a contact surface co-operating with the collector or contact shoe which will bear on this side.

[Price 6d.]



*Improvements in and relating to Electric Railway, Tramway & like Systems.*

In a further form the conductor rail is of Z-cross-section, preferably the side of the flange of the upper part of the Z forming bearing surface for the collector. In a further modification the section of the conductor rail could be of substantially channel form with a further portion substantially parallel with the web to form a thickened wearing part to receive the side pressure of the collector. 5

The collector may bear upon either the upper flange of the rail or upon the lower flange, the former, however, is preferred.

The bearing surface of the rail for the contact shoe can be vertical inclined inwards towards the web from the head of the rail or also in certain cases it may be desirable to provide the bearing surface tapered away from the web so that the head of the rail from the web to the outside will be slightly narrower at the top and thickened towards the lower portion of the flange forming the head of the rail. Similar inclinations of surface would be arranged in the case of the lower flange where it is found desirable to use the side of the lower flange as a collecting surface. 10 15

In one form a pair of substantially channel shaped collector rails are laid together with the inside edges of the flanges adjacent one another. In this preferred form it is then desirable to collect from the sides of the upper flanges of the two rails and a single collector could be arranged to bear on both these surfaces. On one form these surfaces are arranged inclined inwards although, of course, as above stated, the bearing surfaces on the sides of the upper flanges could be vertical or inclined upwards outwardly from the vertical. 20

Further, according to the present invention the conductor rails are held in their supports without the use of clips, screws, nails or other usual means, although such may be used if desired. It is preferred to secure the collector rails and guards by means of bent metal detachable clamps. These clamps are preferably of channel section provided with special depressions for the reception of packing pieces of wood or the like, or locking keys. These clamps can be bent from strip or bar metal. The insulators supporting the collector rails are preferably provided with lugs or lips on one or both sides forming a channel for the reception of the rail, preferably together with its guards. The rails further are preferably connected together by the usual bonding and also by fish plates which are preferably arranged in a substantially horizontal plane connecting the lower flanges of the rail. The insulators can be of the type having a single or a double lip, the head of the insulator being provided with an open slot or channel as above mentioned sufficiently broad to enclose the rail with its guards preferably on both sides of the rail. A packing piece or distance iron is preferably arranged between the web of the rail and one guard in the case of a single collecting rail, or between the webs of the two rails in the case of a double collecting rail. 25 30 35 40

According to the present invention an improved guard is provided for the collector rails of electric traction systems. This guard is preferably of L-shaped cross-section and in certain cases it may be desirable to provide a curved or rebated portion corresponding to the curved portion of the rail with which it would engage, but of course the guard could be cut to have rectilinear sides and sharp angles on the inside and outside. A guard is preferably provided on both sides of the rail. One guard is preferably, as above stated, of L-section and its flange covers the head of the rail. The other guard in the case of a double rail will, of course, be of a similar form. In the case of a single rail it could be of substantially rectangular cross-section. This guard is preferably bevelled along the top edge to allow greater clearance for the contact shoe, and in certain cases also along the bottom edge. The guards are preferably of wood the L-section guard bearing directly on the rail; in certain cases, however, insulating packing pieces could be interposed having a higher dielectric strength. In the case of rails such, for instance, those of Z-section, it may be desirable to provide a guard of similar Z-section or also a guard could be made up of two strips of L-cross-section. 45 50 55

*Improvements in and relating to Electric Railway, Tramway & like Systems.*

One of the advantages of the system of collection according to the present invention, that is to say, in which the contact shoe bears on the side of one of the rail flanges, will be that the shoe will be held in contact with the collecting surface irrespective of slight irregularities of the track, or other causes which would lift the collector shoe vertical relatively to the track.

The collector rail can be arranged either in the centre of the track or upon the outside of the track, or again alternatively, in what is usually termed the six-foot way, that is to say, in a double track the collector rails could be arranged between the two lines of rails.

Where the conductor rails terminate at points or crossings a ramp is provided or the conductor rail may taper towards the six-foot way to form a suitable guide for the contact shoe approaching towards the end of the conductor rail. In the case in which the pressure of the contact shoe is directed inwards in a direction towards the four-foot way, the guide or ramp is made inclined in the direction of the four-foot. This is considered preferable as it allows a greater clearance in the six-foot way. The ramp portion of the conductor rail can be isolated or made a dead length of rail, by interposing or arranging a space between this rail and the next length of conductor rail. This space can be bridged over by an insulating block such as wood to form a continuous path for the contact shoe. A guard is preferably also provided for this ramp or guide rail and the guard is preferably arranged to project some distance ahead of the rail or ramp which it protects.

A space is preferably arranged between the base of the conductor rail and the safety guard as an outlet for water, snow, or dirt that may collect. This space can be provided by using a spacing member broader than the overhanging portion of the flange at the base of the rail, and also the guard can be bevelled as above described to increase this effect without unduly broadening the width over the safety guards.

Dated this 12th day of January, 1914.

For the Applicant:

W. P. THOMPSON & Co.,  
6, Lord Street, Liverpool.

**COMPLETE SPECIFICATION.****Improvements in and relating to Electric Railway, Tramway and like Systems.**

I, JOHN AUDLEY FREDERICK ASPINALL, of Gledhill, Mossley Hill Drive, Liverpool, in the County of Lancaster, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to an improved electric railway, tramway, and the like system.

In the system of the present invention the vehicles are supported entirely on rails independent of the current feed and contact rails arranged substantially in the same plane, which have base or body, web and flange portions distinct from one another from the side of one or more of the flanges of which parallel with the plane of the web of the rail current is collected.

It is to be understood that the present invention is applied to rails having three distinct portions, a body portion for attachment or mounting upon insulating supports, a web portion and one or more flange portions depending from said body and web portions, but distinct therefrom in contradistinction to

*Improvements in and relating to Electric Railway, Tramway & like Systems.*

rails formed of two portions only, such as a body and web portion, or a body portion alone. The present invention is further distinguished from known methods of collection on rails having body, web and flange portions where hitherto collection has been effected from the web, upper or under surfaces of the head of the rail.

The rail preferably is of such a cross-section that its centre of gravity lies so low that normal current collecting pressure upon the side of one of its flanges substantially parallel with the web of the rail will not overturn it about its base, even when the rail is not positively secured to the track.

The present invention will be more particularly described with reference to the accompanying drawings, in which:—

Figure 1 is a sectional elevation through part of the track and current collecting means.

Figure 2 is an end sectional view of a modification.

Figure 3 is a plan view partly in section of a modification.

Figure 4 is a plan view of a ramp portion of the track.

Figure 5 is an elevation of an insulator and cap.

Figure 6 is a plan view.

Figure 7 is a plan view of a modification.

Figure 8 is an end view corresponding to Figure 4.

Figure 9 shows modified sections of rail.

Figure 10 shows a further modification.

The preferred form of rail is as shown in Figure 1 of channel section, having a base flange or body 1 preferably broader than the head flange 2, but the flange head 2 is of greater depth or thickness than the base flange 1.

By providing a broad base flange 1 it is secured that the centre of gravity of the rail is lowered to the degree desired. The collector bears upon either the upper flange of the rail or upon the lower flange, or both. It is preferred however that the collector bears upon the upper flange, as shown in Figure 1. The bearing surface 3 is parallel with the plane of the web portion of the rail and this latter is preferably disposed as shown so that this surface will lie vertically.

In one form of construction as shown in Figure 2 a pair of substantially channel shaped collector rails 5 and 6 are laid together with the inside edges of their flanges adjacent one another. In this preferred form it is then desirable to collect from the upper flanges 7 of the two rails and a single collector such as 28 (Fig. 3), can be arranged to bear on both these surfaces. When the collector used in this instance is in the form of a bar it will be held in contact with the two surfaces by a torsional action about its longitudinal axis.

It will be seen that by the preferred disposition of the centre of gravity of the rail these may be held in their supports without the use of clips, screws, nails or other usual means, although such may be used if desired. It is preferred to secure the collector rails and their guards such as 8 and 9 by means of bent metal detachable clips 10. These clips are preferably of channel section provided with special depressions for the reception of packing pieces of wood or the like, or locking keys such as 11. These locking keys 11 are preferably duplicate and interchangeable with the locking keys 12 of usual form serving to secure the vehicle supporting rails of the usual track 13 to the usual chairs 14 where used.

The insulators supporting the collector rails are preferably provided with a central portion 15 having a depression to receive a wooden block 46 for the reception of the rail, this portion being somewhat broader than the rail so that a space 16 is left between the rail and the guard 9 forming an outlet for water, snow, or like matter which would otherwise at certain times form an obstruction. The insulator is preferably provided with two side cheeks 17, 18 for supporting the guards 9 and 8 respectively. The insulators have tapering bases 19 and can be secured to the sleepers 20 by angle clips 21 engaging said tapering sides 19. To simplify the track the sleepers 20 are arranged to mutually support

*Improvements in and relating to Electric Railway, Tramway & like Systems.*

the insulators 19 and the chairs 14 for the permanent way 13 or where chairs are not used for supporting the track, to support the rails directly.

The electric conductor rails are preferably connected together by the usual bonding and also by fish plates which are preferably arranged in a substantially horizontal plane connecting the lower flanges of the rail, the conductor rails are also anchored in the usual manner.

A packing or distance piece 22 is preferably arranged between the web 4 of the conductor rails and the guard 9 arranged opposite the flanges of the conductor rails so that this guard 9 lies in spaced disposition relatively thereto providing a vertical slot 23 for the passage of the collector shoe 28. The distance piece 22 can be loosely inserted between the rail and guard and pieces of similar formation may be used for fish plates or expansion joints secured by means of bolt and nuts 24 to rail flange 1. The conductor rail is preferably provided with a recess portion 25 to receive one end of the bent metal distance piece or strip 22 to prevent it rising.

As shown in Figure 2 this distance piece 22 which may be of wood, in the case of collection from two rails will be arranged between the rails 5 and 6.

The guards 8 for the collector rails are preferably of L shaped cross-section and in certain cases it may be desirable to provide a curved or rebated portion corresponding to the curved portion of the rail with which it would engage, and it can be bevelled at the top edge to allow greater clearance for the current collector. The guard protecting the other side of the rail is preferably rectangular in cross-section as shown in Figure 1.

It will be seen that by this means the rail is very efficiently guarded, for the guards 8 and 9 completely enclose the sides of the rail and the head of this latter, leaving only the narrow slot for the passage of the collector shoe such as 28.

Further the guards 9, and more especially the guards 8, are arranged with portions 70 extending below the lower edge of the bottom flange of the rail 2 for the purpose of further protection.

In the case however of a double conductor rail shown in Figure 2 the other guard will similarly be of L-section.

The guards are preferably of wood bearing directly on the rail. In certain cases, however, insulating packing pieces 26 such as shown by way of example as applied to the right hand rail, Figure 2, could be interposed between guard and rail having a higher dielectric strength.

The current collector or shoe 28 is preferably of rectangular form (Figure 3).

Where the conductor rails terminate at points or crossing a ramp 36 (Fig. 4) is provided or the conductor rail may taper towards the six foot way to form a suitable guide for the contact shoe 28 approaching towards the end of the conductor rail. In the case in which pressure of the contact shoe by means of the spring is directed inwards in a direction towards the four foot way, the guide or ramp 36 is made inclined in the direction of the four foot. This is considered preferable as it allows a greater clearance in the six foot way. The ramp portion 36 of the conductor rail can if desired be isolated or made a dead length or rail by interposing a space between this rail and the next length of conductor rail 37, but the ramp and rail are preferably arranged continuous to make the rail more stable at this point for the collecting shoe to strike against when entering the ramp. The space where arranged can be bridged over by an insulating block 38 of wood or the like to form a continuous path for the contact shoe. A guard 39 is also provided for this ramp or guide rail. This is adapted to be supported near the end of the ramp by brackets or caps 47 carried on the insulators of similar form to the normal third rail supporting insulators above described. The caps 47 also support the guards thus allowing one type of insulator to be used for the conductor rail at all points; the guard is arranged to project some distance ahead of the rail or ramp which it protects as at 40.

*Improvements in and relating to Electric Railway, Tramway & like Systems.*

and also prevents any current arcing from the rail or collecting shoe to the ordinary running rails.

In order that a standard insulator may be used for supporting the end of the ramp rail a detachable metal cap such as 47 is provided (Figures 4 and 8) which has side cheeks 48 against which the guards 9 and 39 may abut and may be adjustable to suit width over guards at any particular sleeper at which an insulator is placed. This cap 47 slips over the top of the standard insulator used for supporting the third rails as above described. 5

To prevent for instance the foot of any person accidentally entering the end of the ramp rail between the outer end 40 of the main guard and the auxiliary guard 9 parallel to the track, an auxiliary guard piece 49 is arranged transverse to the guards 39 and 9 across this open end which may be held in place by the standard clip 10 and key 11. 10

In an alternative section to that described above the rail may be of girder section 72, Figure 9, or an inverted T-form 74 with a thickened portion on one side at the base of the web which will then be uppermost to form a contact surface—co-operating with the collector or contact shoe which will bear on this side. 15

In a further form the conductor rail is of Z-cross-section, 73, Figure 9, preferably the side of the flange of the upper part of the Z forming the bearing surface for the collector. 20

By the present system it will be seen that the advantages obtained with a vertical motion of the collector relatively to the collector rail does not interrupt the contact until the end of the collector 28 has actually been lifted higher than the top contact surface of the rail 3. It will be seen that a good contact will be obtained by this system in which the contact shoe bears on the side of one of the rail flanges as the shoe will be held in contact with the collecting surfaces irrespective of slight irregularities of the track or other causes which would lift the collector shoe vertically relatively to the track. 25

The collector rail can be arranged either in the centre of the track or upon the outside of the track, or again alternatively, in what is usually termed the six-foot way, that is to say, in a double track the collector rails could be arranged between the two lines of rails. By this arrangement one has the advantage of a great saving in width so that particularly in the case in which the collector rails are arranged in the six-foot way, greater space than heretofore is provided between these collector rails for plate layers or similar persons passing along the track in the performance of their duties. 30 35

In the simplest form of track of course the third rails will simply be laid upon the insulators. Such construction of track is illustrated in Figure 5 and shows an end view of a rail on an insulator in position. The rail 60 rests on a wooden block 61 carried by a recessed portion of the insulator 62. 40

It is preferred to provide caps on the insulators such as 63 to prevent the rails from creeping laterally relatively to their supports. The cap is preferably formed of a piece of stamped metal having upstanding tongues 64 thereon adapted to engage either side of the lower flange of the conductor or third rail. This cap may be for instance the form shown in Figure 6, held in place by lugs on the insulator such as 65, or the form shown in Figure 7 in which the cap is formed of one piece 66 fitting completely over the insulator and provided with downwardly turned lips 67. The upstanding lips 64 are preferably formed by punching out of the metal strip so that there are spaces left in the centre through which the wooden block 61 can project. 45 50

Instead of these caps it is possible to provide lugs on the wooden or other cushions for the rails such as 68, Figure 8, for the purpose of preventing the rail creeping laterally.

Stops may be provided on the vehicle or brackets thereon to prevent undue movement of the collecting shoe so that it will be in convenient position to enter the ramp after it has left a rail at points or the like, 55

*Improvements in and relating to Electric Railway, Tramway & like Systems.*

The guards 8 and 9 are preferably provided with extension portions 70 (Figure 1) reaching below the bottom of the conductor rail.

If desired the rail may be rolled with ribs 80 on its under surface engaging the sides of the wooden block recessed in the insulator (Fig. 10).

5 Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that I do not claim any matter set forth in Patent No. 395/1883 but what I do claim is:—

10 1. An electric railway, tramway and like system in which the vehicles are supported entirely on rails independent of the current feed and contact rails, arranged substantially in the same plane which have base or body, web and flange portions distinct from one another, current being collected from the side of one or more of the flanges the surface of which is substantially parallel with the web of the rails, substantially as described.

15 2. An electric railway, tramway and like system as claimed in Claim 1, in which the electric current distribution rails have a centre of gravity disposed so low that the rail will not be upset by normal current collecting pressure on the side of one of its upper flanges, substantially parallel with the web of the rail, substantially as described.

20 3. An electric railway, tramway and like system as claimed in Claim 1, in which the conductor rails are freely supported on insulators, means being provided to prevent lateral creeping of the rails relatively to the insulators, substantially as described.

25 4. An electric railway, tramway, and like system as claimed in Claim 3, in which the conductor rails are supported on wooden or like blocks held by recesses in the insulators, said blocks having ribs or like projections to prevent lateral creeping of the rails, substantially as described.

30 5. An electric railway, tramway and like system as claimed in Claims 1 or 2 in which the conductor rails are provided with enclosing guards covering the head and outer side of the said rails, substantially as described.

6. An electric railway, tramway, and like system as claimed in Claim 5, characterised by the feature that an auxiliary guard is provided in spaced relation to the enclosing guard protecting the inner side of the rail adjacent the place where current collection takes place, substantially as described.

35 7. An electric railway, tramway and like system as claimed in Claims 5 or 6, characterised by the feature that the guards extend below the bottom of the rail, substantially as described.

40 8. An electric railway, tramway, and like system as claimed in Claims 5 to 7, characterised by the feature that the insulating supports for the rails are provided with shoulders to receive the rail guards in spaced relation, substantially as described.

45 9. An electric railway, tramway and like system as claimed in Claims 5 to 7, characterised by the feature that the insulators supporting the conductor rails are provided preferably at ramp portions with a cap having flanges or ribs adapted to hold the guards in predetermined relation to one another.

50 10. An electric railway, tramway and like system in which a pair of channel sectioned conductor rails each having body, web and flange portions distinct from one another, are arranged face to face and current collection is adapted to take place from the sides of the opposite flanges substantially parallel to the webs, said rails being supported preferably from common insulators independent of and in the same plane as the running rails, substantially as described.

11. An electric railway, tramway and like system as claimed in Claim 10, characterised by the feature that L-shaped guards are provided enclosing the outer surfaces of body rails, substantially as described.

55 12. An electric railway, tramway and like system as claimed in Claim 10, characterised by the feature that a common collecting shoe bears simultaneously

*Improvements in and relating to Electric Railway, Tramway & like Systems.*

on the sides of opposite flanges of two rails substantially parallel with the web thereof, substantially as described.

13. An electric railway, tramway and like system as claimed in Claim 1, in which contact is made with the rails by a collector shoe in the form of a bar lying in a plane substantially parallel with the web of the rail, substantially as described. 5

14. An electric railway, tramway and like system as claimed in Claims 6 or 10, characterised by the feature that a space is left between the auxiliary guards and rails or between opposite rails to allow moisture and like foreign matter egress, substantially as described. 10

15. An electric railway, tramway and like system or the like as claimed in Claims 5 and 6 or 10, characterised by the feature that a bent metal clamp is provided for securing the guards and conductor rail together, said clamp being locked by means of a key preferably duplicate and interchangeable with the normal running rail key, substantially as described. 15

16. An electric railway, tramway and like system as claimed in Claims 5 and 6, characterised by the feature that the guards extend beyond the end of the rail and have preferably a cross piece arranged between an auxiliary guard and the main guard to protect the enlarged space between the ramp end of the rail and the auxiliary guard parallel with the normal running rails, substantially as described. 20

17. An electric railway, tramway and like system as claimed in Claims 1 or 2, in which the conductor rail has a lower flange broader and thinner than its upper flange, substantially as described.

18. The improved electric railway, tramway and like system, constructed and arranged to operate substantially as described with reference to the accompanying drawings. 25

Dated this 13th day of July, 1914.

For the Applicant:

W. P. THOMPSON & Co.,  
6, Lord Street, Liverpool, and at Bradford and London,  
Chartered Patent Agents. 30



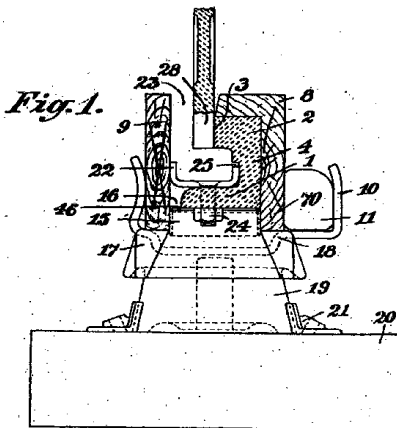


Fig. 1.

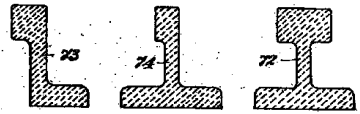
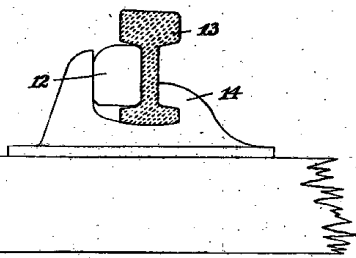


Fig. 9.

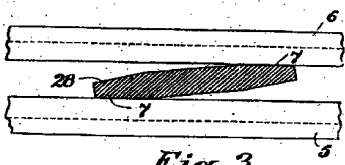


Fig. 3.

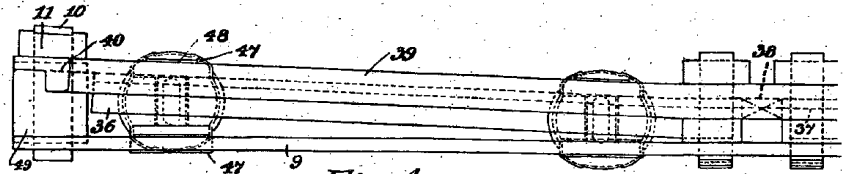


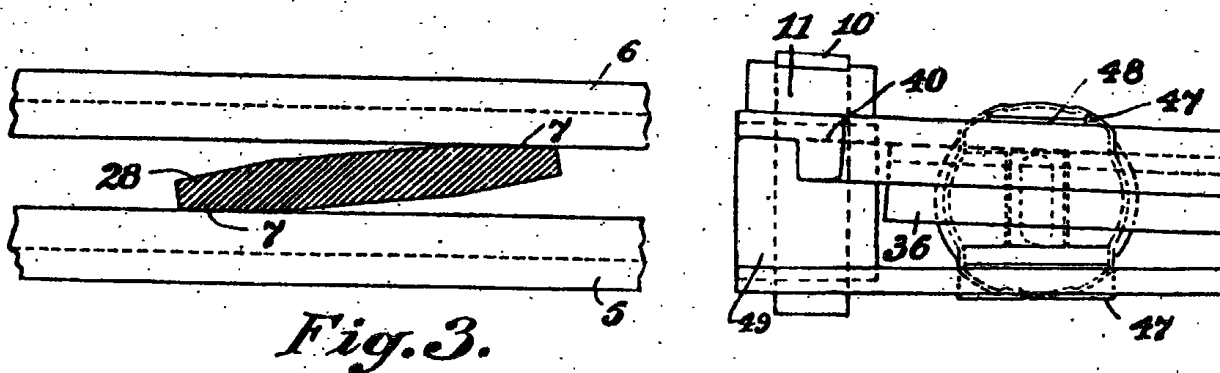
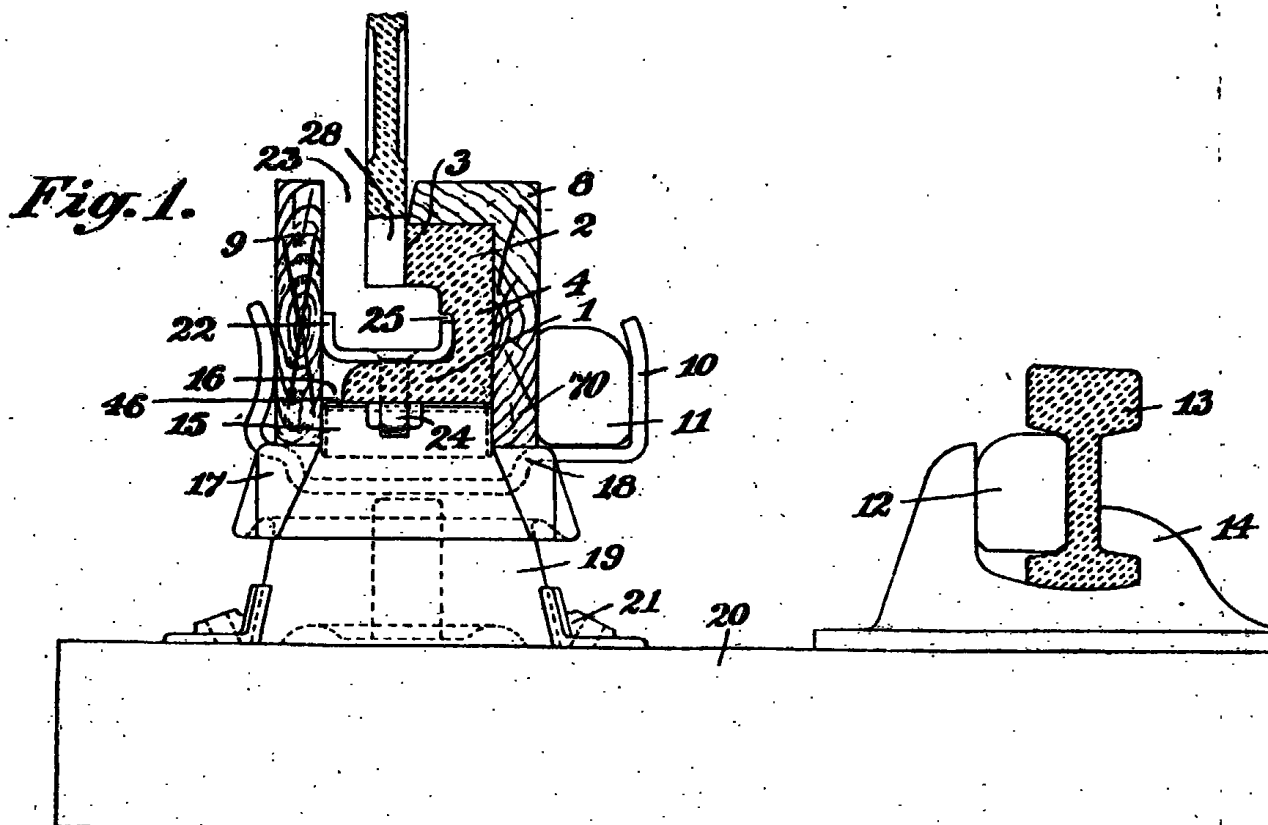
Fig. 4.

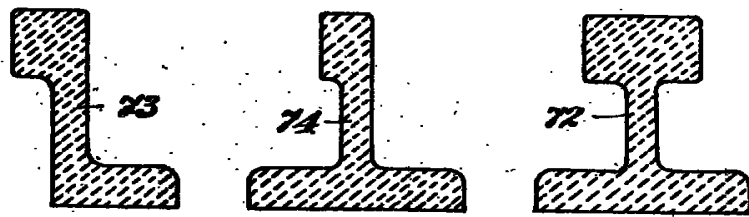
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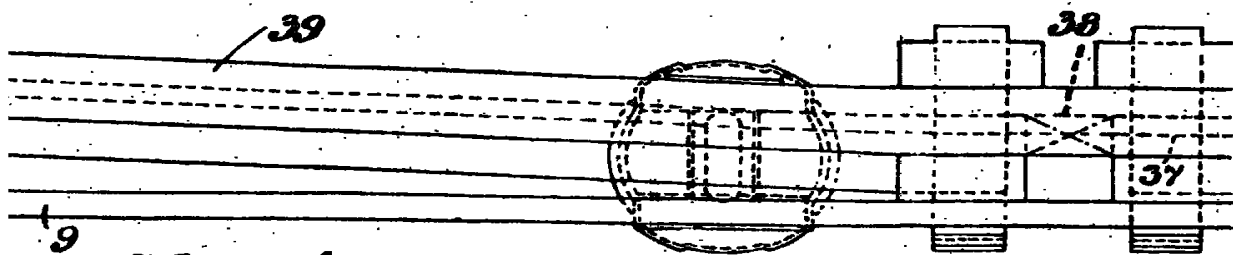
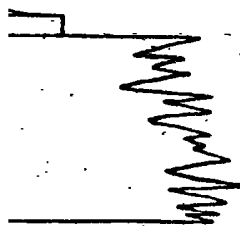
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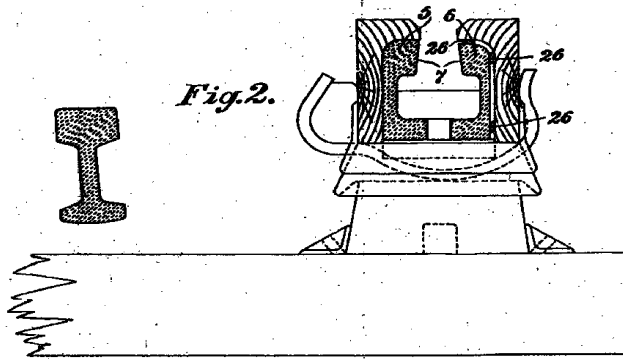
*Fig. 9.*



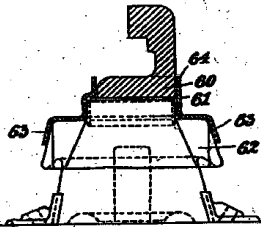
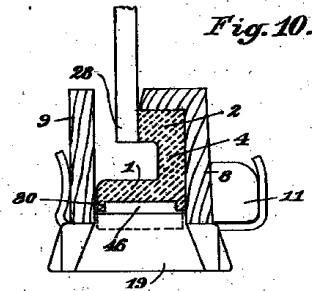
*Fig. 4.*



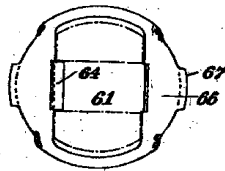
*Fig. 2.*



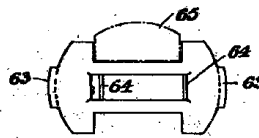
*Fig. 10.*



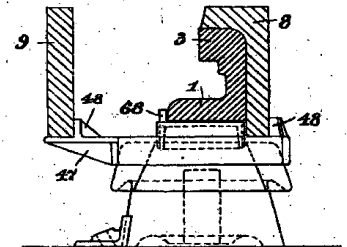
*Fig. 5.*



*Fig. 7.*



*Fig. 6.*



*Fig. 8.*

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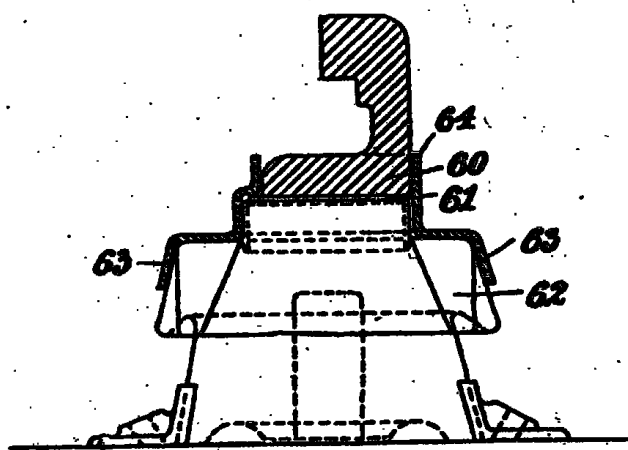
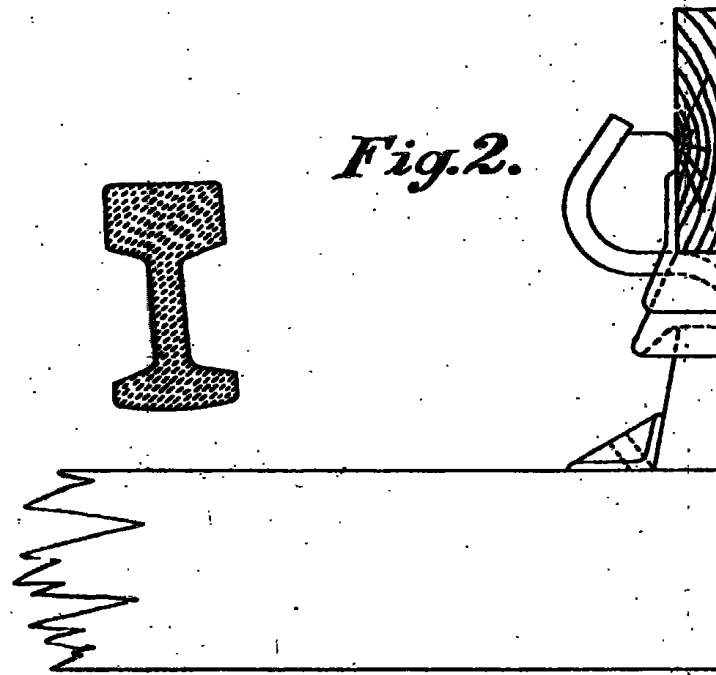


Fig. 5.

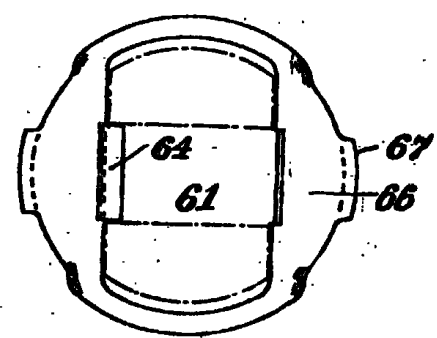
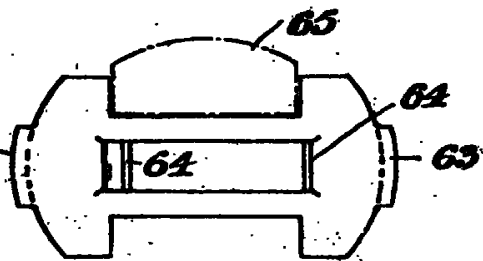
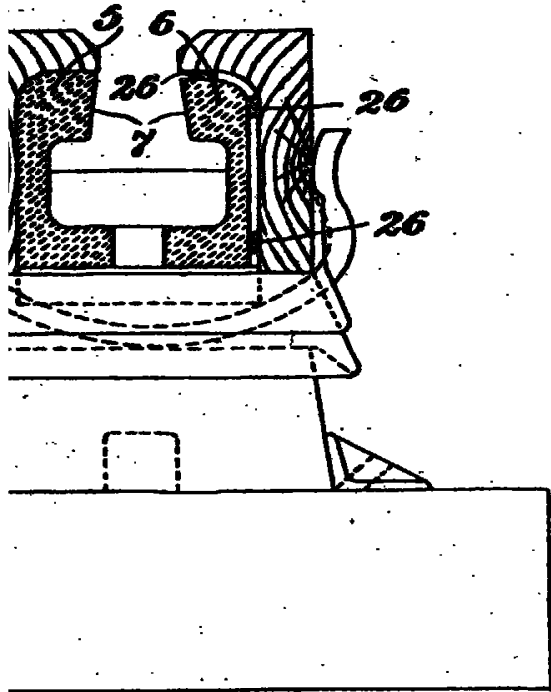
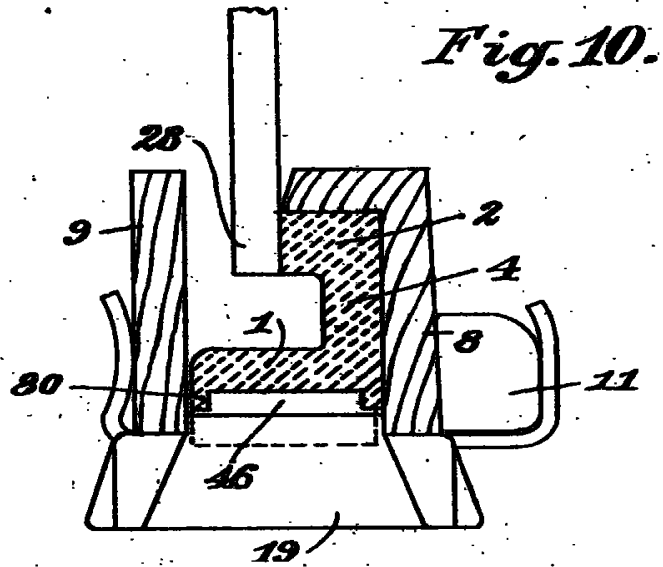


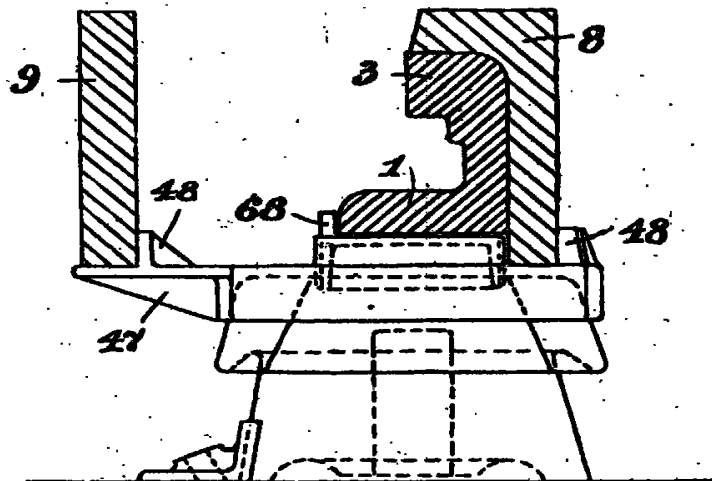
Fig. 7.



*Fig. 6.*



*Fig. 10.*



*Fig. 8.*