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Webster

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[54] **RAILROAD FROGS**

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[52] **U.S. Cl.** **246/468**

[51] **Int. Cl.** **E01b 7/10**

[58] **Field of Search** 246/468–471, 435

[56] **References Cited**

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Assistant Examiner—Richard A. Bertsch
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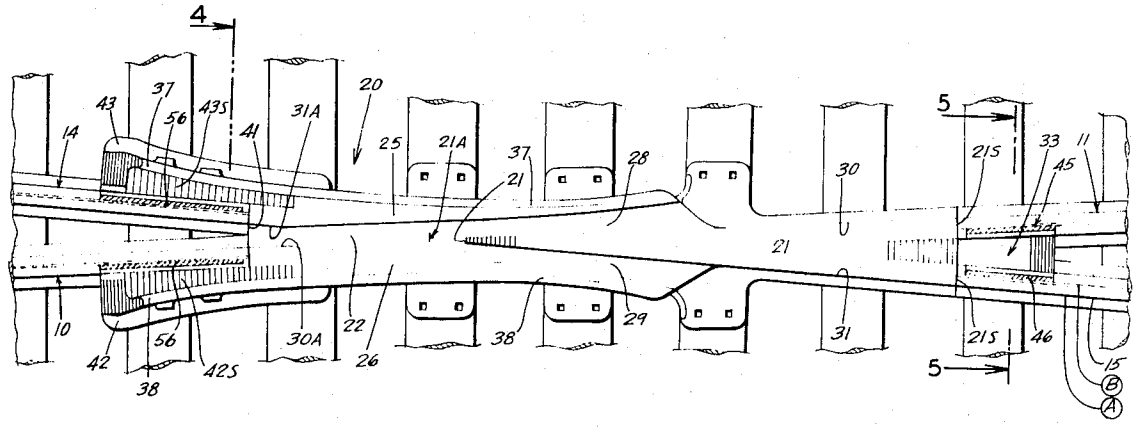
[57] **ABSTRACT**

A railroad frog casting is characterized by a heel extension having opposed sides spaced laterally from the opposed track rails at the heel end of the frog with adapters fitted in the resultant spaces; the wing rail element have extensions lapping the track rails at the toe of the frog and are also spaced laterally therefrom so that adapters may be fitted in the resultant spaces.

5 Claims, 7 Drawing Figures



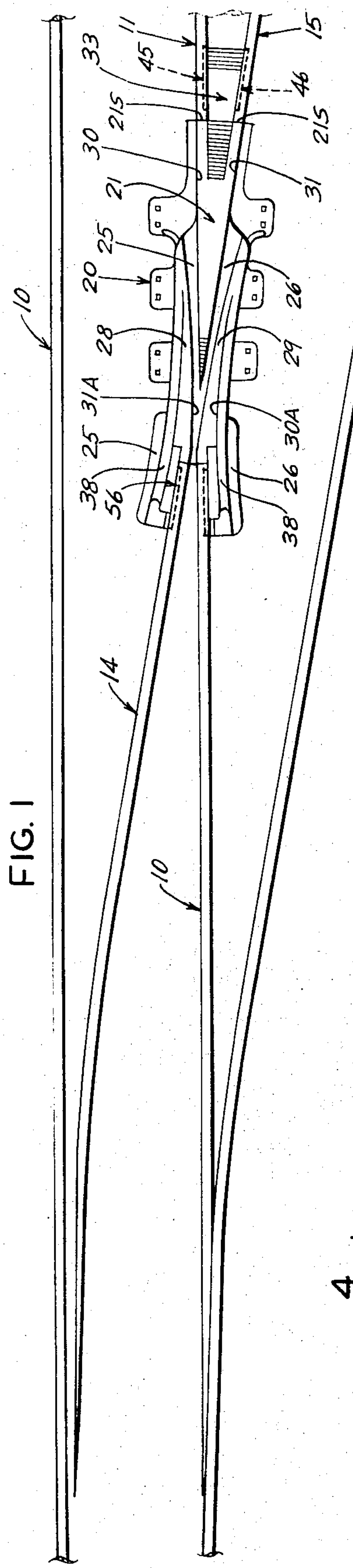


FIG. 1

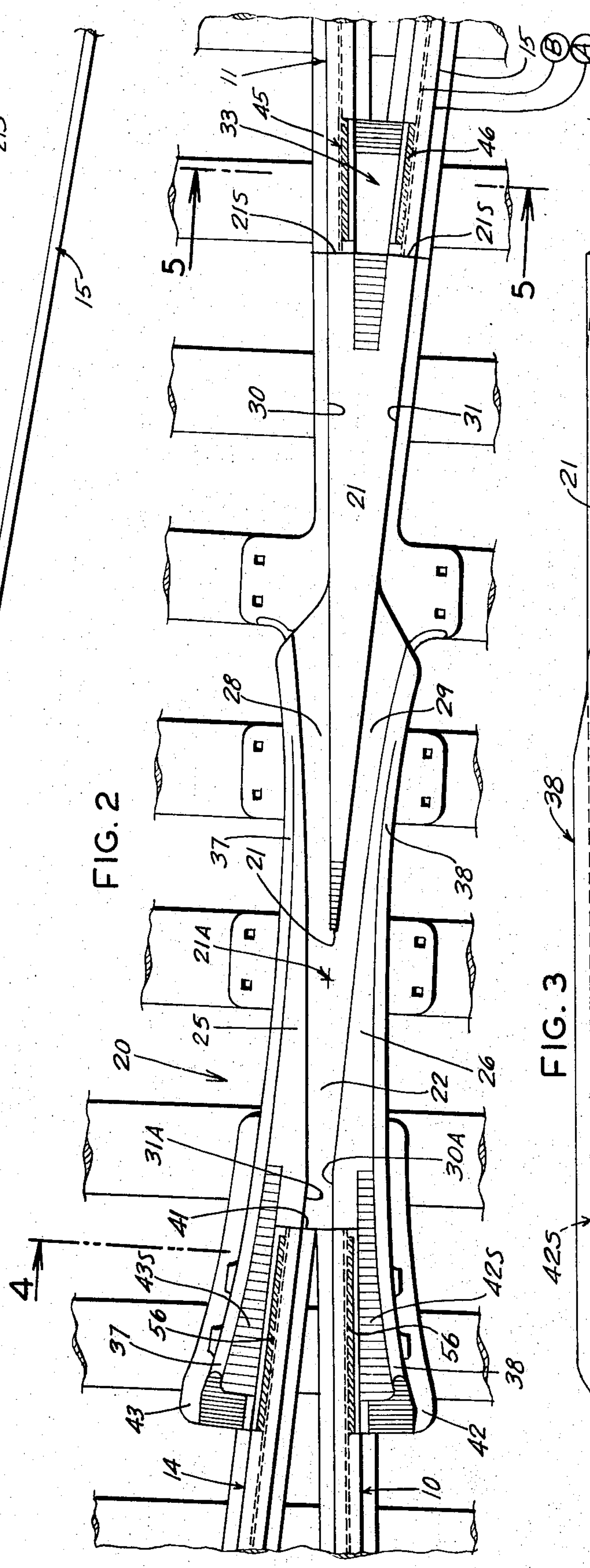


FIG. 2

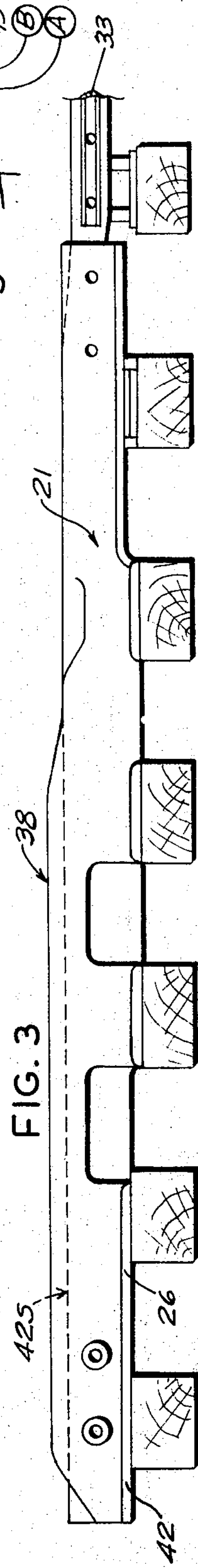


FIG. 3

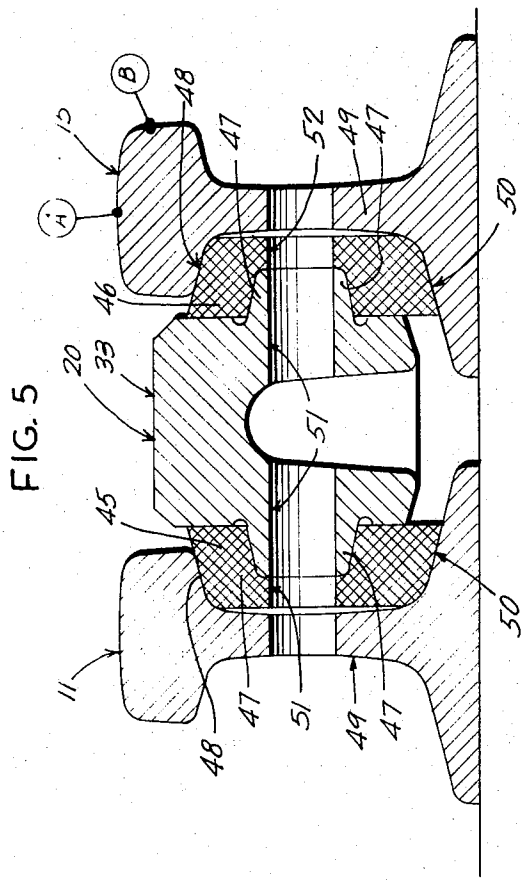


FIG. 5
B
A
10
48
47
52
49
47
50
46
20
33
51
45
11
48
47
51
49
47
50

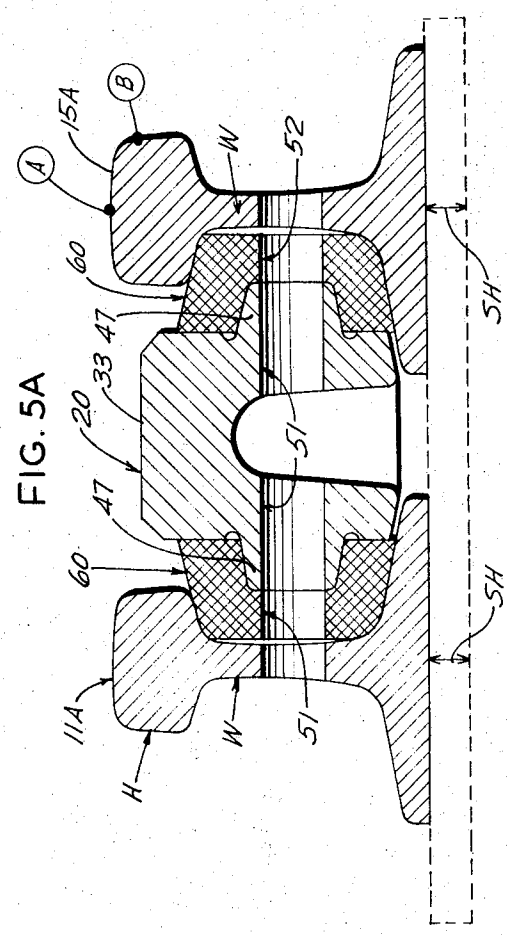


FIG. 5A
B
A
15A
W
52
60
47
SH
33
20
51
47
60
SH
11A
H
W
51

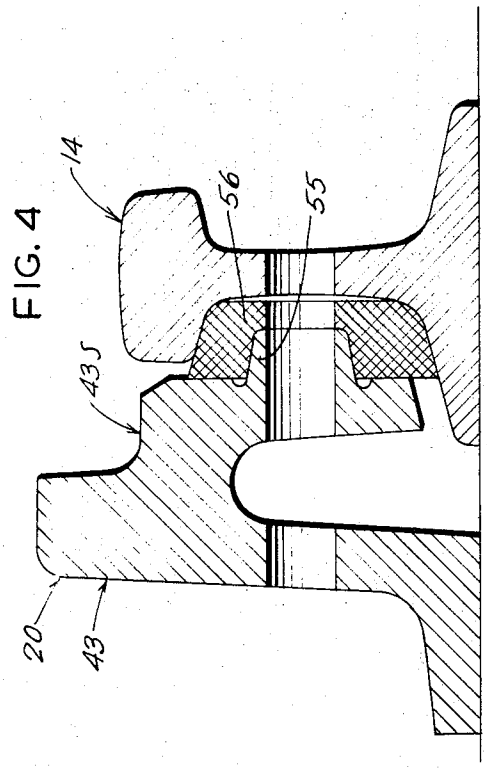


FIG. 4
14
56
55
43S
20
43

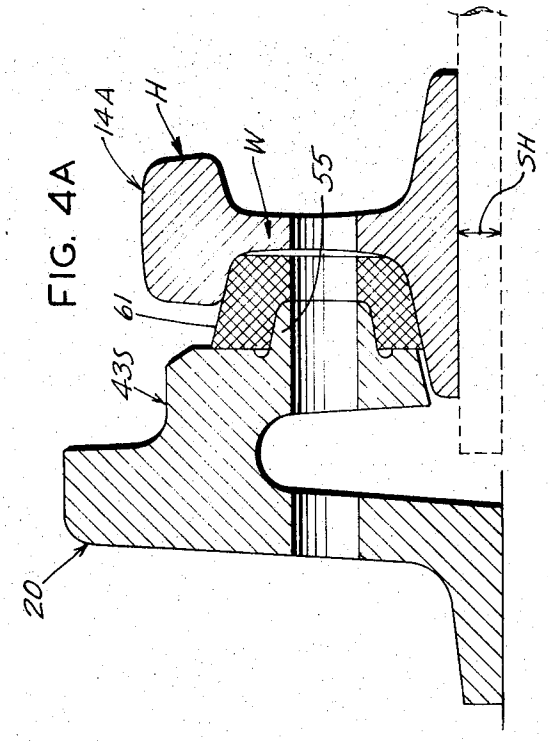


FIG. 4A
14A
H
W
55
SH
61
43S
20

RAILROAD FROGS

This invention relates to railway frogs.

In railroad parlance, a frog is a trackwork joint incorporating rail sections so constructed and assembled as to permit the car wheels on one rail of a main track to cross a rail of an intersecting track. The frog is a complex casting presenting four pieces of rail interposed between the two rails which cross. Four pieces of rail are presented by the frog because when the two main rails cross, they do so in the form of an *x* or + depending on the angle of intersection, and since the frog is installed at what amounts to the center of the intersection there must be four matching rail sections.

In keeping with railroad parlance, the frog has a solid point or tongue shaped like an arrowhead in that there are opposite sides ("gage lines") converging from the so-called heel or wide end of the point to the tip or apex of the point. The gage lines meet at the apex. These two sides of the point thus afford two of the rail sections of the frog in that either side is configured to accept the tread of a car wheel. Additionally, the frog includes two wing rail elements, one on each side of the point. The wing rail elements afford the flangeways for the car wheel and also continuations of the gage lines so that a car wheel may traverse the frog from either direction. Thus, the wing rail elements present the remaining two rail sections of the frog.

A car wheel moving through the intersection will always traverse the gage line presented by one of the wing rail elements and the gage line of the point aligned therewith as a continuation, the wing rail element first or last depending upon the direction of car movement, and in doing so the wheel either enters or leaves the main track. The flange of the wheel is always on the inside of the track rail which is why the frog must have a throat and flangeways, also explaining why there is a discontinuity of the gage lines at the throat of the frog.

The surfaces of the frog on which the tread and flange of the car wheel may travel are called the "tread portion" and "gage line." The wheel tread is supported and rolls on the tread portion and the wheel flange is guided by the gage line and held in alignment by both the gage line and guard line. Thus, it is essential that the gage lines of the rail sections of the frog match and meet the gage lines of the rails of the rail system, otherwise there will be a car derailment; and for the same reason the frog must be rigidly coupled to the main tracks. In complying with these standards, the practice is to construct the most superior form of frog so that rigid sections thereof complementally abut and exactly match the inside profile of the track rails. The track rails are actually bolted to the rigid sections of the frog, whereby the track rails are both joined to the frog and braced by the complemental fit.

Even so, this has presented a problem for those railroads which have grown by merger, assimilating a rail system which was constructed with a different profile of rail. Thus, while the gage system (the spacing between rails) may be assumed to be standard in North America the shape of the rail head may vary as well as its height above the rail base. While it is an exaggeration to say that matching the abutment parts of a frog to the profile of the main rails is comparable to matching a round peg to a square hole, nonetheless a particular track intersection simply will not tolerate all frogs from the standpoint of rail head configuration and height above base, so the railroad has to maintain a varied inventory of frogs keyed to the divergent nature of its rail system, adding significantly to the cost of operation. Briefly, the current practice is to profile the frog to the profile of the main rail, and the frog is so cast. A casting of such size is very expensive.

It is the object of this invention to enable a railroad to simplify its inventory of frogs and to make possible a universal frog which can be matched to any rail profile or section. Specifically it is an object of the present invention to construct a frog with undersized rail bracing sections at the toe and heel whereby there is a gap between the opposed surfaces of the main rails and the bracing sections of the frog, the gaps being filled by adapters which fit both the frog profile and the profile of the opposing side of the main rail. Thus I invert the concept and profile the adapter to the frog and connecting rail, rather than casting the whole frog to fit the connecting rail profile. Consequently the railroad need not key its inventory of frogs to rail profiles, but need only concern itself with an inventory of adapters representing an inventory item of far less magnitude compared to the frogs.

In the drawings:

FIG. **1** is a simplified and fragmented showing of a track system having a turn-out and a frog located thereat;

FIG. **2** is a plan view of a frog constructed in accordance with the present invention, partly sectioned for clarity;

FIG. **3** is a side elevation of the frog shown in FIG. **2**;

FIGS. **4** and **5** are sectional views taken on lines **4—4** and **5—5** of FIG. **2**; and

FIGS. **4A** and **5A** are sectional views similar to FIGS. **4** and **5** showing the invention applied to a lighter rail section utilizing a plate to accommodate the difference between the bottom of the frog casting and top of tie.

FIG. **1** shows a fragment of a railway system. A main track comprises a pair of main line rails **10** and **11** and branch or side tracks **14** and **15.** A frog casting **20** is interposed at the area where rails **10, 11** and **14, 15** intersect. As an introduction to terminology, the frog **20** is a unitary one-piece casting comprising a frog point **21** with opposite sides converging toward the apex **21A.** There are a pair of wing rail elements **25** and **26** which have surfaces spaced from the opposite sides of the point to afford flangeways **28** and **29.**

The opposite sides of the point constitute gage lines **30** and **31** which match the gage lines of the connecting rails **11** and **15** at what is known as the heel end of the frog corresponding to the wide end of the point. Actually, as will be further described, there is a heel extension **33** at the wide end of the point.

It will be noted that the gage lines **30** and **31** meet at and terminate at the tip or apex of the point **21,** but beyond or ahead of the throat **22** the gage lines are continued at **30A** and **31A,** which are surfaces presented by the wing rail elements. Thus the gage lines **30** and **31,** convergent as they are inward from one end of the point, intersect at a theoretical point **21A** and are continued as divergent surfaces outward of the throat in the direction of the other end of the frog, known as the toe end. The actual intersection cannot prevail but must be opened at the throat to allow the flange of a car wheel to traverse the frog from either direction.

The connecting track rails **11** and **15** are connected to the frog at the heel joint, and the continuations of the track rails **10** and **14** are connected to a toe joint at the toe end of the frog as will be explained.

The frog **20**, FIG. **2**, thus comprises a point **21** and a pair of wing rail elements presenting crossed gage lines which constitute collectively two additional rail sections of the frog representing continuations of the connecting rails **10** and **14**.

The heel extension **33** at the wide end of the heel is an integral part of the frog casting **20**, and in fact all parts to be described hereinafter, with the exception of the adapters and the connecting bolts, constitute a unitary one-piece casting, shown by solid lines in FIG. **2**.

The heel extension is of considerably less width than the wide end of the point **21**, but is centered with respect thereto to define spaced shoulders **21S**, FIG. **2**, at the wide end of the point which tog ether with the heel extension constitute two heel joints where the corresponding end of the frog is joined to the connecting rails **11** and **15**. The heel joint will be described in more detail below.

The gage lines **30** and **31** in effect meet at the apex or tip **21A** of the point **21**. This is at the throat area **22** of the frog. The wing rail elements **25** and **26** present spaced gage lines **30A** and **31A** constituting extensions of the gage lines **30** and **31**, respectively, as noted. The gage lines **30A** and **31A** of the wing rail elements are spaced well forward of the tip of the point and forward of the throat as well.

The wing rail elements **25** and **26** include guards **37** and **38**. The inside faces of the guards **37** and **38** are spaced from the gage lines **30** and **31** of the point thereby to cooperate with opposed sides of the point to define the flangeways **28** and **29**. The spaces **28** and **29** are known as flangeways because the flange of the car wheel is adapted to travel in one or the other depending upon the direction the car wheel is traversing the frog. Thus the tread of the car wheel may be on gage line **30** of the point moving in the direction of the throat in which event the flange of the wheel will be disposed in flangeway **28**, eventually traversing the throat **22** and moving onto the continuing gage line **30A**; or the wheel may have a similar direction of movement while the tread is on the other gage line **31**; or the wheel may be on gage line **30A** or **31A** moving into the throat in the direction toward the heel joint. The guards are not always necessary since their principal function is to guard the flange of the wheel against derailment in the event there is a tendency for the wheel to "pick" the point and travel down the opposite flangeway.

The gage lines **30A** and **31A** presented by the wing rail elements are of course spaced from one another to allow the car wheel to traverse the frog. The gage lines **30A** and **31A** terminage at what is known as the toe joint **41** which, like the heel joint mentioned above, allows the frog at the opposite end to be joined to the connecting rails **10** and **14**.

The present frog, FIG. **2**, is also characterized by so-called easer arms **42** and **43** which are integral extensions of the wing rail elements, extending beyond the toe joint **41**. The easer arms may be considered as part of the toe joint just as the heel extension **33** may be considered part of the heel joint. The easer arms are so termed because of the sloping surfaces **42S** and **43S** which are sloped upwardly in the direction of the point, proceeding from the left-hand extreme end. The reason for the sloped surfaces is to accommodate worn wheels as is well known in the art.

The heel extension **33** fits between and therefore laps the inside faces of the track rails **11** and **15** presented to the heel end of the frog. Under and in accordance with the present invention the opposed surfaces of the heel extension, opposed to the inside faces of the rails **11** and **15**, do not directly abut the rails **11** and **15** which is the ordinary construction, but to the contrary are spaced from the inside faces of the two connecting rails **11** and **15** as will be readily apparent in FIG. **5**.

In like manner, the inside face of each easer arm which would ordinarily abut complementally the outside profile of the connecting rail **10** or **14** is dimensioned to be spaced from the related connecting rail as will be readily apparent in FIG. **4**. In this connection it is to be understood that a section taken through the easer arm **42** rather than the easer arm **43**, FIG. **4**, will produce nothing more than a mirror image of FIG. **4**.

It will be recognized that the easer arms lap the track rails to present frog surfaces at the toe of the frog opposed to the outside faces of the track rails, just as the heel extension laps the rails to present frog surfaces at the heel of the frog opposed to the inside faces of the track rails.

The frog **20** is not cast as an entirety to take into account the inside profiles of the connecting rails but to the contrary, the outer faces of the heel extension and the inner faces of the easer arms which will be opposed to side surfaces of the connecting rails may themselves be cast of some acceptable, standard configuration whereby adapters, FIGS. **2** and **5**, may be disposed complementally in the spaces between the opposed surfaces of the frog and the connecting rails.

More specifically a pair of adapters **45** and **46**, FIGS. **2** and **5**, are afforded for the heel joint. The heel extension **33**, FIG. **5**, is cast on each face with lugs **47** while the related adapter plates **45** and **46** are cast with complemental grooves characterizing a dovetail fit of the adapter plates to the heel extension **33**. Furthermore, the adapter plates **45** and **46** at the surfaces opposed to the track rails **11** and **15** are profiled to fit complementally the underside of the head **48** of the rail, the vertical web or plate **49** of the rail and at least the area where the base of the rail **50** and the vertical plate meet. The rails **11** and **15** are of the same cross-section. Consequently, the heel extension **33** and adapters effectively support the connecting rails **11** and **15** beneath the heads thereof and accurately space the connecting rails **11** and **15** to fit the gage lines **30** and **31** of the frog point. At the same time, the frog is supported by the bases of the rails **11** and **15**.

I do not profile the heel extension **33** to fit the rail profile but rather profile the adapter plates to fit both. In this connection those skilled in the art will fully appreciate that the distance separating the very bottom of the rail from the very top is not important, and in fact in rail systems in North America this distinction may vary from between 5 inches and 6 inches. Likewise those skilled in the art will appreciate that the web or plate section of the rail may vary widely, equally true of the head of the rail, and indeed these very variations have constituted a great expense to railroads in maintaining frog inventories, but this cost is greatly reduced under the present invention.

As shown in FIGS. **2** and **5**, the heel extension and adapter plates are formed with registered openings **51**

and **52**, registering with openings in the plates of the rails whereby the latter may be bolted to the frog casting which is a standard procedure so far as fastening is concerned.

In like manner, the inside faces of the easer arms as **43**, FIG. **4**, are cast with projecting bosses or ledges **55** spaced from the opposed surface of the connecting rail and the space therebetween is filled complementally by an adapter plate **56** which, as shown in FIG. **2**, may be associated with either easer arm, a feature which is equally applicable to the adapter plates **45** and **46**, FIG. **2**, which are interchangeable. Again, FIG. **4**, the parts are joined by bolts, and any rail profile may be accommodated by appropriately configuring the interposed adapter plate.

The essential feature is that the parts of the frog which lap the track rail are spaced laterally of the track rails presented to the ends of the frog and that adapters placed in such spaces be shaped complemental to the space whereby the frog braces the track rails. Therefore, one side of each adapter will be complemental to the lapping part of the frog and the other side of each adapter will be complemental to at least the underside of the head and the top side of the rail base, whereby the rail head is supported by the frog in effect and whereby the rail base supports the frog. The dovetail could be reversed with projections on the adapters fitting recesses or slots in the heel extension or easer arms as the case may be. With these principles in mind, the universal feature of the present invention may be quickly realized with reference to FIGS. **4A** and **5A** where the rail system is different from that shown in FIGS. **4** and **5**. Thus it will be recognized that the rails **14A**, **11A** and **15A**, FIGS. **4A** and **5A**, are substantially different compared to the rails **14**, **11** and **15** in FIGS. **4** and **5**, the difference residing principally in a differently shaped rail head H and a web W of shorter height compared to the web for the rails shown in FIGS. **4** and **5**. This will entail shims of a thickness SH, FIGS. **4A** and **5A**, interposed beneath the base of the rail and the supporting ties at the turn-out where the frog is installed.

However, the frog for the rails shown in FIGS. **4A** and **5A** will be identical to that of FIG. **2** as shown by like reference characters. On the other hand, the adapters **60** at the heel joint, FIG. **5A**, mounted on the supports **47**, are shaped complementally to the opposing profiles of the rails **11A** and **15A**. Again the essential feature is that each adapter **60** be supported by (jointed to) the heel extension **33** while complementally engaging the underside of the head of the related track rail and the upper face of the base of the related track rail. In like manner, each adapter **61**, FIG. **4A**, at the toe joint is supported by (jointed to) the related easer arm while the opposite side of the adapter **61** complementally fits the underside of the track rail to brace the rail **14A** while at the same time being configured to fit complementally the top side of the rail base whereby the rail **14A** in turn supports the frog. As noted above, frog **20**, FIGS. **4A** and **5A** is identical to the frog shown in FIG. **2** demonstrating that the present invention greatly diminishes the inventory problem in that a railroad need maintain only an inventory of different adapters rather than an inventory of different frogs keyed to different rail configurations.

It may finally be noted that while rail profiles may vary widely, nonetheless the standard requirement is that points A and B, FIGS. **5** and **5A**, at the rail head be separated by a standard ⅝ inch vertical distance. These points represent a proper fit of the wheel on the rail, and even though rail profiles at butted sections may vary the wheel will move smoothly across the butt because of the standard A-B dimension. Referring to FIG. **2**, the frog of the present invention is therefore cast to have points A and B at the heel and toe joints coincident with points A and B of the track rails butred thereto regardless of the profile of the track rails that may be present at the heel and toe joints.

I claim:

1. A railroad turn-out system including a frog interposed between and connecting main track and side track rails, the frog having a point presenting gage lines on opposite sides thereof which converge from the heel end of the point toward a common apex, and wing rail elements on opposite sides of the point forming flangeways therewith which converge to a throat ahead of the apex, the wing rail elements also providing continuations of said gage lines outward of said throat to allow a car wheel to traverse the frog from either direction, the point and wing rail elements being embodied in a unitary one-piece casting, the point having a heel joint to be joined to the track rails at one end of the frog and the wing rail elements at the other end of the frog presenting a toe joint for the track rails at said other end of the frog, the heel joint and toe joint having surfaces opposed to and spaced from surfaces of said rails, and adapters disposed in the spaces between said opposed surfaces, each adapter at one side complementally fitting the frog surface and at the other side complementally fitting the related rail.

2. A turn-out system according to claim **1** wherein the casting includes a heel extension extending rearward from the wide end of the point and defining with the wide end of the point a pair of shoulders against which ends of the track rails are to be butted with the heel extension lying therebetween, the wing rail elements having terminal ends at the toe end of the frog and having arms cast integral therewith and extending forwardly therefrom, the track rails at the toe end of the frog being butted against the terminal ends of the wing rail elements and disposed between said arms, the inside faces of said arms opposed to the track rails and the outside faces of the heel extension opposed to the track rails being respectively spaced from the opposed rail surfaces to afford spaces for said adapters.

3. In a railroad turn-out system where a frog is interposed between and connects main and side track rails: a frog having a frog point presenting gage lines on opposite sides thereof converging from the heel end of the point toward a throat, said frog having wing rail elements providing continuations of said gauge lines outward of the throat to allow a car wheel to traverse the frog from either direction, the point and wing rail elements being embodied in a unitary one-piece casting, the point having a heel joint to be joined to the track rails presented to one end of the frog, the wing rail elements at the other end of the frog having a toe joint for the track rails presented to said other end of the frog, the heel joint and toe joint having surfaces opposed to and spaced from surfaces of said rails, and adapters to be disposed in the spaces between said opposed surfaces at the joints, each adapter at one side complementally fitting the opposing frog surface and at the

other side complementally fitting the opposing surface of the related rail.

4. A frog according to claim 3 wherein the casting includes a heel extension extending rearward from the wide end of the point and defining with the wide end of the point a pair of shoulders against which ends of the track rails are to be butted with the heel extension lying therebetween, the wing rail elements having terminal ends at the toe end of the frog and having arms cast integral therewith and extending forwardly therefrom so that track rails at the toe end of the frog may be butted against the terminal ends of the wing rail elements and disposed between said arms.

5. A railroad frog having a pair of heel joints and a pair of toe joints for connecting the frog to two track rails at opposite ends of the frog, the heel joints being characterized by a part of the frog fittable between and thereby having surfaces opposed to the two track rails presented at one end of the frog, the toe joints being characterized by spaced parts respectively presenting a surface which will lap and thereby be opposed to one of the track rails presented to the other end of the frog, and an adapter for each heel joint and each toe joint interposable between the track rail at the joint and said opposed surface of the frog at the joint, each adapter having one side shaped complemental to the underside of the rail head and upper side of the rail base of the rail at the joint and having another side shaped complemental to the surface of the frog opposed to the rail at the joint.

* * * * *