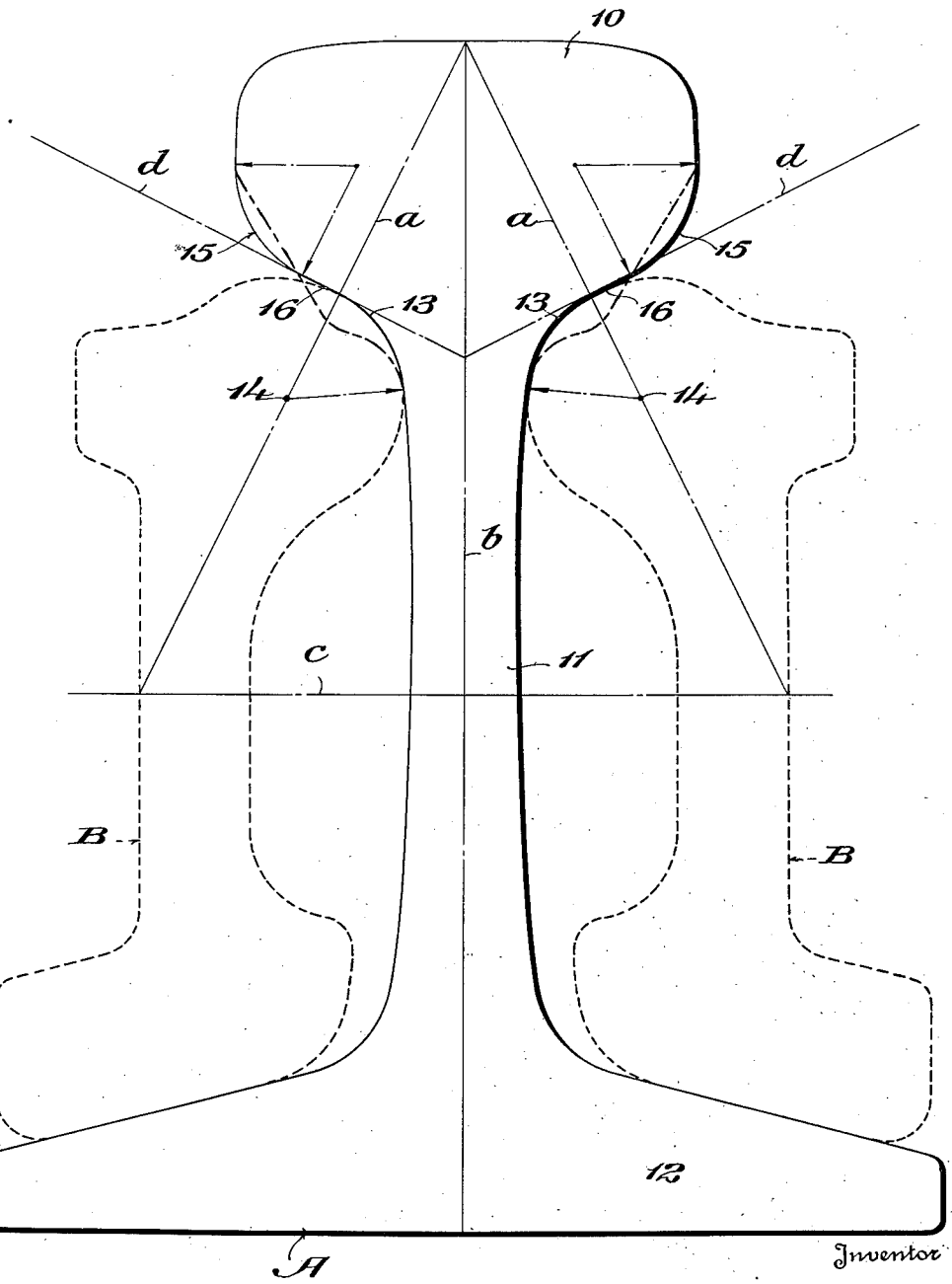
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RAILWAY RAIL

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RAILWAY RAIL

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1 Claim. (Cl. 238—175)

This invention relates to railway rails and joints, and has particular reference to improvement in rails for use with joints of the so-called "Headfree" type wherein loading cooperation of the splice bars with the rails is solely between the upper, inner, rounded corners of the splice bars and the head-web fillets of the rails and the tops of the splice bars are "free" or have clearance from the under sides of the rail heads outwardly of the head-web fillets thereof.

One special object of the invention is to provide a rail for Headfree type joints having all of the advantages of Headfree rail as heretofore produced and, at the same time, embodying a novel head design tending to optimum freedom from abnormal or unequal stresses, both during production stages of rolling and cooling and under actual joint assembly and service conditions.

Another special object of the invention is to provide a rail for Headfree type joints having the foregoing advantages and embodying a head design such that all abrupt deflections as between its different faces and especially regarding its under contour, are avoided, whereby, as compared with Headfree rail as heretofore produced, there is obtained a more even flow and working or molding of the head and upper web metal in rolling, a more uniform or better graduated cooling, and a more regular texture with finer grain and less fibre stress or stress concentration in the metal of the head and the upper web structure.

Another special object of the invention is to provide a rail for Headfree type joints having the foregoing advantages and which is characterized by having larger than usual head-web fillets affording larger than usual bearing areas for loading cooperation with the upper, inner corners of splice bars, whereby joints between the rails are sturdier and possess materially longer than usual life.

Another special object of the invention is to provide a rail and joint assembly of the Headfree type according to which the generally enlarged head-web fillets of the rails are confined between planes which extend longitudinally of the rails, which pass through the radial centers of the head-web fillets, which intersect with each other at or near the tops of the rails in the common central, vertical, longitudinal plane of the rails and which also intersect with the bolting faces of the splice bars substantially in the horizontal plane of bolting of the joint; whereby load forces imposed on the rails are resolved into resultant forces which act inwardly on the bar heads and tend constantly and positively to intensify the pinch of the heads of the bars on the head-web fillets of the rails with the result of maintaining the joint tight and the rails high, as well as advantageously insuring substantially uniform stressing of the joint under load.

With the foregoing and other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in the novel features of construction, combination and arrangement as will be hereinafter more fully described, illustrated in the accompanying drawing and defined in the appended claim.

In the accompanying drawing, the figure is an end view of a rail for Headfree type joints embodying the features of the invention, the same being shown as superimposed upon a standard Headfree rail, indicated by dot and dash lines, and as having operatively associated therewith cooperating splice bars, indicated by dotted lines.

Referring to the drawing in detail, A designates generally the present improved rail of the Headfree type, according to one practical embodiment of the invention, and B, B designate generally associated splice bars.

The rail A includes, as usual, a head **10**, a web **11**, a base **12** and head-web fillets **13** at the junction of the head **10** with the web **11**. However, as essentially distinguished from prior rails, the present rail is characterized by having the radial centers **14** of its headweb fillets **13** disposed in planes *a*, *a* which, as illustrated in the instant case, intersect with each other and with the central vertical, longitudinal plane *b* of the rail at or approximately at the top of the head **10** and with the outer or bolting faces of the splice bars B in or substantially in the horizontal plane *c* of bolting of said splice bars. As further distinguished from prior rails, the present rail is characterized by having the lower, outer corners of its head defined by large fillets **15** and by having, between the fillets **13** and **15** and connecting said fillets, flat under face portions **16** of narrow width which are tangent to said fillets.

The flat, under face portions **16** are disposed in planes *d*, *d* which are normal to the planes *a*, *a* and which intersect with each other and with the central, vertical, longitudinal plane *b* of the rail at the theoretical bottom of the head **10**.

Since the radial centers **14** of the head-web fillets **13** are disposed in the planes *a*, *a*, and since the planes *d*, *d* are tangent to the top por-

tions of said head-web fillets, and as said head-web fillets merge, of course, with the web 11, it follows that said head-web fillets necessarily are considerably larger than usual and afford bearings of considerably greater than usual area for loading cooperation with the upper, inner, rounded corners of the splice bars B, B, which, in turn, contributes, of course, to reduced wear and increased life of the head contacting portions of the rails and the splice bars, as well as in effectively transmitting load forces imposed on the rails to the splice bars. It also follows from the fact that the portions 16, 16 are in planes normal to the planes *a*, *a*, that the head-web fillets 13, 13 are confined between said planes *a*, *a*, or, in other words, do not extend outwardly beyond said planes. In this connection, since the heads of the splice bars are formed to take loading engagement only with said head-web fillets 13, it further follows that loading engagement between the heads of the splice bars and the rails is confined between the planes *a*, *a*. Loading of a rail is substantially centralized at or adjacent to the point of junction of its top with its central, vertical, longitudinal plane, and from this point the loading forces diverge downwardly and outwardly to the bolting faces of the splice bars in the horizontal plane of the center line of the joint bolts. This means that, according to the present invention, load transmission is confined between the planes *a*, *a*, and that, since the fillets 13, 13 are generously enlarged and extend outwardly to said planes *a*, *a*, the joints are practically uniformly stressed and load forces are resolved into resultant forces which act inwardly on the heads of the splice bars and tend to tighten their contact with the head-web fillets 13. As a consequence, the joints are maintained tight and the rails are maintained high.

Due to the generously enlarged fillets 13 and 15 and to the consequent lack of abrupt deflections as between the different faces of the head of the present rail, especially its under head faces, the rail is exceptionally easy to roll and there is obtained, as compared with prior rail, a more even flow and working or molding of the head and upper web metal in rolling, a more uniform or better graduated cooling and a more regular texture with finer grain and less fibre stress or stress concentration in the metal of the head and the upper web structure, all of which are important considerations from the standpoint of providing rails and joints which are strong, durable and substantially devoid of undesirable stress concentrations.

Obviously, instead of the present rail having the flat tangent faces 16, 16, the radii of the fillets 15, 15 may be such that said fillets extend inwardly to the planes *a*, *a*. Ordinarily, however, this would result in undesirably large fillets 15, 15 and compound reverse deflections. Therefore, the head of the present rail preferably includes the tangent faces 16, 16. In this connection and as will be observed from the drawing, the said tangent faces 16, 16 and the top and medial portions of the head-web fillets 13, 13 are respectively disposed higher and a definitely greater distance outwardly from the vertical center of the rail than the top and medial portions of the head-web fillets of the comparable Headfree rail, as illustrated by comparison of the outline of the present rail, shown by full lines, with a comparable ordinary Headfree rail as shown by the dot and dash lines. The splice bars B therefore are higher and stiffer than the splice bars used with an ordinary Headfree rail. Moreover, the metal in effect saved by raising the head-web fillets of the present rail as compared with an ordinary Headfree rail, is used advantageously in providing the large corner fillets 15, 15, so that there is little or no difference in cross sectional area between the present rail and an ordinary Headfree rail.

Another feature of practical importance, included in the present invention, has to do with the rail underhead conformation comprising the enlarged and reversely curved fillets combined with the intervening tangent portion 16 at a preferable inclination of approximately 1:2 to the horizontal and normal to planes which pass through the theoretical center of loading on the rail top and through the radial centers of the head-web fillets, whereby the arcs of the enlarged head-web fillets are substantially radian arcs, that is, of lengths substantially equal to their radii, and their bar contact or load transmission surfaces will reside wholly within the angle formed by such planes. The conventional inclination of the undersides of rail heads in Standard T-rails and Standard Headfree rails is a fixed 1:4 inclination (about 14° to the horizontal), whereas, according to the metal distribution of the present invention, the objects and advantages of the latter are attained by having the underhead inclination angles ranging anywhere between approximately 24° (about 1:2.25) and approximately 30° (about 1:1.75) with the horizontal, though as stated the preferred inclination involved is the 1:2 inclination, that is, a much steeper inclination than the conventional standard 1:4 inclination referred to. Thus, it will be noted how the fillet radii and "out-to-out" center of bolting dimensions are interdependent and how they vary between the above tolerance inclinations of about 1:2.25 and about 1:1.75. The greater inclinations provide greater "out-to-out" dimensions and have larger web fillet radii but smaller radii in the underhead corner fillets, and conversely the lesser inclinations will have smaller web fillet radii and relatively larger corner fillet radii, while in the case of the prescribed and preferred 1:2 inclination the respective radii usually will be equal, or substantially so.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claim.

I claim:

In a rail splicing structure, a rail and splice bars disposed for cooperative bolting assembly therewith, the rail having a new underhead formation as compared with a standard rail of substantially equal cross-sectional area, said new underhead formation comprising outer bottom corner fillets extending downwardly and inwardly from approximately the gauge line at the sides of the rail head for the relief of wheel flange wear, enlarged inner head fillets, and an intervening tangent between the two fillets, which tangent is disposed at an inclination of approximately 1:2 relative to the horizontal, the arcs of each of said head fillets being of lengths substantially equal to their radii and also confined between vertically divergent planes extending longitudinally of the rail at right angles to the

1:2 planes of said tangents and downwardly therefrom through the radial centers of the said arcs to intersections with the bolting faces of the splice bar assembly substantially in the center line of bolting of the said assembly, whereby the said combination of fillets and the 1:2 slope of the tangents provides for reduced wear of the head contacting portions of the rails and the splice bars, as well as confining the load transmission surfaces wholly within the angle formed by the aforesaid planes to facilitate cooperation of said bars and rails.

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