Sept. 23, 1941. McLEOD THOMSON 2,257,027

MODIFIED T-RAIL

Filed May 3, 1941 2 Sheets-Sheet 1

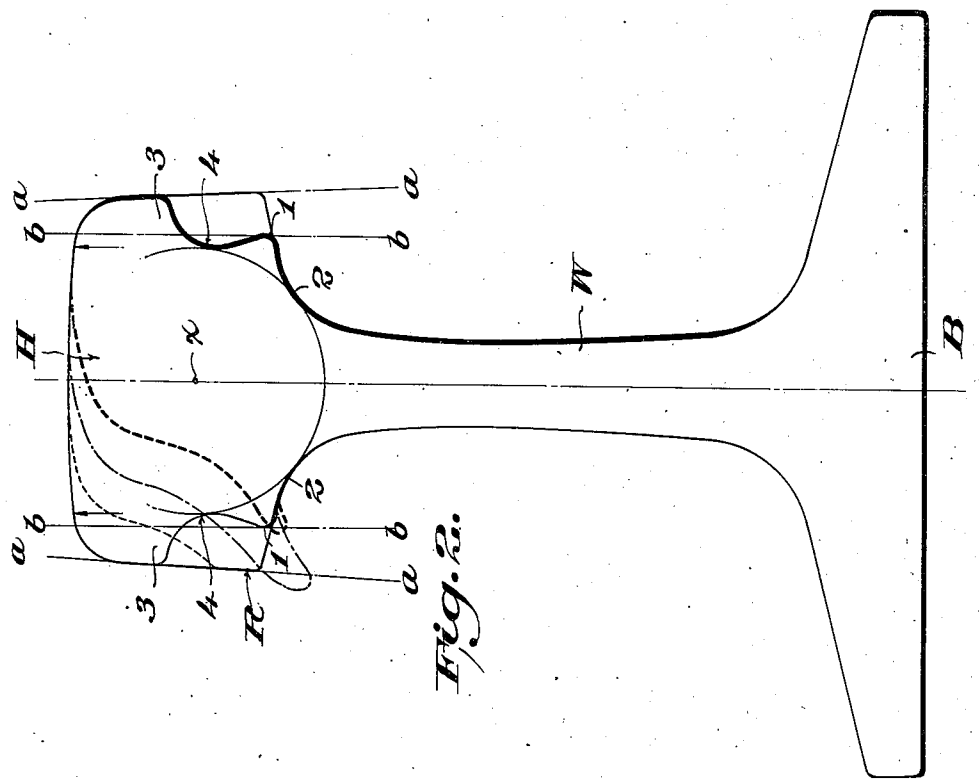


Fig. 2.

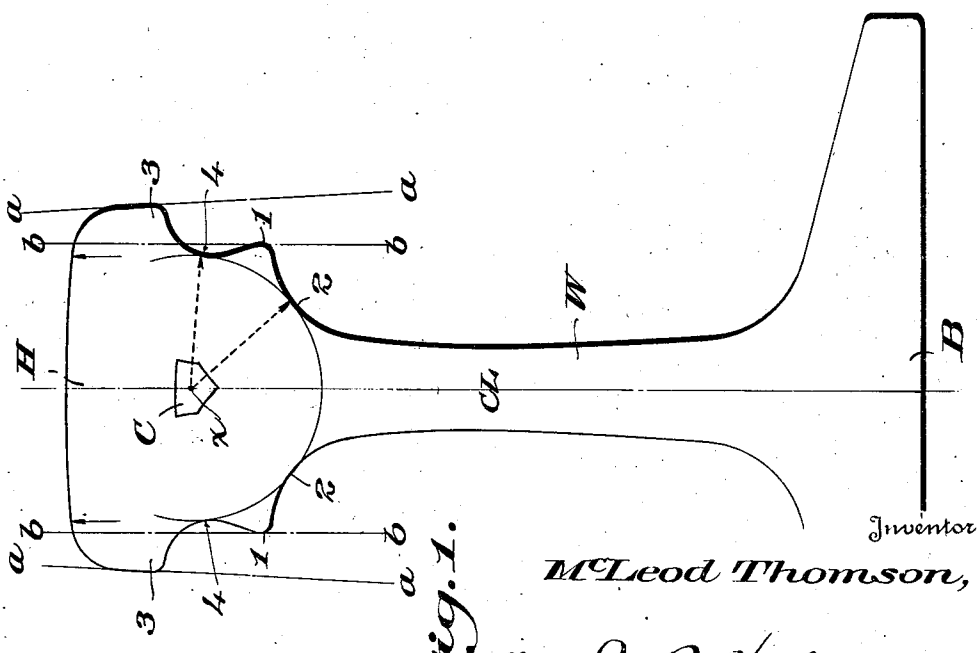


Fig. 1.

Inventor

McLeod Thomson,

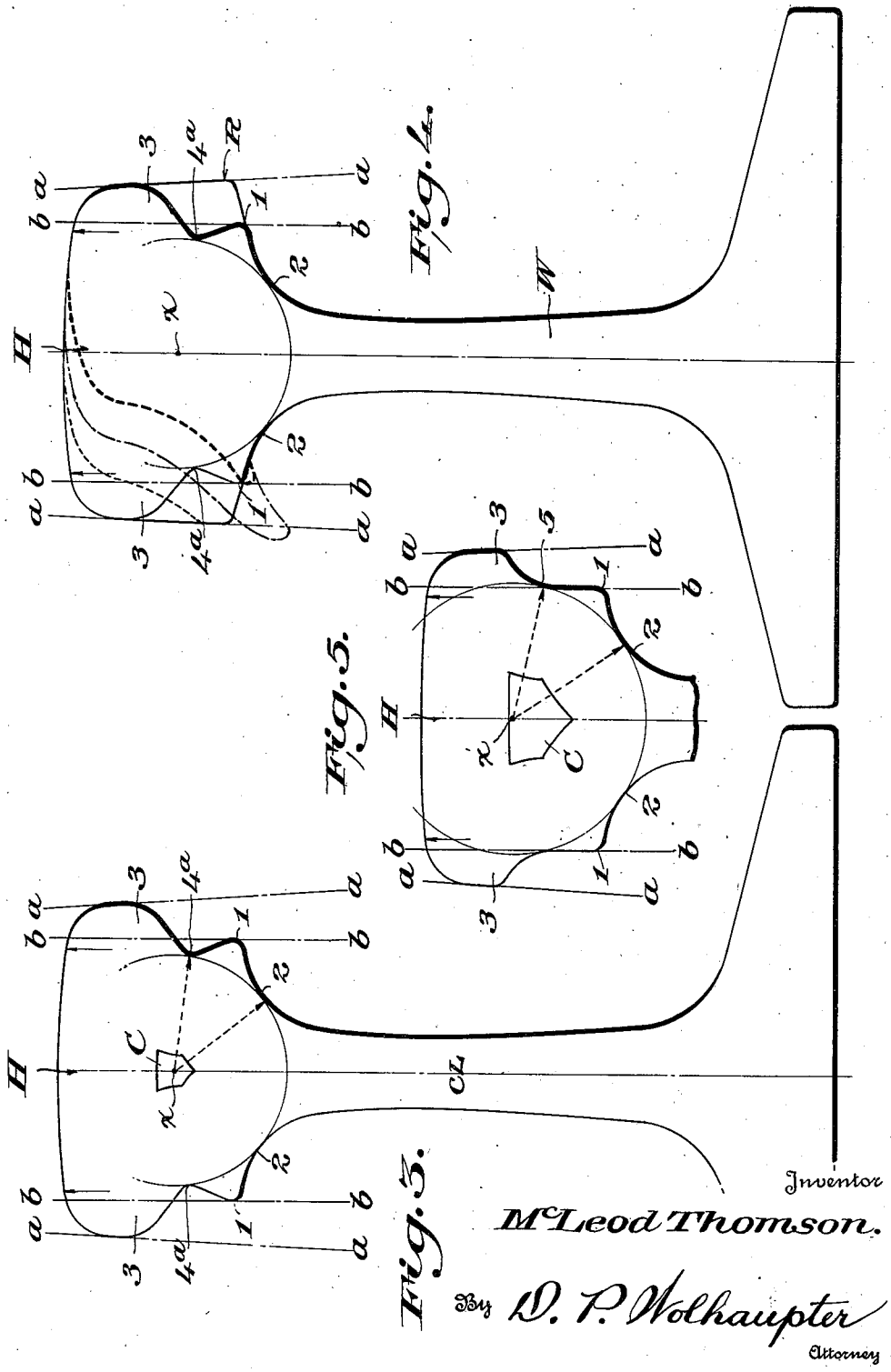
By D. P. Wolhaupter

Attorney

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MODIFIED T-RAIL

Filed May 3, 1941 2 Sheets-Sheet 2



Inventor

McLeod Thomson.

By D. P. Volkaupter

Attorney

Patented Sept. 23, 1941

2,257,027

UNITED STATES PATENT OFFICE

2,257,027

MODIFIED T-RAIL

McLeod Thomson, Atlantic City, N. J., assignor to The Thomson Rail Corporation, a corporation of New York

Application May 3, 1941, Serial No. 391,778

2 Claims. (Cl. 238—122)

The present application is a continuation in part of application Serial No. 325,237, filed March 21, 1940, and the invention thereof relates to railway rails and more particularly to a modification in the cross-sectional shape of the head of the ordinary T-rail, whereby the life of the rail in track is greatly prolonged, particularly where the rail is used as the high rail at curves, in which locations the rail is subjected to relatively rapid and destructive wheel flange wear, requiring early removal of the rail when such wear has produced the usual "depending lip" due to the wiping and abrasive action of the flanges of the car wheels.

Therefore, a principal object of the present invention is to provide a modified rail head construction, of novel sectional shape below the gauge line of the rail head, whereby the usual formation of a depending lip at the bottom corner of the rail head, by wheel flange wear, is so greatly delayed that the life of the rail in track is considerably prolonged. Frequently, in the ordinary T-rail the wheel flange wear at the side of the rail head is so rapid as to destroy the usefulness of the rail, by rendering it a menace in track even before the rail has worn at its tread sufficiently to justify its removal from track. These serious objections to the ordinary rail are removed by the present invention, while furthermore, the present modified rail head, according to this invention, effects a material saving in metal in the production of the rail. Of equal importance, the present modified rail head, as wear takes place, provides space for the wheel flanges to remain free from the side of the rail head.

A further object of the invention is to provide a rail head structure which, by reason of the novel relation of the reentrant side recesses or concavities to the curved head-web-fillets, provides a new distribution of metal whereby uniform cooling is assured for the entire under-head structure of the rail, resulting in better structure of steel (Pearlite grain) at the points where fillet cracks usually occur.

In carrying forward the present invention the same represents an improvement upon the rail head structure shown in the patent of S. G. Thomson, No. 1,806,426, dated May 19, 1931, in the particular of utilizing the enlarged curved bearing surface at the underside of the rail head, which constitutes the head-web fillet, and which extends outward from the web of the rail to a point where it joins the smaller radius which determines the lower outer corner of the rail head, thereby providing amply wide bearing for convex or rounded joint bar heads.

The essentials of the invention, and preferable forms thereof are shown in the accompanying drawings, in which:

Figure 1 is an end view of a modified rail, illustrating the cross-sectional form of one embodiment of the present invention.

Figure 2 is a view of the form of the invention shown in Fig. 1 superimposed on a Standard 130–R.E. rail, illustrating by light and heavy dotted lines respectively, the actual wheel flange wear, showing the deformation produced thereby respectively on a 130–R.E. rail, and on a modified rail constructed in accordance with the present invention.

Figure 3 is a view similar to Fig. 1 showing a modified form of the present invention.

Figure 4 is a comparison view like Fig. 2 showing the form of rail in Fig. 3 superimposed on 130–R.E. rail and also showing by light and heavy dotted lines respectively, a comparison of the wheel flange wear on the two rails.

Figure 5 is a view similar to Figure 2 of a modification of the invention illustrating a minimum condition of the metal distribution.

Referring to the drawings, in detail, it will be noted in Figure 2 that by comparison with a Standard T-rail, R, typified by the illustration of 130–R.E. rail, the present rail includes of course the usual head H, web W and base B, but definitely distinguishes from the T-head formation in establishing the lower outer corner of its head, as at *l*, at a point inwardly of the plane *a*—*a* of the outer side of the rail head. In establishing or disposing each of the lower outer corners of the new rail head construction inwardly of the said plane of the outer sides of the rail head a feature of practical importance is observed. That is, to maintain a proper relation between the width of the tread surface on top of the rail head and the extent of the under bearing surfaces for the rail joint bars. As is well known all Standard railway rails have the tread surface defined and governed by a large radius which joins or meets the smaller radii defining the opposite top corners of the rail head. This tread surface is loosely termed the approximately flat portion of the rail head lying between the top corners of the rail head and provides a broad bearing carrying the wheel load and the greater this area of bearing the lower becomes the unit of pressure under load. In observing these fundamentals, a rail head should provide fishing bearings for rail joint bars having an out-to-out at least equal to

the width of the tread surface on top of the head of the rail, and the present invention provides a form of construction which, for the first time in the art, provides a means for keeping metal out of the way of the wheel flange and at the same time providing joint bar fishing bearings totaling a width equaling or greater than the surface on the top of the head of a rail. In connection with this phase of the invention, that is, the relation between the out-to-out width of the under bearing surfaces of the rail head to the width of the tread surface at the top of the rail head the invention also contemplates defining the entire under surfaces **2**, which constitute the fishing bearings for the joint bars, by a radius forming a wide curving surface merging into the smaller radii forming the bottom corners **1** of the rail head without intervening tangents, thereby providing ample and substantial bearings for convex or rounded joint bar heads. In the drawings the vertical arrows indicate the width of the tread surface of the rail head with relation to the out-to-out width of the underside of the rail head between the planes *b*—*b*. Thus, it will be seen that while the present invention includes an enlarged curved bearing surface at the underside of the rail head which constitutes the head-web fillet, it also includes and provides for the new structural formation wherein the bottom corners of the rail head are disposed or set-in a distance inwardly from the outer sides (indicated by planes *a*—*a*) of the rail head, thereby obtaining the practical advantages hereinbefore pointed out.

Accordingly, an important phase of the present invention is to provide a construction wherein positive rail joint support is provided by having the total out-to-out of the extreme bottom of the rail head at least equal to the width of the tread surface at the top of the head of the rail, and at the same time making it possible to free the wheel flanges from wiping and abrasive action by the removal of metal from the lower side portions of the rail head to the extent provided for and which will now be more fully explained. That is to say, between the said plane *a*—*a* of the outer side of the rail head and a vertical plane *b*—*b* tangent to the said lower, outer corner **1** of the rail head, the lower side portion of the rail head, below the gauge line **3**, is recessed or concaved inwardly as at **4**, to a point at least meeting the said plane *b*—*b*, as shown in Fig. 5, but preferably extending inwardly beyond said plane b—b toward the middle of the rail head, as shown in Figs. 1 to 4. The result of this construction is that the said inward recessing or concaving of the lower side portions of the rail are such that the middle or median portion of the line defining the re-entrant recess or concavity lies within or inside of the tangent vertical plane *b*—*b*, thereby to provide for such an abrupt inward slope of the sides of the rail head, below the gauge line, as to assure definite clearance of the car wheel flanges. In the figures of the drawings the reference numerals **4**, **4a** and **5** indicate approximately the median part or portion of the line referred to as defining the re-entrant recess or concavity.

Also, it will be observed from the drawings that the walls of the re-entrant side recesses or concavities are extended inwardly so as to be approximately the same distance from a point within the center zone of cooling of the rail head as the distances of the walls of the curved head-web-fillets to said point, thereby providing for uniform cooling for the entire under-head structure which results in strengthening the rail at the points where fillet cracks usually occur. Illustrating this feature of the invention, the center zone of cooling is designated by the reference letter C and the vertical center line of the rail is designated by the reference mark C—L, and there is also shown an inscribed arc of a circle, the center of whose radius, indicated at *x*, lies within the said vertical center line or plane of the rail and within said center zone of cooling. Therefore, it is to be observed that the said re-entrant side recesses and the said head-web-fillets are both tangent to the said arc and consequently the same distance from the said radius center which lies within the center zone of cooling. With that relation between the said re-entrant side recesses and the head-web-fillets, that is, both being disposed approximately the same distance from the radius center at the vertical center line of the rail and within the center zone of cooling, the uniform cooling throughout the entire under-head structure of the rail is assured to thereby obtain the results and advantages referred to.

Preferably the re-entrant recesses or concavities **4** are in the form of regular re-entrant curves, struck on a suitable radius, as shown in Figs. 1 and 2 of the drawings, or the same may be of angular formation, as shown at **4a** in Figs. 3 and 4 of the drawings. However, in either construction, with the metal disposed as above indicated, the modified rail head structure has the capacity, strength, and shape to meet all of the engineering and track requirements of the comparable T-rail of a given weight, while at the same time possessing the distinct advantage of saving metal in the manufacture of the rail, and, more importantly still, in materially delaying and minimizing the formation of the usual "depending lip" pressed out from the bottom corner, in time, by wheel flange wear. This destructive action of wheel flange wear is well known to and watched by railroad engineers, and, as illustrated in both Figs. 2 and 4 of the drawings, it is shown that this wear, when it reaches the bottom corner of the usual T rail head, provides a definite protruding lip upon which the flanges of the car wheels ride and is ordinarily broken off thereby. The fact that such protruding lips are not set up in this present modified rail section is because the lower portions of the wheel flanges are left free from contact with the rail thereby allowing a rolling instead of a sliding friction which in turn means less train resistance.

In the same illustration there is shown, by the heavy dotted lines how this flange wear is greatly delayed in the present invention until it reaches the bottom corner **1** of the modified rail head, and even then produces only a very small lip, far smaller in size and far less dangerous in track than the lip produced at the lower, outer corner of the regular T-rail head. In either case, however, when the flange wear has reached the lower, outer corner of the rail head the rail is usually ready to be removed from the track.

It is because of the disposition of the lower, outer corner of the modified rail head as aforestated, and because of the inward projection of the recess or concavity **4**, **4a** or **5** of Figure 5 at least to or beyond a vertical plane *b*—*b*, tangent to said bottom corner **1**, that the desirable results of this invention are attained. In this connection it will be observed that in the function of the present invention, as the car wheel flanges

wipe against the upper side portion of the head and thereby effect a downward wiping of the metal of the head, the downwardly wiped metal is not required to flow only downwardly into a lip of progressively increasing depth and area, but is permitted to flow inwardly practically without depending lip formation, so that any lip which may eventually be formed is minor in character and does not occur until at or near the end of the life of the rail. This relationship which the bottom corner of the head has with the end of the life of the present rail is what determines that the recess or concavity below the side or gauge line shall extend inwardly at least to or beyond the vertical plane *b*—*b* tangent to said lower corner of the rail head. Furthermore, for any given weight of rail the head of the present rail can, if desired, be maintained at standard depth, and if desired all or a portion of the metal removed from the lower portions of the head of the rail could be added at other points of the rail.

Reference has already been made to the modification of Fig. 5 of the drawings, but in further explanation thereof it should be noted that the re-entrant recessing of the metal extends inwardly to a point as far as the vertical plane *b*—*b* tangent to the lower corner of the rail head and then follows said vertical plane to such lower corner, and this formation also illustrates the fact that space is not provided for in a Standard rail to free the sides thereof from wheel flange wear whereas, according to any of the forms of the invention illustrated in the drawings and including the modification of Fig. 5, it is not possible for a lip or shoulder to be set up at the bottom corners of the rail head until the rail has approximately reached the end of its life.

It will have been noted from the foregoing that the present invention includes the provision of fishing bearings for the rail joint bars provided by a radius forming a wide curving surface merging into the smaller radii forming the bottom corners of the rail head without intervening tangents, thereby producing enlarged and adjustable bearings for convex or rounded joint bar heads. To that end the present invention represents a new and practical improvement in railway rail construction over the inventions of the patents of Samuel G. Thomson, to wit: Nos. 1,796,414, dated March 17, 1931, 1,806,426 and 1,806,427 both granted May 19, 1931, and 1,816,099, dated July 28, 1931, and adaptable to rail joint bars of the type and kind disclosed in said patents.

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 claims.

I claim:

1. A railway rail having the lower outer corners of its head disposed a distance inwardly of the planes of the upper outer sides thereof to provide the outer terminii of curved head-web anchorages for joint bars, said terminii lying closer to planes of said upper outer sides than to the vertical plane passing through the center of the rail head, the said rail head being further provided in its side portions with recesses extending from approximately the gauge line of the rail head to said lower outer corners of the head and also extending a distance inwardly to approximately the same distance from a radius center at the vertical center of the rail head within the center zone of cooling as the distance from said radius center to the said head-web anchorages, thereby to cause uniform cooling of the under rail head structure and to minimize lip formation.

2. A railway rail provided at the underside of its head with curved head-web anchorages for joint bars and also provided in the side portions of its head with recesses extending from approximately the gauge line of the rail head to the outer corners of said curved head-web anchorages, both said head-web anchorages and said recesses being tangent to an inscribed arc whose radius center is disposed at the vertical center of the rail head within the center zone of cooling thereby to cause uniform cooling of the under rail head structure.

McLEOD THOMSON.