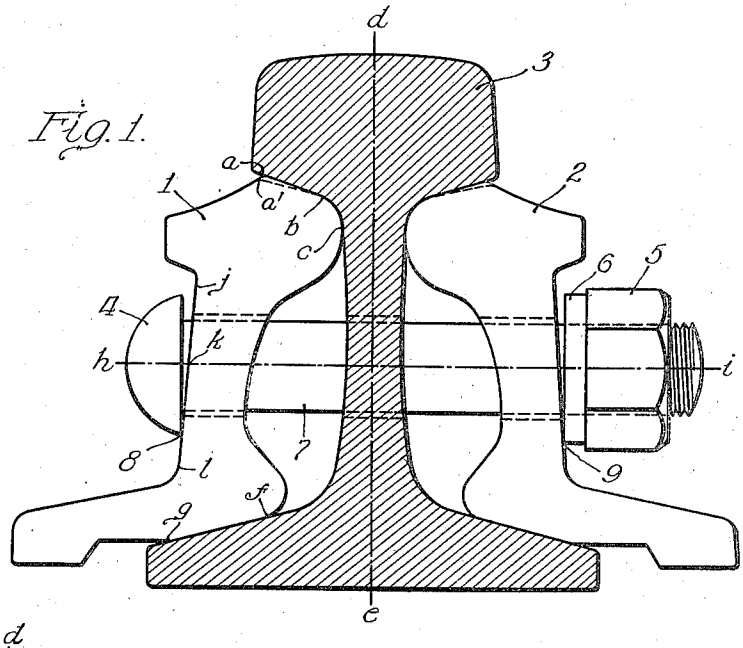
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RAIL JOINT

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Fig. 1.



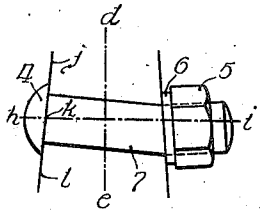


Fig. 2.

Fig. 3.

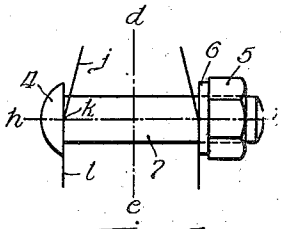


Fig. 4.

Inventor:
George Langford

By:
Brown, Jackson, Boettcher & Dunn
Attys.

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Fig. 6.

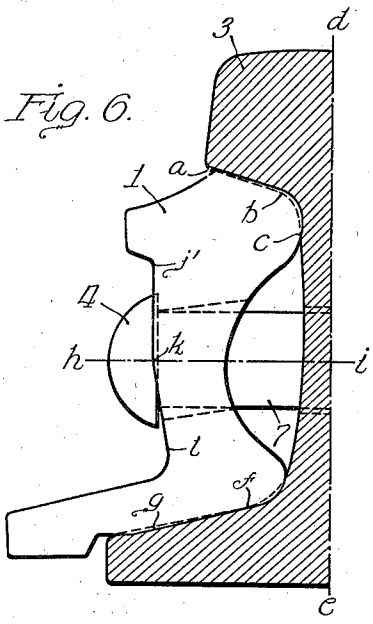


Fig. 5.

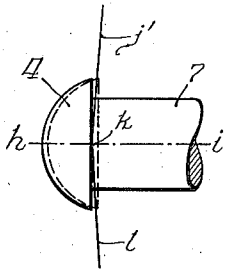
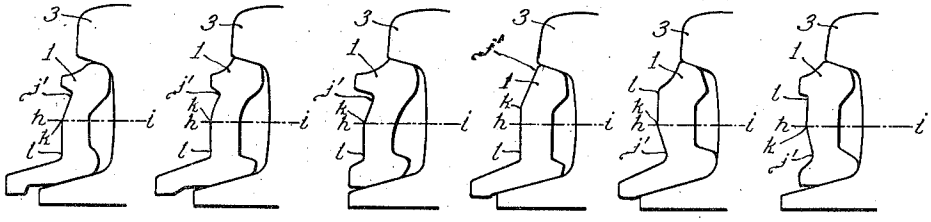


Fig. 7. Fig. 8. Fig. 9. Fig. 10. Fig. 11. Fig. 12.



Inventor:
George Langford

By: Browne, Jackson, Boettcher & Dienner
Attys.

Patented Oct. 25, 1938 2,134,449

UNITED STATES PATENT OFFICE

2,134,449

RAIL JOINT

George Langford, Joliet, Ill.

Application September 2, 1936, Serial No. 99,074

5 Claims. (Cl. 238—243)

My invention is a rail joint for railway tracks. More particularly it is a feature included in a certain type of bar used in and typifying a certain kind of joint wherein the wear resulting from service is compensated for in a special manner.

In ordinary bars, joint wear is taken up by drawing the top and bottom of the bar to the rail more or less equally, this being accomplished by tightening up the joint bolts. The head end and nut end of each of the four or six bolts used, are seated on the outer faces of each pair of bars, so that when the nuts are screwed up, the bars are forced in tightly to top and bottom fishing engagement with the rails. The bolts exert a very powerful pull when forcing the bars into their initial tight fitting position. Ordinarily the outer bolting face of each bar is perpendicular to the longitudinal axis of each bolt; and no more than a direct pull of the bolts is required to place and maintain the bars in tight contact with the rails. This is true of bars whose outer bolting faces are perpendicular to the horizontal axis of the bolts. However, in a certain type of bar, the bolting face is inclined to the longitudinal bolt axis, so that the pull is indirect, throwing great transverse strains upon the bolts. The bar of my invention includes a novel feature whereby a direct bolt pull may be exerted upon the face of a bar ordinarily inclined to the vertical axis of the rail and to the longitudinal axis of the bolts. My invention pertains mostly to a type of bar whose wear take-up action makes it necessary to incline its outer face to the rail at the beginning of or during a large part of its life. Usually the outer face of the bar is inclined at the beginning of and during a large part of its life. This pertains to a type of bar whose wear take-up is all at the bottom, of which the commercially known head free and full head contact bars are representative. Such bars are hinged at the top and swing in at the bottom as the joint wears, thereby changing the angularity of the outer bolting face of the bar. Bars with outer web face so inclined as to have initial bolt head contact only below the transverse center line of the bolt, have an important advantage over other types of bars, in their tendency to avoid canting. It is well known to those familiar with the fitting up of new rail joints, that as the bolts are tightened, there is a tendency for the bar to cant or tip out of correct position, the outer part of the bottom member tipping upward. To correct this tendency, the common practice is to strike the outer face of the bottom portion of the bar with a hammer as the bolts are tightened so as to maintain the bottom fishing surface of the bar in proper contact with the rail. However this hammering in of the bottom of the bar may be done too soon or too late as the bolts are tightened and the result is a canted bar having incorrect fishing contact with the rail, not only at the bottom but at the top also. In the head free and full head contact bars, the inclined outer web face results initially in bolt-head contact below the transverse center line of the bolt, thereby tending to draw the bottom of the bar inward more strongly than at the top and to prevent the bar's canting as the bolts are tightened. The bar of my invention has the same advantage but further provides for an improvement in initial tight bolting and fishing contact over known bars previously referred to as of swing type.

The common practice is to divide the angularity of the inward swing equally each side of the perpendicular, so that in a new joint, the outer bolting face of each bar is inclined about 3° in each bar, making a total of about 6° in the pair of bars in a joint. This inclination of the bolting faces throws great strain upon the bolts. The main object of my invention is to provide for a direct instead of an indirect bolt pull. Another object is to remove unnecessary strains upon the bolts. Still another object is to provide a form of bar which may be advantageously reformed from a new or from a worn bar. These and other advantages will be understood from the following description and from the accompanying drawings, in which:

Fig. 1 is an end view of a newly made rail joint illustrating known bars of swing type;

Fig. 2 is a fragmentary end view of the bolt action of Fig. 1;

Fig. 3, comparable with Fig. 1, typifies a rail joint of my invention;

Fig. 4, comparable with Fig. 2, shows the bolt action of Fig. 3;

Fig. 5, a fragmentary end view shows the action of the head end of the joint bolts when the bar has completed the first half of its life in the joint;

Fig. 6, comparable with Fig. 3, shows the rail joint of my invention at the end of its life;

Figs. 7–12 inclusive, illustrate various forms of my invention.

Fig. 1 is an end view of a rail joint showing two joint bars 1 and 2 newly bolted to a rail 3. The two bars are of full head contact type disclosed in my Patent No. 1,759,458, issued May 20, 1930. This bar has rail head contact *a*—*b* plus

rail fillet contact *b*—*c*. Another bar of somewhat the same general type is the head free bar which is similar to the bars of Fig. 1 except at the top, shown by the dotted line *a'*—*b*, there being clearance between the outer part of the bar's top surface and the under side of the rail head. Fig. 1 may then be considered as representing a head free, as well as a full head contact type of bar. The two have the same features in common, of rail head-web fillet contact and inward rotative movement at bottom to take up wear.

In bars of this type, the outer web face varies in its angularity to the vertical, as wear and take-up progress. In the ordinary head contact bar, this outer face once vertical remains vertical for the reason that wear is taken up at the top as well as at the bottom. But in the bar of Fig. 1, the take-up is only at the bottom, and the bar swings in like a door, hinged on the top inner fillet *b*—*c*.

I find that in general, the bar swings about 6° from the beginning to the end of its life in the joint. The common practice has been so to design the bar, that when new its outer face will incline about 3° to the vertical. This inclination is outwardly at the bottom. When the bar's life is ended, it will be inclined 3°, but inwardly at the bottom. In this way, the swing of 6° is equalized from beginning to end without any excess of inclination in either extreme. The bar of my invention is an improvement in this method of designing the outer face of a bar.

In Fig. 1, *d*—*e* is the vertical axis of the rail, *h*—*i* is the horizontal axis or longitudinal axis of the joint bolts. The angles of the top *a*—*b* and bottom *f*—*g* fishing surfaces are the angles of the top and bottom fishing surfaces in relation to line *h*—*i*, *j*—*k*—*l* is the outer face of the bar. In ordinary head contact bars, *j*—*k*—*l* is generally vertical or parallel to axis *d*—*e*, and the top and bottom fishing angles are the same in their relation to this outer face of the bar. In Fig. 1, face *j*—*k*—*l* is inclined about 3°, making the top fishing angle 3° less, and the bottom fishing angle 3° more in relation to it. In the case of A. R. A.—A. rail sections ordinary used, it is common practice to incline the face *j*—*k*—*l* of the bar newly applied at about 3°, the top fishing angle in relation to it then becoming 11° and the bottom fishing angle 17°, although the top and bottom angles are similarly inclined 14° to the horizontal axis *h*—*i*. In effect, the bar is tilted about 3°, bottom outward, and this tilting is shown in the outer face *j*—*k*—*l* of the bar of Fig. 1.

j—*k*—*l* is the bolting face which engages the head **4** of bolt **7** for one bar, and washer **6** on the other bar. The joint is made tight by screwing up the nut **5**. Fig. 1 shows the two bars bolted to the rail but not finally tightened.

Inasmuch as the bolt is straight, and the bolting-faces *j*—*k*—*l* of the bar are each inclined 3°, the bolt head **4** will have initial contact only at its edge **8**, and washer **6** will have contact only at **9**. With complete and final tightening although the inward bolt pull on the lower half of the bar avoids canting, the bolt must yield or bend somewhere so that the bolt head **4** and washer **6** will acquire more complete contact. This is illustrated in the end view diagram of Fig. 2. The bolt is shown bent in the threads of the nut end. It may bend at the head end or it may bend in the middle. In any case it must bend somewhere under the powerful pull of the nut seating itself and the head on the inclined bolting face of each bar. This is an immediate effect. The bolts must be forcibly bent to seat the head and washer properly on the bolting face of each bar. Furthermore this bending of the bolt must continue. When the joint is new, the ends of the bolt must be bent up, and when the joint is old, they must be bent down. This is very severe punishment on the bolts. They have broken or been pulled in two, requiring stronger design and increased physical properties acquired by oil-quenching.

It can be seen and understood from Figs. 1 and 2 that the bolts must withstand much abuse, and this is what I propose to remedy.

Fig. 3 is an end view of the rail joint of my invention. Only the upper part *j'*—*k* of the outer face *j'*—*k*—*l* of the bar is inclined, and this does not become in part, as in Fig. 1, an initial bolting face. The initial bolting face is *k*—*l*, this being made substantially vertical so that the lower half of the head **4** and the washer **6** may be in tight contact with the outer face of the bar without any bending of the bolt. The effect upon the bolt is shown in Fig. 4, which latter may be compared with Fig. 2. My bars seat at least half of the bolt head and washer, and that is enough to secure a tight joint without any bending of the bolts. At the same time, the feature of inward pull of the bottom half of the bar by the bolts to avoid canting is maintained. It is obvious that bars of the type having top anchorage and bottom inward movement possess desirable qualities; and so a tilted bolting face resulting in strained and bent bolts has been accepted as a necessary adjunct. But this bolt straining and bending is unnecessary, and I find it highly desirable to remedy it in the manner illustrated and described.

It is important to distinguish between the initial condition and conditions which result later on from wear. For example, in Fig. 1 it is obvious that some part of the bolt must be bent before the new joint can be made tight. There is no time for the bars or bolts to wear themselves into proper adjustment. It is also obvious in Fig. 3 that the bolts need not be bent to make the joint tight when new. It may also be shown that after the first fitting, further changes are only gradual, and that as the bar rotates inward at the bottom, the bolt head and washer adjust themselves gradually by wear and have time to do so, seeing that the change of angularity of the outer bolting face of the bar is very gradual.

Fig. 5 is a fragmentary view of the head end of the bolt. It is assumed that the bar is at about the middle of its life, having swung in about three degrees at the bottom. In this time elapsed, the bolt head wears into the bar from its new position, full lines, to its worn position, dotted lines. The contact of the bolt head and outer face of the bar is made sufficient by gradual wear.

Fig. 6 shows half of the joint at the end of its life. Surface *j'*—*k* has become the secondary bolting face. It has become so by the inward swing at bottom, but in the meantime direct bolt pull has been maintained by gradual wear. The bolt head wears into the bar and adjusts its seating thereby. It is a very common occurrence in worn bars to see wear by the head and nut end of the bolt, $\frac{1}{16}$ inch and more deep in the bars. This is a gradual wear adjustment quite different from the initial bolt bending adjustment necessary in Fig. 1. It is this initial adjustment, that the bar of my invention is largely concerned with. The gradual adjustment to change in the

bar's inclination, is a gradual wear adjustment which takes care of itself.

My main claim to novelty is a bar with a primary and a secondary outer bolting face adjacent to and inclined obtusely to each other. The primary bolt face is perpendicular or nearly so, to the longitudinal axis of the bolt so as to secure enough seating of the head and nut end of the bolt to avoid bending the bolt. The secondary bolting face comes into use when the bar has swung in at the bottom. In Fig. 3, *k* may be a little above the bolt center line *h—i*. It may also be a little lower. The main utility of my invention lies in the initial fitting, for a newly made joint badly fitted will deteriorate more rapidly than one become ill-fitted by wear. Canting is an example of bad initial fitting, and this is avoided by confining the bolt pull initially to the lower half of the bar. Instead of a very limited initial contact between the lower part of the bar and bolt head as in the prior art, I provide an ample contact which although confined to the lower half of the bar to prevent canting is nevertheless sufficient to avoid objectionable bending strain upon the bolt or bolt head.

Figures 7 to 12, inclusive, represent various forms of my invention. In Figs. 7 to 10 the primary bolting face is on the lower part; in Figs. 11 and 12 it is on the upper part of the bar. Fig. 7 is a head free angle bar. Fig. 8 is an ordinary head contact bar of angle type, Fig. 9 being one of I-beam type. In Fig. 10, the primary bolting face extends a little above the horizontal axis *h—i*.

Figs. 11 and 12 represent flange free bars. The wear take up is at the top, and the bar swings in at the top on a hinge at the bottom on the rail flange-web fillet. Fig. 11 is an angle form, and Fig. 12 an I-beam form. The primary bolting face is on the upper part of the bar.

In Fig. 3, it may be seen that the general aspect of my invention is much like that of an ordinary bar with the upper half bent inward, and that is broadly the method I use for making it from an ordinary new or worn bar. The method of making the bar follows its form closely, although it presents novel aspects when compared with the method of the prior art.

It can be seen that the drawings illustrate only a few of the many variations of application, and so my invention should not be limited to any particular forms, and may include others not shown nor described. While intended primarily for such types of bars as have top hinge and bottom swing movement to take up wear, my invention may be applied to other types where more direct bolt pull is desired. However my invention is applied preferably to the bar of Fig. 3 which is a full head contact bar and to a head free bar, similar to the first named except for its provision for clearance from the rail head on its top fishing surface.

What I claim is:

1. In a rail joint including the rail ends and the joint bolts, a bar bolted to the rail ends, said bar comprising an upper portion and a lower portion connected by an intermediate web portion, one of said upper and lower portions being provided with an inner fillet having bearing contact in the corresponding web fillet for hinging movement thereabout, the other of said upper and lower portions being spaced outwardly from the rail web for wear take-up movement thereof inwardly to the rail by hinging movement of said bar about said rail web fillet, said web portion of said bar being provided with bolt holes receiving said bolts and having its outer side divided into two flat faces, one extending from the axes of said bolt holes to said one portion of said bar at an inclination inward of the joint, and the other face extending from the axes of said bolt holes to said other portion of said bar perpendicular to said bolts when said bar is initially applied in the joint.

2. In a rail joint including the rail ends and the joint bolts, a bar bolted to the rail ends, said bar comprising an upper portion and a lower portion connected by an intermediate web portion, said upper portion of said bar having bearing contact on its top surface and in the rail head-web fillet for hinging movement thereabout, said lower portion of said bar being spaced outward from the rail web for bottom wear take-up movement inwardly to the rail of said lower portion by hinging movement of said bar about said rail head-web fillet, said web portion of said bar being provided with bolt holes receiving said bolts and having its outer side divided into an upper flat face extending upwardly and inwardly of the joint from the axes of said bolt holes, and a lower flat face extending downwardly from said bolt holes perpendicularly to said bolts when said bar is initially applied in the joint.

3. In a rail joint including the rail ends and the joint bolts, a bar bolted to the rail ends, said bar being as in claim 2 except for clearance between its top surface and the under surface of the rail head.

4. In a rail joint including the rail ends and the joint bolts, a bar bolted to the rail ends and comprising an upper portion and a lower portion connected by an intermediate web portion, said lower portion of said bar having bearing contact in the rail web-base fillet for hinging movement thereabout, said upper portion of said bar being spaced outwardly from the rail web for top wear take-up movement inwardly to the rail of said top portion by hinging movement of said bar about said rail web-base fillet, said web portion of said bar being provided with bolt holes receiving said bolts and having its outer side divided into an upper flat face extending upward from the axes of said bolt holes perpendicular to said bolts and a lower flat face extending downwardly and inwardly of the joint from the axes of said bolt holes when said bar is initially applied in the joint.

5. In a rail joint including the rail ends and the joint bolts, a bar bolted to the rail ends, and comprising an upper portion and a lower portion connected by an intermediate web portion, said upper and lower portions being in rail contact, and said intermediate portion being provided with bolt holes receiving said bolts and having its outer side divided into an upper flat face extending upwardly and inwardly of the joint from the axes of said bolt-holes, and a lower flat face extending downwardly from the axes of said bolt-holes perpendicular to said bolts when the bar is initially applied in the joint.

GEORGE LANGFORD.