April 10, 1934. McLEOD THOMSON 1,954,687

RAILWAY RAIL

Filed Dec. 30, 1932

Fig. 1.

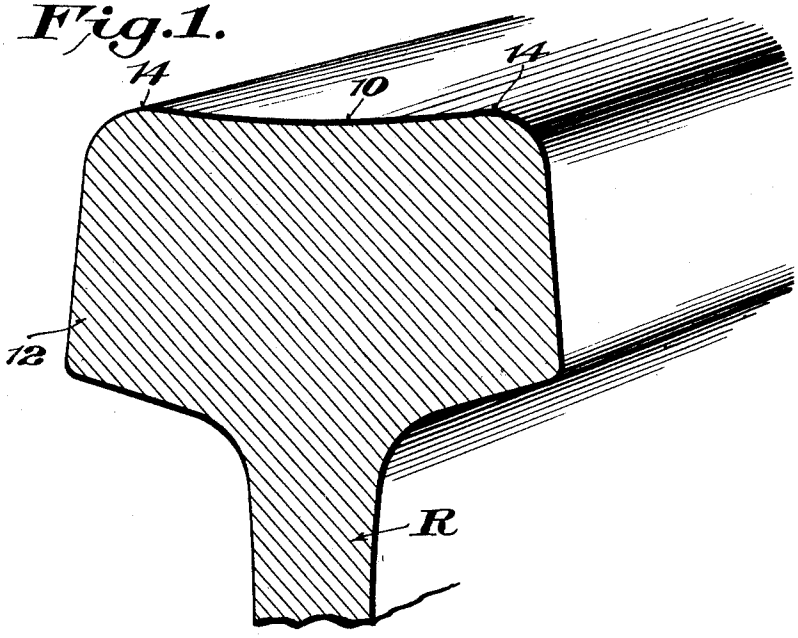


Fig. 2.

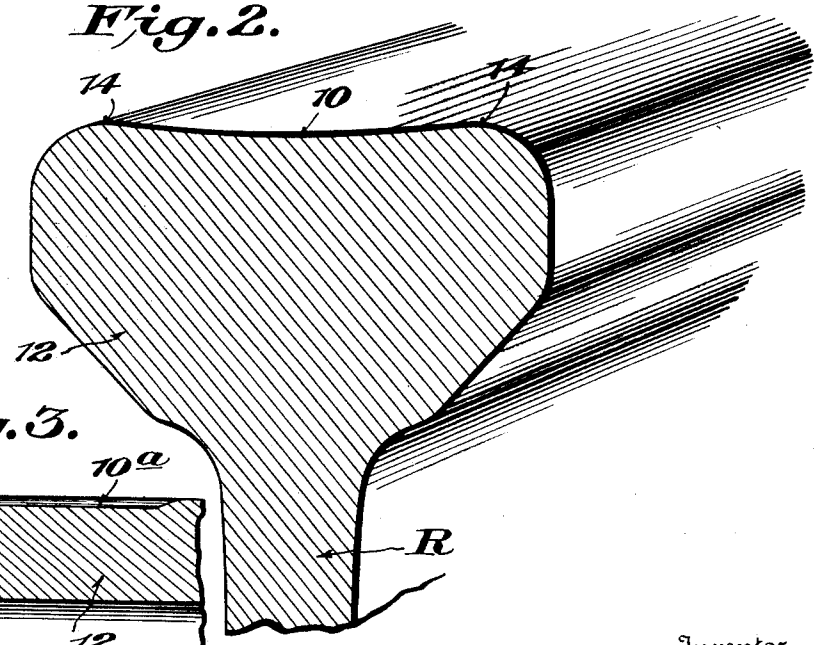
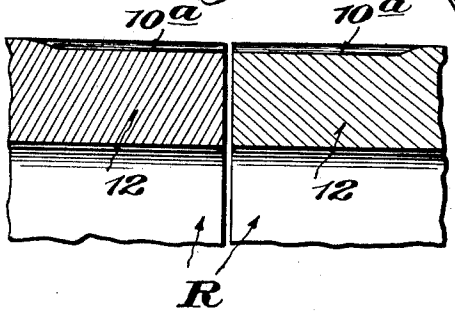


Fig. 3.



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1,954,687

RAILWAY RAIL

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4 Claims. (Cl. 238—148)

This invention relates to railway rails, and has generally in view to provide a rail having a novel sectional shape and distribution of metal designed particularly to retard rail end batter and corrugating of the top surface of the rail by locomotive and car wheels passing thereover, thereby to avoid or reduce attendant disadvantages, and at the same time to obtain advantages which are not possessed by rails of present commercial types.

Due to increasing wheel loads and higher speeds of more recent years rail end batter has become one of the most serious conditions encountered in railway track and presents an extremely difficult problem with which to cope. Its principal cause can be attributed to the high unit pressure of passing wheels arriving at the ends of the rail, where the metal, due to being unrestrained, cold-flows over the rail ends and results in the formation of depressions and fractures in and at the top of the rail at the ends thereof. The more rapid batter occurs in the early stages of service before the metal has become hardened by the cold rolling action of passing locomotive and car wheels, and thereafter is to some extent retarded although even at the retarded rate batter continues to progress in length and depth throughout the time the rail is in service, but by the time there exists any appreciable resistance to batter due to the cold rolling action of passing locomotive and car wheels the principal damage has been done. The result is a greatly shortened rail life, increased expense of maintenance and a rough and noisy riding track with acceleration of wear to wheels and equipment, as well as to the track structure by vibration and oscillation. Consequently it has been proposed and trials have been made of various methods of increasing the hardness of rails either in their entirety or at the rail ends before being placed in service. Also methods have been proposed and trials have been made of hardening the top surface of rail ends while in service, but for one reason or another these methods of providing relief from batter have thus far been unsatisfactory and have proved to be undependable and dangerous because of resultant change in the physical properties of the steel by such treatment. Also such methods have proved to be expensive, insufficient, or impracticable.

Following flow of the metal over the rail ends, spalling and chipping frequently occurs at the rail ends by reason of the small vertical movement of the rails until finally it becomes necessary either to remove and crop the battered and spalled rail ends, build them up by additions of metal welded thereto, or to relegate them to less important branch tracks, yards or sidings, but none of these expedients represents a satisfactory solution of the problem involved because all are costly in labor and material. The first represents a great expense through the cost of cropping and the loss of many tons of valuable metal and increases the number of joints by further use of the shortened rails. The second is only a temporary and expensive expedient for increasing the life of rails and often proves costly by further unsatisfactory service, as well as creating a condition which may result in further spalling or complete fracture of the rail end, while the third relegates to inferior tracks rails that otherwise would give long service in their original location.

On the subject of the flow of metal in the rail head under wheel loads one well known authority has stated that: "the flow of the metal of the head apparent to the eye and witnessed very generally in portions of the track, may be taken as evidence of exhausted ductility of the metal. The ability of the steel to elongate, as found in the primitive state of the rail before going into service, is lost by reason of its development, and the rail at first tough and capable of being bent, is now brittle and will bend only to a limited extent before rupture. The brittleness is due to the flow of metal at or immediately below the running surface of the rail head. The structural continuity has not been destroyed, as may be shown upon annealing the metal, which effects a restoration in its ability to elongate. A rail from service will not bend well with the head on the tension side, since the surface metal has been subjected to cold flow in advance of its being worn away by abrasion."

Another serious condition encountered in railway track is corrugating of the rails by locomotive and car wheels passing thereover. In other words, the top surfaces of present commercial rails in service soon become undulated or have imparted thereto a wave contour which is conducive to rough and noisy riding and to early deterioration of wheels and equipment as well as the rail and general track structure due to vibration and oscillation resulting therefrom. As in the case of rail end batter, considerable research and study has been and at present is being devoted to a determination of the causes of rail corrugating and a solution of the problem presented

thereby, but so far the causes have not been conclusively ascertained nor has a remedy been provided, other than a slow and expensive method which involves grinding out the corrugations.

The present invention is predicated on the fact that since the top surfaces of rail of present commercial types are transversely crowned or are of convex contour, and since wheel loads therefore are transmitted to the rail head at or near the middle thereof, the metal on the top surface of the head by reason of being restrained against flowing laterally, can flow only longitudinally, and therefore overflows the rail ends, while along the intervening portions of the length of the rail where there is resistance to flow by surrounding metal, lumps or corrugations of varying lengths and depths are formed and developed.

Accordingly, the present invention has in view to provide a rail having a sectional shape such that the rolling action of locomotives and car wheels passing thereover will produce primarily a lateral flow of the metal thereof as distinguished from a longitudinal flow of the metal, whereby corrugating of the top surface and overflow of metal at the rail ends with attendant disadvantages is considerably retarded and in a large measure eliminated.

With the foregoing and other purposes 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 and arrangement as will be hereinafter more fully described, illustrated in the accompanying drawing and defined in the appended claims.

In the drawing:—

Figure 1 is a sectional perspective view of a rail of standard type constructed in accordance with the invention.

Figure 2 is a similar view illustrating the invention embodied in a rail of the headfree type.

Figure 3 is a detail view of two adjoining rail ends, partly in section, illustrating a modification wherein the top cavity of the rail head is limited in extent to a portion of the rail head at and adjacent to the end thereof.

Referring to the drawing in detail, it will be observed that the invention resides primarily in forming by any suitable means the top surface 10 of the head 12 of the rail R with a concaved or dished transverse contour instead of flat or convex contour as has been the general practice heretofore.

By reason of the foregoing construction numerous disadvantages heretofore encountered are partly or entirely avoided and at the same time advantages are obtained which are not possessed by rail of present commercial types.

The dishing or concaving of the rail surface as indicated at 10 results in the formation of a rib or rib-like contour 14 of metal along the top surface of the rail at each side thereof, and preferably the surfaces of these ribs are of convex curvature and merge gradually into the concave or dished surface 10, and into the sides of the rail head, as shown. Thus, locomotive and car wheels instead of contacting initially with the rail head across an appreciable portion of the top width thereof, contact primarily and initially with the tops of the rib-like contours 14 whereby correspondingly less friction and less resistance to free rolling of the wheels is encountered.

Primarily, the medial dishing or concaving of the top of the rail head permits the metal constituted by the relatively outwardly disposed ribs 14 to flow inwardly under the rolling action of wheels passing over the rail, with the result that instead of the metal being forced longitudinally and forming corrugations along the length of the rail, and overflowing the rail ends, it is, due to its lack of restraint against inward displacement, displaced inwardly in a uniform manner with a tendency to fill the convexity. Thus, instead of corrugations being formed along the top surface of the rail the ribs are rolled downwardly in a uniform manner to afford a straight wheel contacting surface along the length of the rail, so that this desirable condition is established simultaneously with the gradual retarded and restricted hardening of the rail by the cold rolling action of the passing wheels. Moreover, because of the concave contour of the top of the rail, permitting the metal to be displaced inwardly, overflow of metal at the ends of the rail is to a considerable extent eliminated and at least effectively retarded and diminished, so that the numerous and serious disadvantages heretofore experienced due to this condition are in a large measure avoided.

The present invention is also applicable to meet a condition where the railroad may not desire the entire rail length conforming to the transversely concaved contour described herein, but confined to that portion of the rail at and in approximate relation to the rail end batter zone. That is to say, the invention can be incorporated in a rail by grinding or re-conditioning the top surface thereof within the so-called batter area, for instance, to the extent of nine or ten inches more or less from each rail end, as indicated by the reference number 10^a in Fig. 3 of the drawing. Such a contour, as depicted in Fig. 3 would provide relief from and retard rail end batter and of course could be followed as wear proceeds by subsequent work of the same kind.

By the use of rail having a top contour as shown and functioning as described a stronger rail with material increase in the life of the rail as compared with present commercial types of rail is obtained due to the elimination of wheel contact pressure at the center and adjoining portions of the top of the rail, particularly through the stages before cold rolling and hardening of the metal by passing wheels has occurred, and at the same time there is obtained the desirable result of decreased resistance to train movements. Moreover, the present rail lends itself readily to being reconditioned either at its ends or throughout its length by a re-rolling process or in other suitable manner; or a reconditioning of the rail in service locally at its ends or at other points in the rail where corrugation has occurred or may be likely to occur or throughout its length by grinding or in any other suitable manner or with new or used rail in or out of track by any suitable arrangement or means effects a saving in labor and material over that required in connection with present types of rail by reason of providing a safer track, increasing the normal life of rails, joint bars and other track material and reducing the necessity of reconditioning corrugated surfaces and rail ends; requires less replacement of rails by reason of fractured or chipped rail ends; requires less labor and material to maintain a satisfactory line and surface; and provides a smoother and quieter riding track with the accompanying advantage of reduction of vibration and oscillation with consequent increased life and service of track and equipment.

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 including a head having a rib of metal at its top surface to either side of and projecting above its medial portion, said ribs of metal having transversely convexed surfaces merging into the sides and into the medial top surface of the head.

2. A railway rail including a head having formed in its top surface a transverse concavity which is concaved only to such an extent that the rolling action of locomotive and car wheels passing thereover will produce a lateral flow of the metal thereof until the concavity is substantially eliminated.

3. A railway rail having its top surface reformed or reconditioned throughout its rail end batter area to provide the same with a transverse concavity which is concaved only to such an extent that the rolling action of locomotive and car wheels passing thereover will produce a lateral flow of the metal until the concavity is substantially eliminated.

4. A railway rail having its top surface reformed or reconditioned in a localized area to provide the same with a transverse concavity which is concaved only to such an extent that the rolling action of locomotive and car wheels passing thereover will produce a lateral flow of the metal until the concavity is substantially eliminated.

McLEOD THOMSON.