

1,361,428.

G. W. WHITEMAN.  
U-RAIL SECTION.  
APPLICATION FILED MAY 24, 1919.

Patented Dec. 7, 1920.  
2 SHEETS—SHEET 1.

*Fig. 1.*

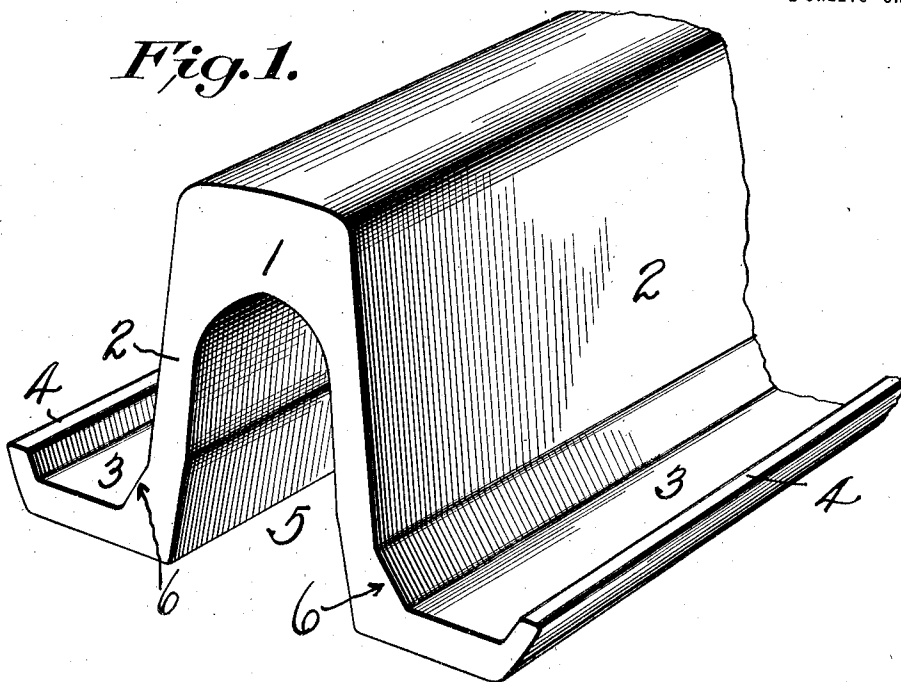
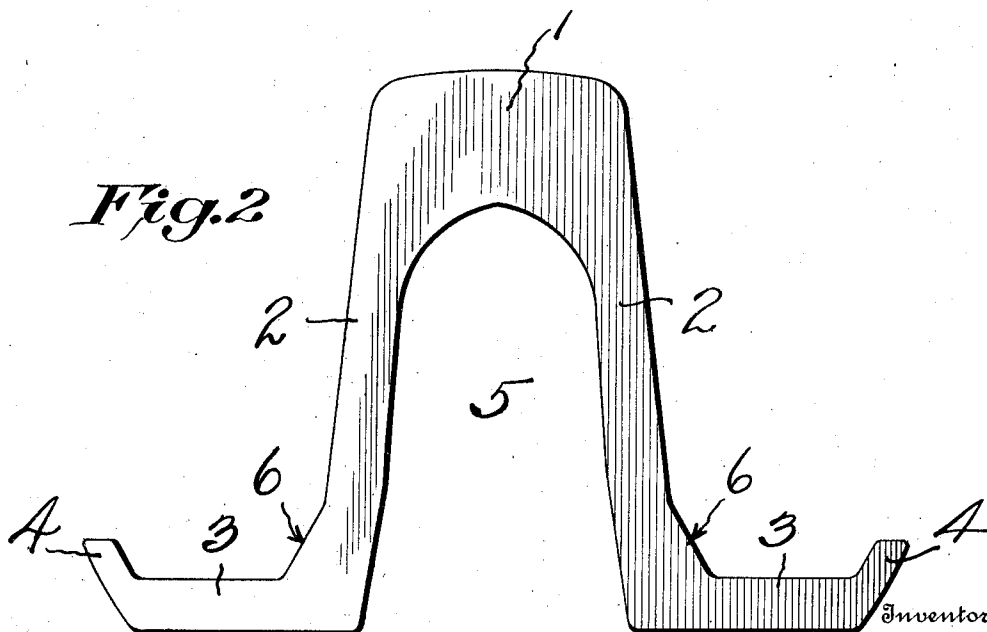


*Fig. 2*



Witness

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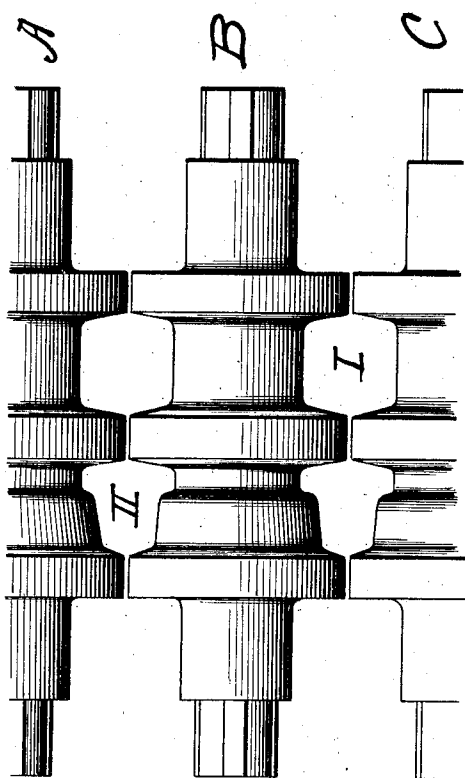


Fig. 3.

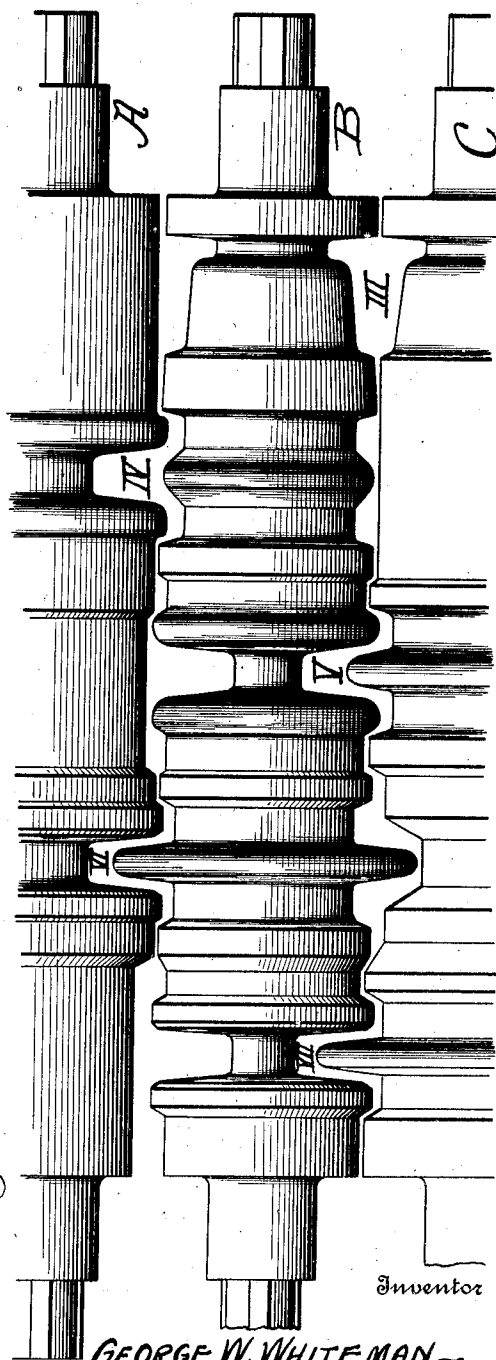


Fig. 4.

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# UNITED STATES PATENT OFFICE.

GEORGE W. WHITEMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE RAIL JOINT COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## U-RAIL SECTION.

1,361,428.

Specification of Letters Patent.

Patented Dec. 7, 1920.

Application filed May 24, 1919. Serial No. 299,388.

*To all whom it may concern:*

Be it known that I, GEORGE W. WHITEMAN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in U-Rail Sections, of which the following is a specification.

This invention relates to the subject of rails for railroad tracks, and more particularly to a novel U-rail section capable of safe and efficient service in track and which will also respond to modern engineering requirements.

Two principal objects are achieved by the present invention. One of these objects is to provide a U-rail section having a novel construction which readily lends itself to modern rolling mill practice while at the same time providing for a balanced distribution of metal which contributes materially to the stability and strength of the section. The other principal object of the invention is to provide a U-rail section which insures and facilitates a strong and substantial splicing of the rails at the joint and a firm and even fastening of the rails to their supporting bases or ties.

In the attainment of these particular objects the invention contemplates a U-rail section which admits of better and more homogeneous rolling than is possible in the rolling of a T-rail, while also having the structural components or elements of the section so related that the same will more advantageously absorb or resist the resultant of the thrust and wheel-load forces than the conventional T-rail section. Furthermore, with the same general object in view it is proposed by the present invention to provide a U-rail section of a particular form, wherein the over-roll of metal will be disposed in such a location with reference to the horizontal neutral axis of the section that there will be no interference by the over-roll with any of the parts or fittings associated with the rail, and in addition to that desirable feature will add materially to the total moment of inertia of the section.

A further and more general object of the invention is to provide a U-rail section wherein the side webs or legs thereof are so disposed with reference to a reinforced foot flange, and a solid head portion, that the side portions of the head are well supported

by a substantial body of metal immediately thereunder and inclining in conformity with the general inclination of the resultant of forces passing down through the rail.

The invention also has in view a novel distribution of metal in a U-rail section which maintains a substantial balancing of the section moduli both above and below the neutral axis, which is an important consideration, which, as far as known, has not heretofore been provided for or even considered in U-rail sections heretofore proposed or used.

It is also the purpose of the invention to provide a U-rail section designed to meet all modern requirements as to splices and track fastenings as well as being readily adaptable to switch and frog work, and generally available for use wherever the conventional T-rail is employed.

With these and other objects in view it will be apparent to those familiar with this art as the details of the improvement are better understood and the same consists in the said novel structural shape, hereinafter described, illustrated and claimed.

The essential features of the invention are necessarily susceptible of modification as to shape and dimensions without departing from the scope of the invention, but a preferable and practical embodiment thereof is illustrated in the drawings, in which:—

Figure 1 is a perspective view of a U-rail section embodying the present invention.

Fig. 2 is an end view of the new section.

Fig. 3 is a detail view of a set of primary reducing rolls that may be employed in breaking down the billet into a primary shape from which the completed section may be developed through a series of other roll passes.

Fig. 4 is an elevational view of a set of rolls constructed and arranged to provide a series of passes for distributing the metal into the new U-rail section contemplated by the present invention.

Like references designate corresponding parts in the several figures of the drawings.

In carrying forward the present invention special consideration is given to certain important features. Primarily, it is proposed to provide the section with a densely rolled homogeneous head portion, which is rendered possible by rolling the metal of the

head between opposing rolls and thereby effecting that density and solidity in the head which renders the same more durable and less liable to fracture than the less densely rolled head of a T-rail. Furthermore, by reason of the densely rolled homogeneous rolling of the head of the bar the liability of the formation of a "pipe" in the section is practically eliminated or the "pipe" so spread out laterally into the webs or legs of the section as to be a negligible factor, whereas it is well known that the frequent formation of the "pipe" in a T-rail section with the "pipe" extending from the head down into the web is a frequent cause of rail fracture or breaking that may be obviated by the use of the present invention.

Another special feature that is observed in my new design of U-rail section and in the making thereof, is to provide for the over-roll of the metal in such a location, at a substantial distance from the horizontal neutral axis of the section, as to contribute materially to the total moment of inertia of the section and aid substantially in maintaining an approximate balancing of the moduli both above and below the neutral axis. And, at the same time the over-roll feature materially reinforces the foot portion of the rail so that it will better withstand bending stresses imposed thereon by the acting and reacting forces. Also, the over-roll feature is utilized to facilitate the even and firm fastening down of the rail onto its supporting base or tie.

The foregoing special features of improvement are embodied in a U-rail section rolled from a single billet or bloom and essentially comprising a solid head member 1, the opposite inclining side webs or legs 2—2, and a horizontal base flange 3 extending outwardly from the lower edge of each side web. The head member 1 of the section has a substantial depth vertically and is intended to be very compactly rolled throughout so as to effectually carry the load and to either entirely eliminate "pipe" formation or so distribute the latter into the side legs 2 as to render it of little or no effect. Also, the head member 1 has the side edge portions merged directly into the upper portions of the side webs 2 and being substantially in alinement with the latter are effectually supported and braced by the said webs, as distinguished from the unsupported overhanging edge portions of the head of the T-rail.

In connection with the foregoing relation between the compactly rolled head member 1 and the side webs or legs 2 thereof, a distinctive and important feature of the invention resides in forming at the outer edges of the bottom out-turned base flanges 3 the upstanding stiffening or reinforcing ribs 4. These reinforce ribs are located at

the extreme bottom corners of the U-rail section. Such location of the ribs 4 is important. First, it provides a desirable location for the over-roll of metal without interference or detriment to the fitting of any of the parts or fastenings which may be associated with the rail. Supplementing that advantage the said reinforcing ribs may be utilized as a part of the fastening means for holding the section to its supporting base besides stiffening and reinforcing the base flange parts throughout the rail to a degree that makes such base flanges a stable footing for the section to effectually support the same against the acting and reacting forces regardless of the direction in which such forces pass through the rail. Also the location of the reinforce ribs 4 is highly important because the same add materially to the total strength of the rail on account of its distance from the horizontal neutral axis and furthermore it is a means of maintaining the approximate balancing of the section modulus both above and below the neutral axis.

These desirable advantages, for the reinforce ribs 4, are readily demonstrable by calculations of the new U-rail section both with and without the said reinforce ribs 4, said calculations having demonstrated that a U-rail section with the reinforce rib 4 has a higher total moment of inertia than the same section of U-rail without said ribs and at the same time maintains a very close balancing between the top and bottom section modulus, that is, the moduli respectively above and below the horizontal neutral axis.

As shown in Figs. 3 and 4 of the drawings the new U-rail section may be advantageously rolled, by a set of rolls having passes which primarily break down the billet into a solid primary or approximate U-shape and subsequently tongue out the recess at one side of the approximate shape simultaneously with the spreading out and channeling of the base flange portions. This is clearly illustrated by the series of passes I to VII inclusive shown in Figs. 3 and 4 of the drawings. For instance, as illustrated in Fig. 3 there may be employed between the rolls A, B and C of a rolling mill a desirable number of passes to effect the breaking down of the billet into the approximate shape. For illustrative purposes there are shown two of such passes, namely the passes I and II of which the pass I is the reducing pass which brings the billet down to the desired cross-sectional area for introduction into an edging pass II having an approximate pyramidal shape and wherein the rolls forming that pass exert a rolling pressure upon the side portions of the shape. This rolling operation will therefore place a desirable rolling pressure upon the side portions of the head member of the section as

well as upon the side portions of the webs or legs thereof, while at the same time giving a starting form to the base flanges of the section. From the initial edging pass

fillet referred to, by reason of its distance from the horizontal neutral axis of the section also contributes to the total moment thereof. 45

From the foregoing it is thought the construction and advantages of the herein described U-rail section will be apparent without further description and it will be understood that changes in the form, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention. 55

I claim:—

1. A U-rail section having projections of metal formed by and with the over-roll metal and so disposed below the horizontal neutral axis of the section as to increase the moment of inertia thereof. 60

2. A U-rail section having upward projections of metal, disposed at the outer bottom corners thereof. 65

3. A U-rail section having upwardly slanting projections of metal at the outer bottom corners thereof.

4. A U-rail section having outstanding feet each of which is formed at its upper side with a channel. 70

5. A U-rail section having foot flanges and reinforcing metal at the inner and outer portions of said flanges.

6. A U-rail section having its feet of channel formation and reinforcing metal at the outer and inner portions of the channel. 75

7. A U-rail section having its feet of channel formation and a stiffening fillet at the inner corner of the channel. 80

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

GEORGE W. WHITEMAN.

Witnesses:

MICHAEL A. MALONEY,  
M. S. SMOKER.

5 II the shape is next subjected to the rolling pass III which is also an edging pass wherein the rolls exert a rolling pressure upon the side portions of the shape, thereby continuing the compact rolling of the side portions which will form the side portions of the head member and the side webs of the section, and at the same time the edging pass III is and may be utilized to give a sufficient depth to the shape to place the same in a suitable form for upright rolling in the succeeding passes IV, V, VI and VII, the latter being the finishing pass. The upright rolling carried on in the passes IV, V, VI and VII gradually develops the interior vertical recess 5 of the section and in so doing rolls the metal at both the upper and under sides of the head member 1, resulting in a compact or densely rolled homogeneous head member having the advantages over the T-rail head member herein pointed out. Also in the upright rolling operations of passes IV, V, VI and VII the projecting metal at the base of the shape is tongued out at the upper side thereof forming channels producing the ribbed or flanged formation characterized by the reinforcing ribs 4 and at the location of these ribs 4 the over-roll of metal occurs with the attendant advantages heretofore pointed out. 35 The rolling operation subscribed also involves a distribution of metal that leaves a well defined and substantial fillet 6 located in the outer angle between each leg 2 and base flange 3. This fillet is arranged in opposite relation to the rib 4 to provide a channel formation for the foot of the rail which contributes to the strength and general utility of the section. At the same time the 40