E. E. SLICK.

ROLLING RAILS.

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1,206,606.

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Fig. 1.

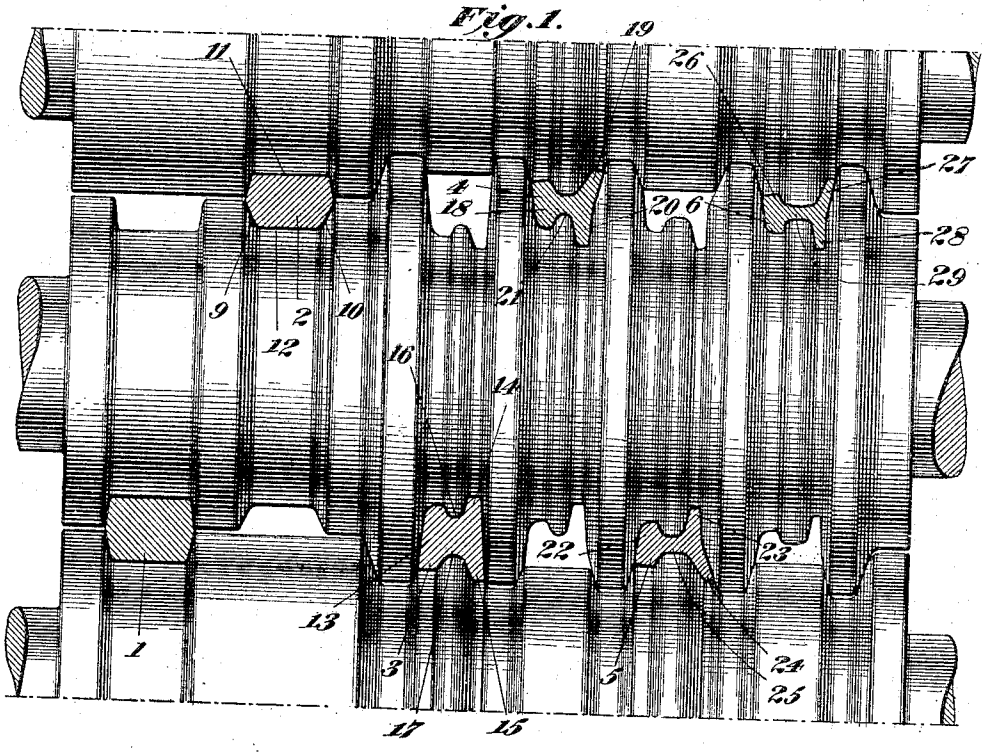
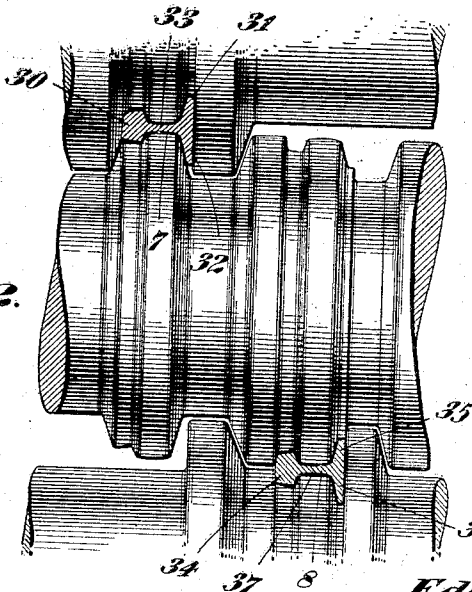


Fig. 2.



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ROLLING RAILS.

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To all whom it may concern:

Be it known that I, EDWIN E. SLICK, a citizen of the United States, residing in the borough of Westmont, in the county of Cambria and State of Pennsylvania, whose post-office address is Johnstown, Pennsylvania, have invented certain new and useful Improvements in Rolling Rails; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to rolling rails, such as are used for railway tracks, and is particularly adapted for use in connection with rolling T rails.

I prefer to begin the operation of rolling rails by operating upon a metal bloom or ingot of approximately rectangular cross-section with rounded corners, but I may begin the operation with a formed or shaped blank of any cross-sectional contour desired to suit the purpose intended. For the purpose of simplifying the description and illustration herein I will, however, confine the same to rolling rails, beginning with a bloom of approximately rectangular cross-section with rounded corners. I also wish it understood that I may perform the preliminary operations either by rolling, pressing or hammering, but will for the further sake of simplifying the description, confine the same to rolling.

I first take a bloom or ingot of approximately rectangular cross-section with rounded corners and pass it flatwise through a groove in the rolls, which will slightly reduce its thickness and slope a portion of each of the edges so that one side is shorter than the opposite side, the shape thus formed being the combination of a rectangle and a trapezoid with rounded corners. I then turn this shape substantially 90 degrees around its longitudinal axis and roll it in a pass which forms two deep grooves in the opposite edges and having a longer side and a shorter side, the material adjacent to the longer side being adapted to form the rail flanges and that adjacent the shorter side the rail head. In order to accomplish the purpose desired, I preferably provide a larger percentage of material than is customary in the portions which are to produce the flanges, thereby allowing for a larger percentage of reduction in order to form the finished flanges.

After first turning the bar, as above described, the bar is passed successively through a series of roll passes maintaining the portion which is to form the web of the rail in substantially the same relative positions at all times and without turning the bar around its axes. The third pass is so formed as to bodily bend one of the flanges at a considerable angle from the other flange, thus forming a flattened V shape in the portion which is ultimately to form the bottom of the flanges. By this means I provide a very large percentage of normal pressure upon the flange which is so bent, thereby working the same thoroughly and efficiently, which would not be the case with a flange not so subjected to a large proportion of normal pressure from the rolls. In the next pass, the flange which was previously bent is straightened, so that its general position is at right angles to the roll axis, while the other corresponding flange is now similarly bent so that in turn it receives a considerable percentage of normal pressure from the roll surfaces, thereby working it thoroughly and efficiently, and in one or more of the succeeding passes I continue to bend the flange portions alternately in the manner and for the purposes previously mentioned. In doing this a larger percentage of reduction than is usual is accomplished on the flanges, and by reason of the large amount of work, due to the large percentage of reduction, heat is produced which maintains the flanges at more nearly the same temperature as the thick head portion of the rail.

In this connection, it should be noted that in the attempt to roll rails with comparatively thin flanges as compared with their thick heads, the cooling action of the large amount of conducting and radiating surfaces of the flanges, as compared with the lesser proportion of cooling and radiating surface of the head as compared with their volumes, causes the flanges to become cold much sooner than the head portion thereby making it difficult or impossible to produce the flanges by rolling, as on account of their coldness they are not plastic, and at the same time the difference in temperatures of the

head and flange portions causes unequal temperature stresses, which are, or tend to be, destructive in their effects.

After the flanges and other portions of the rails are rolled to approximate form in the manner above described, I then introduce the partially finished bar into a leading pass, in which the flanges are straightened and their lower surfaces alined and one of the flange edges is finished, and then I introduce the bar into the final finishing pass, in which all portions are finished, thus completing the operation.

Having thus described my operation generally, I will now refer to the sheet of drawings annexed to this specification and forming a part thereof, and in which like characters refer to like parts.

Figure 1 is a view of a set of rolls embodying the first six passes, these being known as roughing rolls; while Fig. 2 is a view of a set of finishing rolls, embodying one leading and one finishing pass, all in accordance with my invention.

Referring now to the characters of reference on the drawings:—The general forms or shapes assumed by the metal in rolling the rail are numbered on the drawings 1, 2, 3, 4, 5, 6, 7 and 8, representing successively the various cross-sections produced, beginning with an approximately rectangular bloom and finishing with a completed T rail. As will be noted on referring to shape 1, this is an approximately rectangular bloom with rounded corners. After leaving this pass the metal is introduced into the next pass, where about half of its edges are tapered or rolled down, as shown at 9 and 10, forming a shape which is a combination of a rectangle and a trapezoid, with rounded corners, as illustrated, one of the sides 11 being wider than the other side 12, the material adjacent to the wide side being that from which the flange portions are adapted to be produced. After forming the shape number 2, the bar is introduced, after turning on its axis about 90 degrees, into the next pass, which forms shape number 3, which is provided with two deep grooves 16 and 17 in the opposite edges, the projecting portions 14 and 15 being much longer than the head portion 13, the longer and thinner projections 14 and 15 being adapted to ultimately form the flanges and the other projecting portions the head of the rail. In all the succeeding passes, the bar is formed without turning it on its axis, so that no further reference will be made to this. After forming the shape number 3, it is then introduced into the next pass, which forms shape number 4, and in this pass the portion previously marked 14 and now marked 19, is bent over at a considerable angle from its former position and at a considerable angle to the companion flange 20, as illustrated. By reason of this fact a large percentage or proportion of the working pressure is exerted normally in the direction of the thickness of the flange 19, thereby working it thoroughly and causing it to maintain or even to increase in length by such normal pressure. In the meantime the other portion of the flange 20 is partially formed or shaped, as illustrated, and the head portion 18 is considerably reduced from its previous section and the web 21 begins to assume a rudimentary form. After finishing the shape number 4, the metal then goes into the next pass, where it is formed into the shape number 5. In this shape the other portion 24 of the flange is now bent at a considerable angle to its former position and to its companion flange 23, whereby it, in turn, receives a considerable percentage of normal pressure in the direction of its thickness, which works it thoroughly and efficiently and maintains its length or even increases it. The web 25 is further shaped, becoming somewhat longer and thinner and the head 22 is a step nearer its final form. After leaving shape number 5, the bar is then introduced into the next pass, which forms shape number 6, in which one of the flanges 27 is again bent over at an angle, thereby receiving a considerable percentage of normal pressure, to thoroughly work it and maintain or increase its length, while the companion flange 28 receives a somewhat less amount of work in the pass, the general direction of this flange being at right angles to the roll axis; at the same time the head 26 and the web 29 are further shaped and formed. After leaving pass number 6, the bar is introduced into the leading pass number 7, which straightens the flanges 31 and 32 to approximately the ultimate alinement of their bottom surfaces, the web 33 is further reduced and shaped and the head 30 is almost finished on one side. After leaving pass number 7, the bar is finally shaped in finishing pass number 8, which works the opposite side, further slightly reducing the flanges 35 and 36, the head 34 and the web 37, giving the T rail its completed shape. The percentage of reduction of the flanges, particularly in passes 4, 5 and 6 is a greater percentage, as compared with their previous sections, than is the reduction of the head portions, and by this means I more thoroughly work the flanges and at the same time hold and produce heat therein, which equalizes their temperature with that of the head, thereby producing a rail which is more thoroughly and efficiently worked in all portions and which leaves the rolls at a more uniform temperature, all of which is much to be desired. A rail finished at more uniform temperature will have been more thoroughly worked in all its portions, will take less camber or curve in cooling, thus requiring very much less straightening, great

amounts of which tend to destruction, besides which the internal stresses due to cooling are very much reduced, all tending toward excellence of product.

In rolling rails in the manner described, there is an advantage in maintaining the web portion in the successive passes in substantially the same relative positions with the roll axis; that is, substantially parallel to the roll axis, as this obviates excessive and destructive end-thrust of the rolls, besides other advantages.

It will be noted that the rudimentary flange portions 19, 23 and 27 are bent from their normal positions to form in general an acute angle with the roll axis, whereby a large amount of normal pressure is given them for reasons stated.

The arrangement of the roll passes in the coöperating rolls is such, as illustrated, that when one of the flanges is bent at an acute angle with the roll axis, a large amount of reduction can be accomplished upon it by reason of the large percentage of normal pressure communicated to it, while at the same time the conformation of the pass in the opposite roll,—with the flange portion substantially perpendicular to the roll axis,—is such that this latter flange will clear itself from the rolls as they revolve. In proportioning the rolls, small amounts of draft or angularity are provided for, in order that the working surfaces of the rolls will clear themselves as the rolls revolve. In other words, while working or reducing one of the flanges to a very large extent in an inclined position, the other flange is, generally speaking, perpendicular to the roll axis, with such angles of clearances as to enable it to free itself without distortion or abrasion as the rolls revolve. The angle to which I prefer to bend the flanges with respect to the roll axis is about 75 degrees, but I may bend the flanges to any amount between 75 and 45 degrees, if desired.

While I have shown and described my invention in considerable detail, I do not wish to be limited to the exact details of construction specified, but may use such substitutions, modifications or alterations as fall within the scope of my invention, as set forth in the claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. The steps in rolling rails, comprising maintaining the web portion substantially parallel to the roll axis, then bending one of the flanges at an angle with its companion flange while reducing the same, and then straightening the said flange while similarly bending and reducing the other, substantially as described.

2. The steps in rolling rails, which consist in forming grooves on opposite edges of a blank nearer to one side of same than the other, producing a comparatively compact portion on one side of said grooves and elongated projecting portions on the other side, then bending one of said longer projections to a lesser angle with the roll axis while reducing it in thickness, thereby subjecting it to a considerable normal pressure in the direction of its thickness, to thoroughly work it and maintain its length.

3. The steps in rolling rails, which consist in taking a blank provided with grooves in opposite edges and with projections on one side longer than those on the other, then bending one of said longer projections while reducing it in thickness, then straightening said projection and bending the other and reducing it in thickness, while maintaining the web portion, at the base of the grooves, in substantially the same relative position with respect to the rolls.

4. The steps in rolling rails, comprising maintaining the web portion in substantially the same relative position with respect to the rolls, then bending one of the flanges to an acute angle with the roll axis and maintaining the general direction of the other flange substantially at right angles to the roll axis while reducing said flanges and other portions, then squaring the bent flange with respect to the roll axis while similarly bending the other flange during the further reduction of said flanges, substantially as described.

5. The steps in rolling rails, consisting in taking a rectangular bloom and reducing portions of its opposite edges to produce a blank of substantially rectangular outline, with portions of its edges tapered and with rounded corners, then turning said blank on its axis about 90 degrees and producing grooves in its two opposite edges, the grooves being nearer the longer side, thereby providing a pair of longer and thinner projections on one side and a pair of shorter and thicker projections on the other.

6. The steps in rolling rails, which consist in taking a blank, grooved in both edges, having a projecting head portion on one side and two thinner longer projecting portions on the other side, then bending one of said flanges to an acute angle with the roll axis while maintaining the other flange substantially at right angles to said roll axis, the web portion at the base of the grooves being substantially parallel to said roll axis, and simultaneously reducing all said portions.

7. The steps in rolling rails, consisting of taking a blank comprising head, web and flange portions, then bending one of said flanges to an acute angle with the roll axis and maintaining the other flange substantially perpendicular to said axis, while reducing the various portions of said blank,

then straightening the previously bent flange to a position substantially at right angles to the roll axis and bending the other flange to an acute angle with the roll axis, while reducing the various portions, and during these steps maintaining the web portion substantially parallel to said roll axis.

8. The steps in rolling rails, which consist in taking a blank provided with deep grooves on opposite edges, and with projections longer on one side than on the other, then bending one of said longer projections to an acute angle with the roll axis while maintaining the other longer projection substantially perpendicular to said axis, then straightening said bent longer projection to a position substantially perpendicular to the roll axis while bending the other longer projection to an acute angle with said roll axis, all while reducing the various parts in thickness and during the sequence of operations maintaining the web portion at the base of the grooves in substantially the same relative position with respect to the rolls.

9. The steps in rolling rails, comprising bending one of the flanges at an angle less than 75 degrees with the roll axis while maintaining the other flange approximately perpendicular thereto and the web substantially parallel to the roll axis.

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

EDWIN E. SLICK.

Witnesses:

OLIVER B. HICKOX,

FRED A. STAHL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."