N. A. BECKER.

RAILROAD RAIL ROLLING MILL.

APPLICATION FILED OCT. 11, 1913.

1,201,239.

Patented Oct. 17, 1916.

3 SHEETS—SHEET 1.

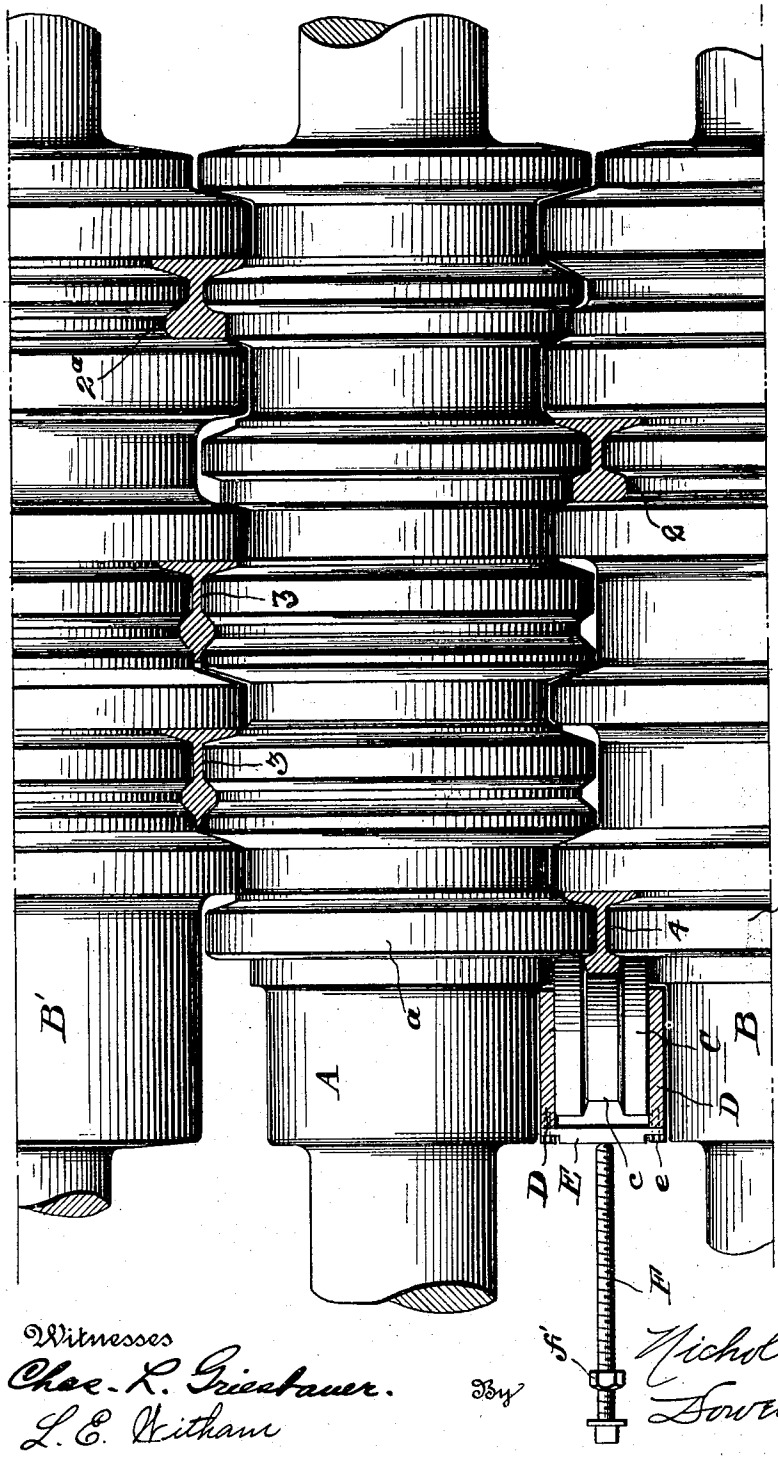


Fig. 1.

Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

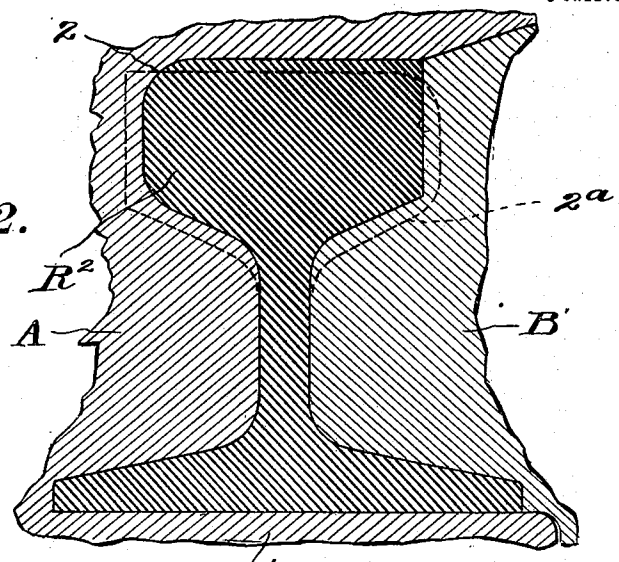


Fig. 3.

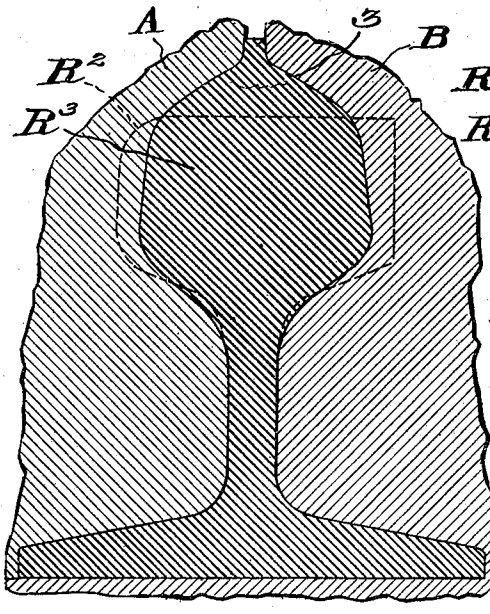
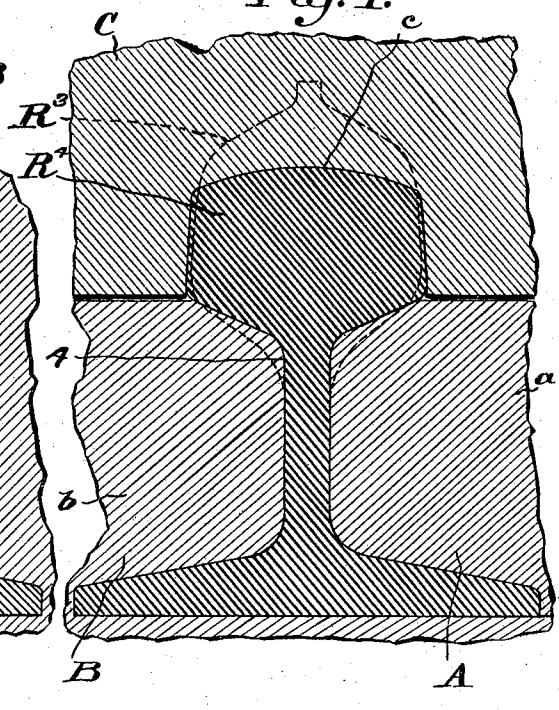


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

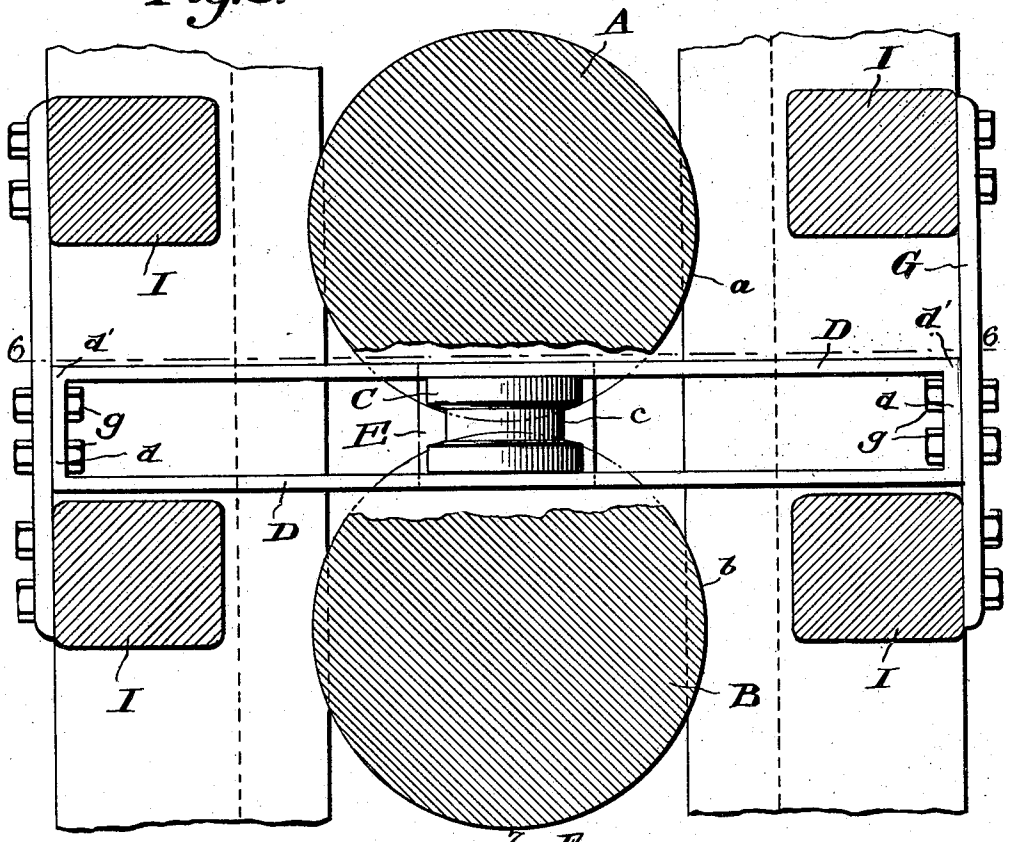


Fig. 6.

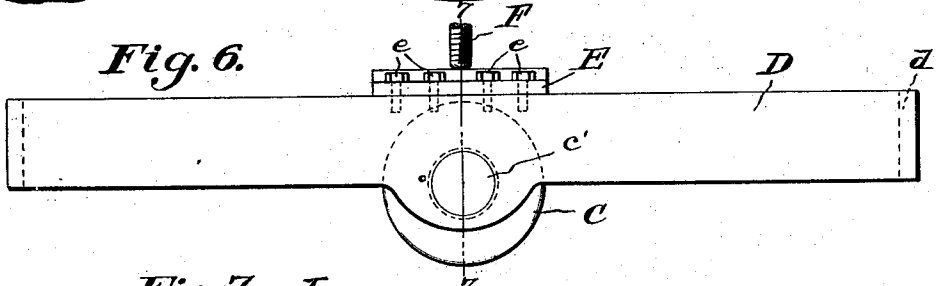
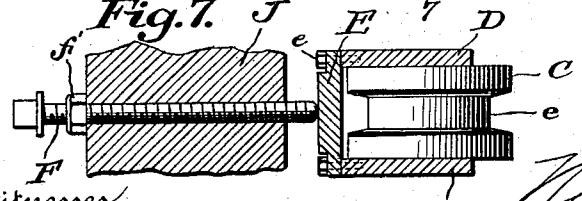


Fig. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

NICHOLAS A. BECKER, OF OAKLAND, CALIFORNIA.

RAILROAD-RAIL-ROLLING MILL.

1,201,239. Specification of Letters Patent. Patented Oct. 17, 1916.

Application filed October 11, 1913. Serial No. 794,659.

To all whom it may concern:

Be it known that I, NICHOLAS A. BECKER, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Railroad-Rail-Rolling Mills; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention relates to rolling mills for rolling railroad rails or so-called T-rails; its object is to provide a mill by which the rails can be produced superior in quality and with less expense than by the present known mills; another object is to produce rails with more compact metal in the head making a tougher and more durable rail, and with a perfect "fish," and to eliminate fracture between the head and web during the rolling by insuring that the head and web shall travel through the rolls at a substantially equal rate of progression.

By my invention I obviate or minimize many of the troubles incident to the present known railroad-rail rolling mills, such as the production of "rough heads," "scaly heads," "seamed heads," "lop-sided heads," and the like.

By my invention I also greatly reduce the amount of cambraying necessary to straighten the rails, as the rails made by my mills are easy to straighten because free from uneven surfaces.

In my invention the head web and base portions of the rail are caused to travel through the passes at approximately the same speed.

The invention resides chiefly in the novel formation of the trailing, leading and finishing passes, whereby the rail head is manipulated in a novel manner productive of most beneficial results.

The invention also includes novel means of mounting the head finishing roll at the finishing pass.

I will explain a practical embodiment of the invention as illustrated in the accompanying drawings, so that rolling mill constructors and operators may be able to manufacture and use the invention; and the claims summarize the invention and novel features of construction for which protection is desired.

In said drawings Figure 1 is a conventional side elevation of a set of rolls for rolling T-rails, showing particularly the novel trailing leader and finishing passes wherein the present invention more particularly resides. Fig. 2 is an enlarged detail sectional view illustrating the manipulation of the rail in the second trailing pass. Fig. 3 is a similar view illustrating the manipulation of the rail in the leader pass. Fig. 4 is a similar view illustrating the manipulation of the rail in the finishing pass. Fig. 5 is a sectional end elevation of part of a rolling mill showing the head-finishing-roll support. Fig. 6 is a detail section on line 6—6, Fig. 5. Fig. 7 is a detail section on line 7—7, Fig. 6.

In the drawings I have conventionally illustrated a set of rolls provided with some preliminary passes and with a trailer pass 2, leader pass 3, and finishing pass 4; but a complete mill would be provided with rolls having all the necessary passes for shaping the stock preparatory to introducing same into the first trailer pass 2 shown in the drawings. The present invention, however, does not relate to the preparatory passes for manipulating the stock, the essential features of the rolls so far as the present invention is concerned being the form of the second trailer pass 2, leader pass 3 and finishing pass 4.

The rolling mill indicated in the drawings has three rolls, A, B, B′; roll A being the central roll and the roll B′ being located above roll A, and roll B being below the roll A, but the mill may have any desired number of rolls. Said rolls are collared and grooved in the usual way to form passes. There may be formed between the rolls A and B, the usual roughing pass or passes to prepare the stock for the first trailer pass 2^a which in turn prepares the stock for the second trailer pass 2, and this prepares the stock for the leader pass 3, (two of which are shown, as these passes usually wear more quickly than the other passes) and the leader pass 3 prepares the rail for the finishing pass 4, which is formed between the collars *a* and *b* on rolls A and B, and an auxiliary head-finishing roll C, which is located between the hubs of the rolls A and B and rotates on an axis perpendicular to the axes of the rolls A and B; and is mounted as hereinafter described. Said finishing roll C is provided with a single annular groove *c* which is adapted to cover the top

and sides of the head of the rail, see Fig. 4, and shapes the head of the rail, while the web and base of the rail are shaped between the collars *a*, *b*, of the rolls A and B.

Referring to Fig. 2, the dotted lines 2^a indicate the section of the first trailer pass 2^a, and also of the rail which is produced by passing through the first trailer pass. It will be seen by reference to this figure that the first trailer pass 2^a is practically of ordinary construction and form, except the rail head is somewhat larger; and such rail head 2^a in this instance is considerably larger than it is when passed through the second trailer pass 2. The full section T-rail in Fig. 2 shows the form of the second trailer pass, and of the rail produced by passing therethrough. The second trailer pass 2 is designedly made so as to work the head R^2 of the rail both vertically and laterally, and also work part of the web, as will be obvious by comparing the section of the rail indicated by dotted lines 2^a (Fig. 2) with the section of the rail shown in full lines therein, which corresponds with the trailer pass 2 in form, such trailer pass 2 being formed between the rolls A and B. The rail from the trailer 2 is then taken to the leader pass 3, and in Fig. 3 the nature of the work performed on the head of the rail in such leader pass is illustrated; the dotted lines R^2 showing a section of the head of the rail coming from the second trailer pass while the full head R^3 shows the amount of work done upon the head in the leader pass. It will be seen by reference to this Fig. 3 that in leader pass 3 the head is worked or compressed laterally (relative to the rail base)—from both sides with practically no work or strain upon the top of the rail, the leader pass being so shaped as to leave a space opposite the central portion of the head R^2 of the rail when introduced into this pass, such portion being clearly indicated above the top of the dotted line R^2 in Fig. 3, and into which space part of the metal compressed from the two sides of the head R^2 may extend. This peculiar shaping of the leader pass is very important in practice and causes a great transverse or lateral compression of the head of the rail and simultaneously elongates it perpendicularly—(relative to the base of the rail). This method of working the head results in breaking loose the scale, ordinarily formed on the head because of the change in form of the head, and clears the head of the rail from such scale; and causes the head to feed through the leader pass at approximately the same speed as the web of the rail is passed therethrough, which is quite important. In the ordinary construction of leader pass the head of the rail is subjected to both vertical and lateral compression, and scale is drawn into the pass instead of kept out of it, and this results in imperfect rail heads and also retards the travel of the head as compared with the travel of the web; and this difference in travel produces fractures between the base of the head and the web; such fractures are microscopic, usually, but nevertheless seriously impair the efficiency of the rail.

From the leader pass 3 the rail is taken to the finishing pass 4, and in Fig. 4 the relation of the finishing pass to the leader pass and the work done upon the head of the rail is clearly illustrated. The dotted lines R^3 in Fig. 4 indicate the shape of the rail brought from the leader pass 3 to the finishing pass 4; while the full lines R^4 show the shape imparted to the head by the finishing pass, and a comparison of the dotted and solid lines in this figure shows the work done upon the head in such pass.

As stated the finishing pass is formed between three rolls A, B and C; the roll C rotating at a plane at right angles to the planes of rolls A and B. This roll C practically works the entire head of the rail and compacts it perpendicularly to the base and may expand it slightly laterally. The flanges *a*, *b* of the rolls A, B, have a slight compressing effect upon the underside of the head at its junction with the web.

It will be obvious from examination of Fig. 4 that quite a large amount of metal is worked in the head at the finishing pass; that the greatest degree of compression is exerted on the head perpendicularly to the base of the rail, such head being thus compressed perpendicularly and solidified; and owing to the comparatively large amount of metal which is worked in the head by this finishing pass the speed or linear travel of the head emerging from this finishing pass is practically uniform with the speed of travel of the web, thus preventing fracture between the web and the head. This perpendicular compression of the head relative to the base by the roll C produces a rail head clean, smooth and of uniform contour, and without fins on either its top or at its upper side edges; the pass 3 also insures that the "fish" between the head and the base remains absolutely uniform.

The rolls A, B, may be mounted in the usual manner in the main frame, and the roll C may have its trunnions *c'* journaled in bearings in upper and lower transverse metal bars D which may be connected at their ends by plates *d*; and these plates *d* may be connected at center outside of the roll C by a plate E secured thereto by bolts *e*, such plate keeping the bars D from springing apart and also affording a bearing for the adjusting screw F. The ends *d* of the head-finishing roller supporting frame are solid as at *d'*, and may be secured by bolts *g* to vertical bars G which are connected to transverse tie-bars, or supporting

bars, I, on the main frame, as indicated in Fig. 5. The bars D extend between the trunnions of rolls A and B and support the rolls C in position adjacent the flanges *a*, *b*, on the ends of rolls A, B. The head-finishing roll C may be adjusted horizontally and held up to its work by means of the bolt F tapped through a cross bar J attached to the frame of the machine and provided with a jam nut *f'*. The advantage of this novel support for the head finishing roll C, is that the bars D are of sufficient resiliency to enable such roll to accommodate itself to any slight variation in the vertical adjustment of the rolls A and B. Sometimes it is desirable to vary the thickness of the web of the rail, or the height of the fish, within small degrees, and this is accomplished by adjusting the rolls A, B, vertically and in such case with my roll support it is not necessary to also vertically adjust the roller C, as it will accommodate itself to slight variations in the relative vertical adjustment of the rolls A and B. Thus if the web portion of the pass should be raised or lowered, within say approximately one-eighth of an inch, the roll C can automatically adapt itself to operate upon the head as soon as the rail is started through the finishing pass and it is not necessary to vertically adjust the head finishing roller each time the rolls A and B are adjusted.

What I claim is:—

1. A mill for rolling railroad rails having a leader-pass adapted to compress the head of the rail laterally on itself relative to the base and elongate it perpendicularly relative to the base.

2. A mill for rolling railroad rails having a trailer pass adapted to work the rail head both laterally and perpendicularly relative to the base; and a leader pass adapted to compress such head laterally and elongate it perpendicularly relative to the base; and a finishing pass adapted to perpendicularly compress the previously laterally compressed and vertically elongated head.

3. A mill for rolling railroad rails having a trailer pass adapted to work the rail head both laterally and perpendicularly relative to the base; and a leader pass adapted to compress such head laterally and elongate it perpendicularly relative to the base; and a finishing pass adapted to perpendicularly compress the previously laterally compressed and vertically elongated head; the reduction on the head in the leading and finishing passes being such that the head of the rail is fed through such passes at approximately the same speed as the web of the rail.

4. In a rolling mill the combination with the main rolls, of an auxiliary roll rotating at right angles to the axes of the main rolls and disposed adjacent the ends thereof; and a frame yieldably supporting said auxiliary roll and extending transversely of and between the trunnions of the main rolls and adapted to permit the auxiliary roll to automatically adjust itself, substantially as described.

5. A mill for rolling railroad rails having upper and lower rolls grooved to form part of a pass, and a third roll mounted adjacent the grooves of the first roll and intermediate the axes of said rolls and rotating upon an axis perpendicular to the axes of said rolls; and a transverse frame yieldably supporting said intermediate roll and adapted to spring sufficiently to permit the latter roll to automatically accommodate itself to adjustments of the upper and lower rolls.

6. In a railroad rail rolling mill the combination of upper and lower main rolls, a head finishing roll coöperating with said upper and lower rolls to form a pass, and located intermediate the axes of said rolls, and rotating on an axis perpendicular to the axes of said upper and lower rolls; with a transverse frame yieldably supporting said intermediate roll and composed of parallel upper and lower bars whereby the head finishing roll is permitted to automatically adjust itself to slight variations in the vertical adjustment of the main rolls.

In testimony that I claim the foregoing as my own, I affix my signature in presence of two witnesses.

NICHOLAS A. BECKER.

Witnesses:
ARTHUR E. DOWELL,
L. E. WITHAM.

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