F. H. DANIELS.

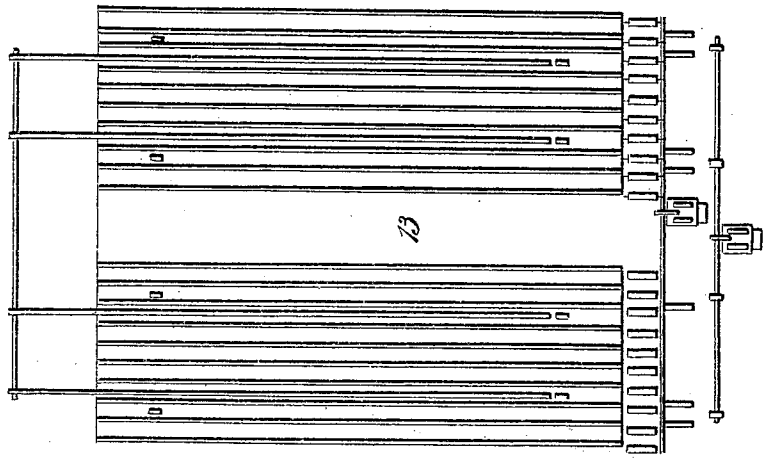
TREATMENT OF STEEL RAILS.

APPLICATION FILED NOV. 21, 1907.

941,134.

Patented Nov. 23, 1909.

2 SHEETS—SHEET 1.



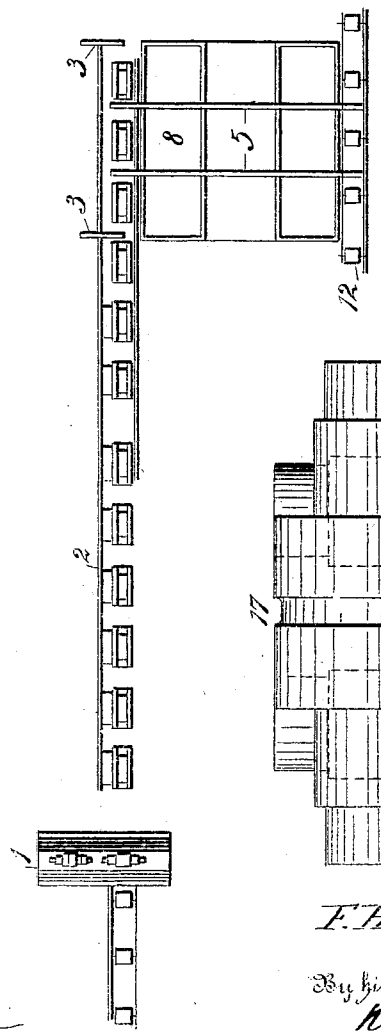


Fig. 1.

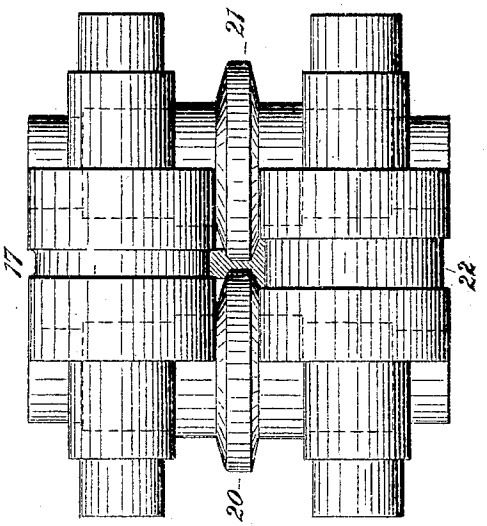


Fig. 4.

Witnesses:
Thos. J. Byrnes
A. A. Dunham

F. H. Daniels Inventor

By his Attorneys
Kerr, Page & Cooper

F. H. DANIELS.

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2 SHEETS—SHEET 2.

Fig. 2.

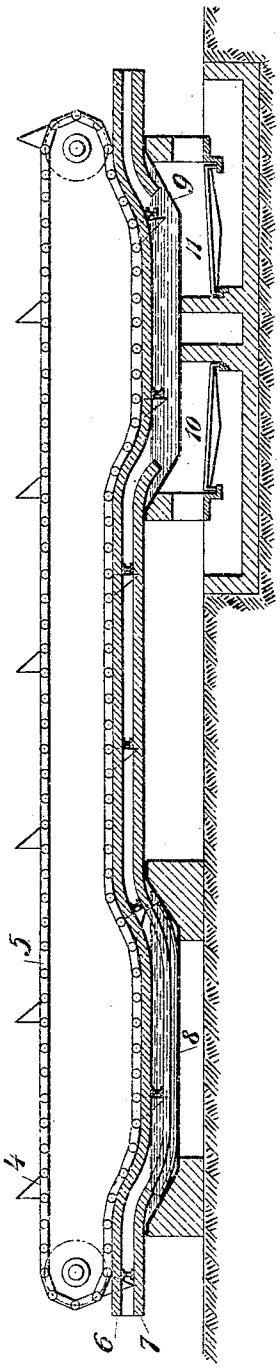
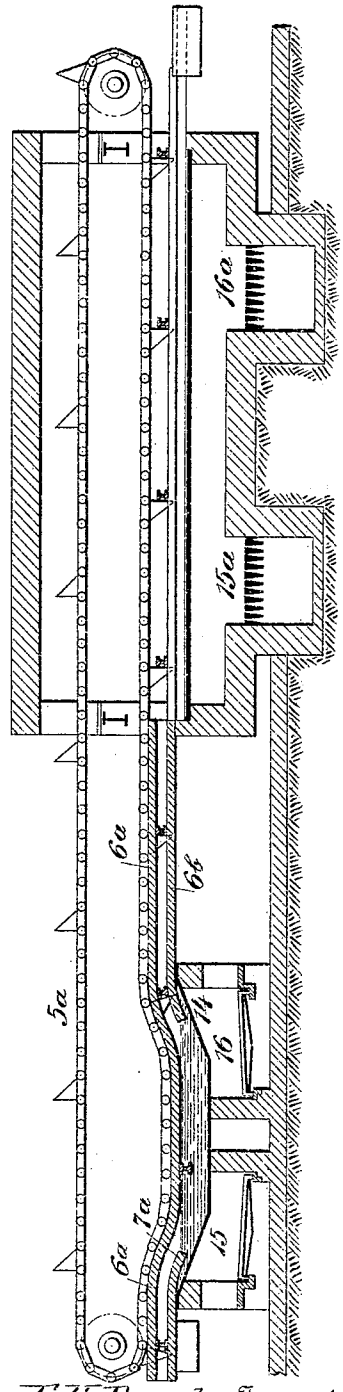


Fig. 3.



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UNITED STATES PATENT OFFICE.

FRED H. DANIELS, OF WORCESTER, MASSACHUSETTS.

TREATMENT OF STEEL RAILS.

941,134. Specification of Letters Patent. Patented Nov. 23, 1909.

Application filed November 21, 1907. Serial No. 403,141.

To all whom it may concern:

Be it known that I, FRED H. DANIELS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a certain new and useful Treatment of Steel Rails, of which the following is a specification.

The great weight and high speed of modern railway trains subject the rails to very hard usage, and it is therefore important that the rails possess the greatest possible durability and resistance to shocks.

In a copending application filed of even date herewith, Ser. No. 403,139, I have described and claimed broadly a mode of treatment by which improved results in respect of durability and lessened liability of fracture are obtained. The method referred to consists, briefly stated, in suddenly cooling or chilling the heated rail, preferably at a temperature of about 1400° to 1600° F., thereby imparting a fine crystalline structure to the metal, but producing internal strains which must be relieved before the rail is in condition for efficient use; then reheating the rail, say to a temperature of about 900° F. which is below a dull red heat, and allowing it to cool gradually, thus removing the internal strains and leaving the rail hard and tough. My present invention involves a similar procedure, but adds thereto an important step which materially improves the wear- and shock-resisting qualities of the rail. The step referred to consists in flattening and elongating the crystals of the metal, more especially at the head and base of the rail, by passing the cooled rail one or more times through suitable rolls or dies.

In the annexed drawings I have illustrated, somewhat diagrammatically, convenient apparatus for practicing the invention.

In the drawings, Figure 1 is a plan view of a complete apparatus for the purpose, in which the sudden chilling of the heated rail is effected by a bath of oil, and the reheating by a bath of molten lead. Fig. 2 is a section on line II—II of Fig. 1, showing the oil and lead baths, with their associated mechanism. Fig. 3 is a similar section showing a lead bath for effecting the sudden cooling or chilling and a hot room or chamber for reheating the cooled rail. Fig. 4 is a diagrammatic elevation of a set of rolls for rolling the rail after its slow cooling.

In carrying out my invention, the treatment begins with the rails at a good red heat, say from 1600° to 1800° F. By preference they are finished at that heat in the finishing rolls, indicated by 1 in the drawings, from which they are delivered by conveying tables 2 to the hot saws 3, where they are cut into suitable lengths for use. Leaving the hot saws, the rails are engaged by teeth or projections 4 on endless chains or other suitable conveyers 5 and carried thereby along guides 6, 7, into and through a bath of oil contained in a vessel 8. The rails are thus cooled rapidly, and the metal is thereby caused to assume a fine crystalline structure. At the same time internal strains are produced, which are removed in the following manner.

From the oil bath the rails are moved along the guides 6 and 8 into and through a bath of molten lead, contained in a vessel 9 and maintained at the proper temperature by furnaces 10, 11. The rails are reheated, preferably to a temperature below a dull red heat, in the lead bath, and are delivered therefrom to the conveying rollers 12 leading to a hot bed 13. In being drawn slowly over the hot bed the rails cool gradually, with the result that the internal strains, produced by the previous sudden chilling, are eradicated. Instead of chilling the heated rails in oil and reheating them in molten lead, they may be chilled in molten lead and reheated in a suitable hot room, as described and claimed in my copending application filed of even date herewith, Ser. No. 403,140. An apparatus for carrying out this treatment is illustrated in Fig. 3, and operates as follows. Receiving the heated rails from the hot saws 3 the conveyer chains 5^a carry them along the guides 6^a, 7^a, into and through a bath of molten lead contained in a receptacle 14 provided with furnaces 15, 16, for maintaining the metal in the molten state. The sudden chilling of the heated rails by the molten lead imparts a fine crystalline structure to the steel, but, as before stated, also produces internal strains. The latter are eradicated as follows: From the lead bath the conveyers carry the rails along the guides 6^a, 6^b, into a suitable hot room, heated by furnaces 15^a, 16^a, to a temperature sufficient to reheat the rails, say to a temperature below a dull red

heat. From the hot room, as from the reheating lead bath of Fig. 2, the reheated rails are taken to the hot bed and there cooled gradually. The cooled rails are now rolled or drawn to flatten and elongate the crystals of the metal. For this purpose an arrangement of rolls like those illustrated in Fig. 4 may be employed. In this figure the roll 17 operates on the top and sides of the head, rolls 20 and 21 on the web, and roll 22 on the edges and bottom of the base. Passed one or more times through these rolls, the structure of the metal of the rail is materially modified, more particularly in the exterior parts of the rail, the crystals being flattened and elongated and the whole toughened. After the cold-rolling, the rails are straightened, if necessary, and then drilled, by suitable apparatus not shown, whereupon they are ready for use.

From the foregoing it will be seen that the method of treatment is simple, and can be practiced with apparatus of simple character. At the same time the treatment is thoroughly effective, rendering the rails materially more durable and more resistant to fracture.

What I claim is:

1. The herein described method of treating steel rails to increase the resistance thereof to wear and shocks, which consists in cooling the heated rail rapidly, and thereby imparting to the metal a fine crystalline structure; reheating the rail and then cooling the same gradually, to eliminate internal strain; and cold-rolling the rail to elongate and flatten the crystals of the metal.

2. The herein described method of treating steel rails to increase the resistance thereof to wear and shocks, which consists in cooling the heated rail rapidly by subjecting the same to a liquid cooling medium, to impart a fine crystalline structure to the metal; reheating the rail and then cooling the same gradually to eliminate internal strains; and cold-rolling the rail to elongate and flatten the crystals of the metal.

3. The herein described method of treating steel rails to increase the resistance thereof to wear and shocks, which consists in rapidly cooling the rail from red heat and thereby imparting a fine crystalline structure to the metal; reheating the rail to a temperature of approximately 900° F. and then cooling the same gradually to eliminate internal strains; and cold-rolling the rail to elongate and flatten the crystals of the metal.

4. The herein described method of treating steel rails to increase the resistance thereof to wear and shocks, which consists in subjecting the red hot rail to a liquid cooling medium, to cool the rail rapidly and impart a fine crystalline structure to the metal; reheating the rail to a temperature of approximately 900° F. and then gradually cooling the rail on a hot bed, to eliminate internal strains; and passing the cooled rail through rolls to elongate and flatten the crystals of the metal.

5. The herein described method of treating steel rails to increase the resistance thereof to wear and shocks, which consists in rapidly cooling the heated rail and thereby imparting a fine crystalline structure to the metal; reheating the rail and then cooling the same gradually, to eliminate internal strains; and flattening and elongating the crystals of the metal exterior parts of the rail.

FRED H. DANIELS.

Witnesses:
WM. A. BACON,
G. LAMPSON.