2 Sheets—Sheet 1.

# W. R. JONES.

## HOT-BEDS FOR BENDING RAILROAD RAILS.

No. 189,471. Patented April 10, 1877.

Fig. 1.

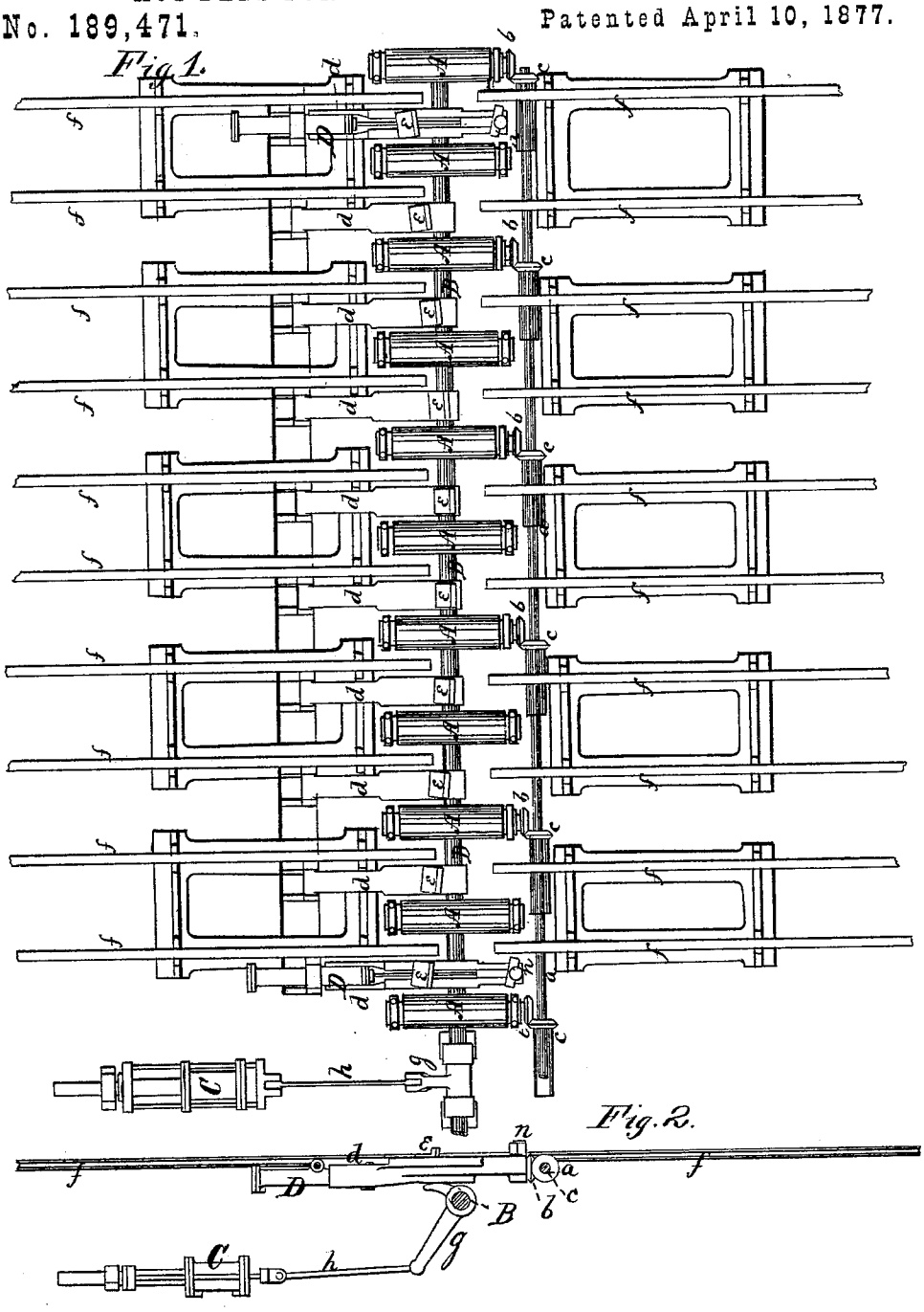

Fig. 2.



Witnesses.

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2 Sheets—Sheet 2.

# W. R. JONES.

## HOT-BEDS FOR BENDING RAILROAD RAILS.

No. 189,471. Patented April 10, 1877.

Fig. 3

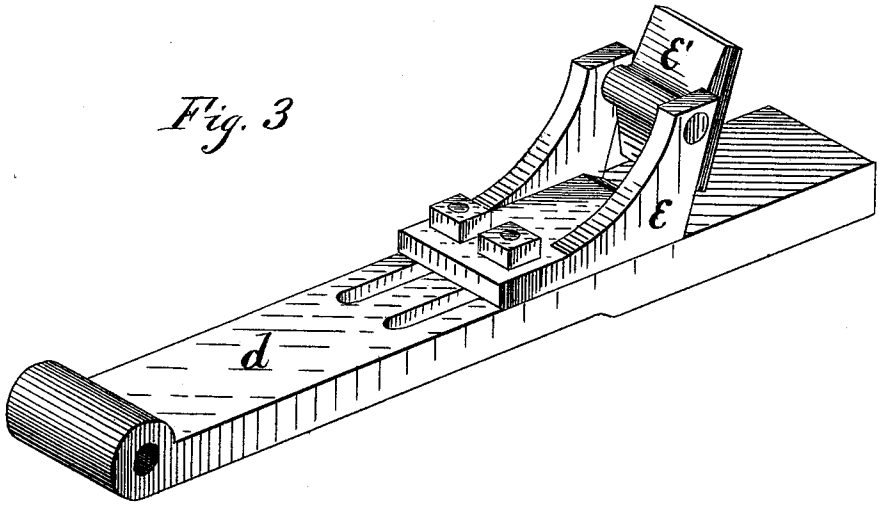
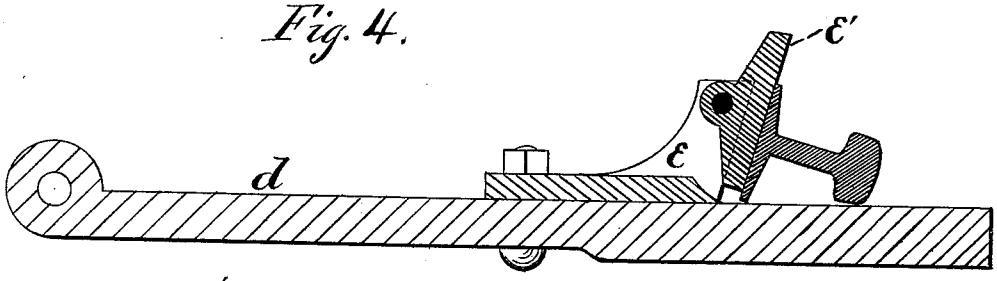



Fig. 4.



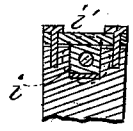




Fig. 5.

Witnesses
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# UNITED STATES PATENT OFFICE.

WILLIAM R. JONES, OF BRADDOCK'S, ASSIGNOR TO THE EDGAR THOMSON STEEL COMPANY, (LIMITED,) OF PITTSBURG, PENNSYLVANIA.

## IMPROVEMENT IN HOT-BEDS FOR BENDING RAILROAD-RAILS.

Specification forming part of Letters Patent No. **189,471**, dated April 10, 1877; application filed December 22, 1876.

*To all whom it may concern:*

Be it known that I, WILLIAM R. JONES, of Braddock's, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Hot-Beds for Curving 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which.

Figure 1 is a plan view of my invention. Fig. 2 is an end view of same. Figs. 3 and 4 are details. Fig. 5 is a vertical section through the journal of one of the rolls, showing means for adjustment.

This invention relates to improvements in "hot-beds" or devices employed in the treatment, while manufacturing, of rails, for the purpose of imparting to the red-hot rail such a curve that the unequal contraction consequent upon cooling shall exactly counteract such curve and reduce the rail to a straight line.

For this purpose manufacturers have been using means such as either of the following: One device consists in what is called a "straightening-plate," for the proper alignment of the rail on its side, beside which is placed either a concave or convex "curving-plate," upon which the rail is thrown and jolted up and down till it has assumed the curvature of the plate under it, after which it is turned over on its side and drawn away to cool.

Another device consists of three rolls set vertically in triangular disposition, between which the rail is passed on its side; but the curvature thus given produces, after cooling, the curve known as the "probate cycloid," and not a straight line, and this necessitates the use of cold straightening.

Now, the perfection of a rail when cool, not regarding the quality of material, depends directly upon its freedom from strain while hot; but it cannot be free from strain when handled in either of the foregoing ways, because, first, the lifting and dropping is bound to stretch the fibers unduly at one or more portions of the surface, and hence, when cool, the rail will have an inherent strain at such points; and, secondly, because in either case the rail must be turned over on its side for removal, and in the then flexible condition of the rail this tends to either injure the curvature or impart a torsional strain or warp; but the chief objection to both methods is the amount of handling required, and the necessity of trusting the standard of excellence to the judgment of unskilled men. It is a slow and laborious proceeding, and not in keeping with the footsteps of progress that are so conspicuously seen in the manufacture of rails.

The object of this invention is to produce a device which shall receive the rail directly from the saws, straighten it laterally, and curve it vertically at the one operation, and in so doing impart any curve which may be required for any particular size or form of rail, and this without moving the rail out of its laterally-straightened position, so that when the curving is done it may be at once drawn off to cool.

To these ends this invention comprises a set of parallel vertically-adjustable rolls set in line with the rolls of the saw-carriage, and actuated by any suitable means, a set of stops projecting or projected upwardly between the rolls, and so arranged relatively to each other as to form points on a curve such as it is desired to impart to the rail, and suitable means for forcing the rail against these stops, and then forcing it for delivery to the cooling-bed.

The invention also comprises the construction and operation of the various parts and other combination, as more particularly described hereinafter.

In line with the rolls of the saw-carriage, and with their top surface at about the same level, is a set of plain rolls, A, made very accurate, and having their bearings adjustable, in order to regulate the height of the respective rolls to a perfect plane. They, or the alternate rolls, are actuated by the beveled gear-wheels *b c* and shaft *a*.

I do not wish or intend to limit myself to any specific means for adjusting the rolls; but the provision shown by Fig. 5 of the drawing

may be adopted as both effective and simple, consisting in the use of a rectangular collar, *i*, in which the roller has its bearing, and which has its seat in a recess formed in the supporting-column. A cap or plate, *i'*, fits over said collar, and, being bolted to the supporting-column, holds the collar in place. When it is desired to adjust the roller, the cap or plate is removed and a wedge or plate of metal inserted below the collar; or, if there already and the roller requires it to be lowered, the wedge may be removed. The collar may sometimes be reduced by filing.

Lying between the several rolls A are stops or shoulders *e*, which may either be permanently fixed to project above the rolls, or, as shown in the drawings, movable vertically, by being attached to pivoted, swinging, or otherwise moving or movable arms *d*, so that they may be elevated for operation, and then depressed to clear the way for the removal of the treated rail. These stops *e* are so located, relatively, that they form, on a horizontal plane, so many points on a curve of the precise form to be imparted to the rail, so that when it is brought against them it shall assume such curve; and they are also so arranged that their combined curvature may be altered at will. This is effected by making them adjustable lengthwise on the arms *d*, which is done by slotting the arms *d* and attaching the stops *e* by bolts through the slots, each stop thus having projective adjustment on its respective arm. Besides this adjustment, the face-plate of each stop—that is, the part which comes in contact with the bottom of the flange of the rail—is also adjustable angularly. This is best effected by hanging it on a pivot, so as to have it automatically adjustable, as it then adapts itself to the angle. This adjustment becomes necessary when it is considered that rails are made vastly differing in their respective dimensions. One rail may have a narrow head and wide flange, and, when on its side, the angle made by its flange and the horizontal line of support is more acute than that formed by a rail whose head and flange differ but little in width. Consequently some means must be adopted for meeting the flange squarely. This construction, as well as that of the adjustment of the stops projecting on their arms, is shown in detail in Figs. 3 and 4, where *d* is the arm, with its stop *e* adjustably bolted through the slots, and the face-plate *e'* so hung on a horizontal pivot behind its center that it normally inclines inwardly to meet the rail-flange, the rail being shown in section. By this method of hanging the face-plates no special attention need be given them, as they all adjust themselves to the inclination of the flange. Extending out on one or both sides of the set of rolls A is a series of rails or guides, *f*, lying either wholly at the level of the rolls, or with their outer ends sweeping downwardly away, in order that the curved rail may be more easily drawn away.

A shaft, B, properly journaled, passes along under the rolls A and under the ends of arms *d*. On this shaft, corresponding with the arms *d*, are arranged the cams *i*, which, when the shaft is rocked one way, elevate the arms *d* and their stops, and, when rocked the other way, permit the arms and stops to fall below the level of the rails *f* and rolls A, so as to be out of the way of the removing rail. The shaft receives this motion, at the will of the operator, by the crank *g*, connecting with the piston-rod *h* of a hydraulic cylinder, C.

The two arms which form the extremes of the series are slotted lengthwise on an extension of their ends, to form a slide for a clutch or head block, *n*, which is jointed to a piston-rod working, at the pleasure of the operator, back and forth in a hydraulic cylinder, D, fixed on the arm. When the rail is brought to rest on the rolls A and the arms *d* elevated, these head-blocks rise on the side of the rail next its head, after which a stroke of the pistons draws the head-blocks *n*, and with them the rail, over against the stops, and holds all there till released by a contrary stroke; then the arms *d* are dropped, and the way is clear for the removal of the rail to cool.

The operation of the complete device is as follows:

The glowing rail, after having been cut to length at the saws, is propelled off the saw-carriage while resting on its side onto the rolls A of the hot-bed, which latter are driven till the rail is in proper position, when they are stopped and the rail brought to rest. In this operation the rail is effectually straightened laterally by reason of the perfect alignment of the rolls A, and requires only curving. Then the piston of cylinder C is actuated, and draws on crank *g* of shaft B, thus, by means of cams *i*, raising the ends of arms *d* and the stops *e* above the rolls A. Then the pistons of the cylinders D are actuated and draw the head-blocks *n* inwardly, and with them the interlying ends of the uncurved rail, bringing it at all points to the curvature of the line of stops *e*, and the stops, being inclined, may exert some slight downward pressure to complete the lateral straightening of the rail unoperated upon by the straightening tendency of the rolls. After this is done the rail is released by operating crank *g* to depress the arms, stops, and head-blocks, the rail removed, and all is ready for another rail.

By this method no double or extra handling of the rail is required. It is both straightened laterally and curved vertically in the same device. There is no irregular bending, no malleting, no straining, stretching, or torsion of fibers. At the same time facilities are afforded for readily altering the curvature to suit any requirement as to size or configuration of rail, and the operation is such that all similarly-sized rails are curved to exactly the same degree throughout their lengths, respectively.

The hydraulic cylinders above described are by no means essential to the effective curving and straightening of the rails, since they may be substituted by any other known power. In this case they have been applied as being the most economical.

The invention is especially adapted to the treatment of steel rails, because they are generally made with the flange so thin that they require more care than can be given in the use of the ordinary hot-bed in order to produce perfect work.

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

1. The combination of the driven rolls A and the curved line of stops *e*, arranged and operating substantially as specified.

2. The combination, with the driven rolls A, of the curved line of interlying stops *e*, provided with means of vertical elevation and depression, substantially as shown and described.

3. The combination, with the driven rolls A, of the curved line of interlying stops *e*, each provided with means of horizontal adjustment, whereby the curvature of the line may be varied at will, substantially as and for the purposes set forth.

4. The combination of the curved line of stops *e* and the movable head-blocks *n*, arranged and operating substantially as described.

5. The combination of a slotted arm, *d*, and a stop, *e*, bolted thereon, and capable of being located at different points of the arm, substantially as described.

6. The combination, with the shoulders of the stop *e*, of the self-adjusting face-plates *e'*, pivoted thereupon, substantially as and for the purpose described.

7. The combination of rock-shaft B, cams *i*, and arms *d*, as and for the purpose described.

8. The combination of rolls A and a series of guide-rails, *f*, on one or both sides thereof, substantially as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand this 2d day of October, 1876.

WILLIAM R. JONES.

Witnesses:

GRAM CURTIS,

WILLIAM WHITE, Jr.