No. 753,409. PATENTED MAR. 1, 1904.

D. H. LENTZ.

PROCESS OF RENEWING TRACTION RAILS.

APPLICATION FILED MAY 3, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

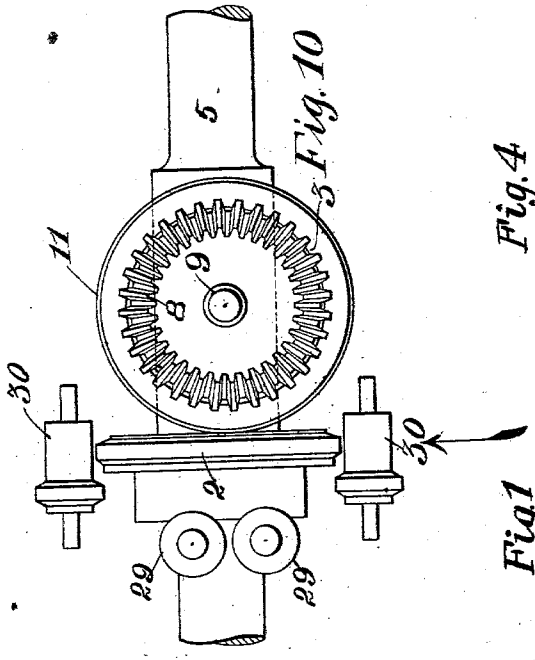

Fig. 10

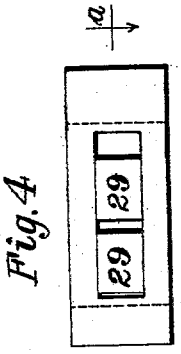

Fig. 4

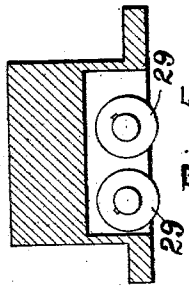

Fig. 5.

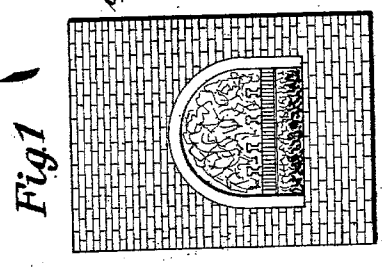

Fig. 1

Fig. 11.

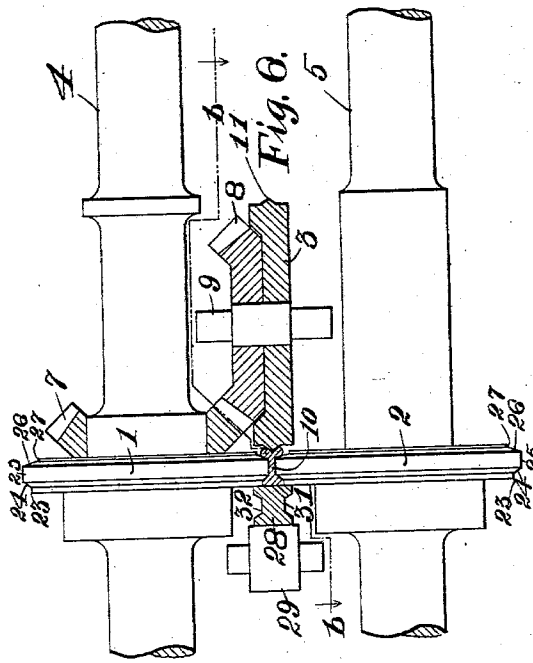

Fig. 6.

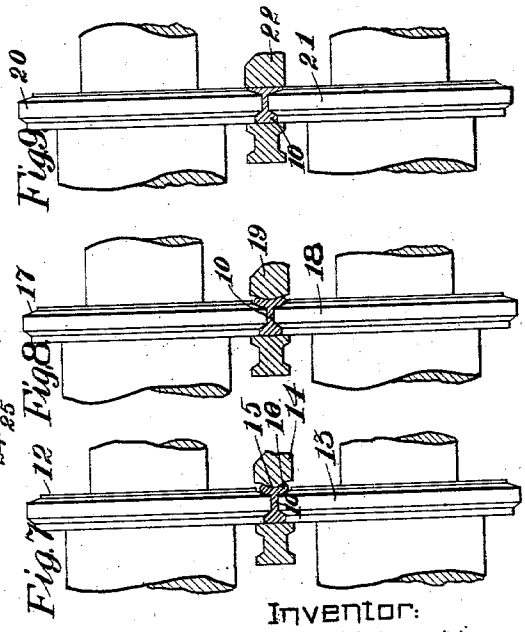

Fig 9

Fig 8

Fig 7

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NO MODEL. 3 SHEETS—SHEET 2.

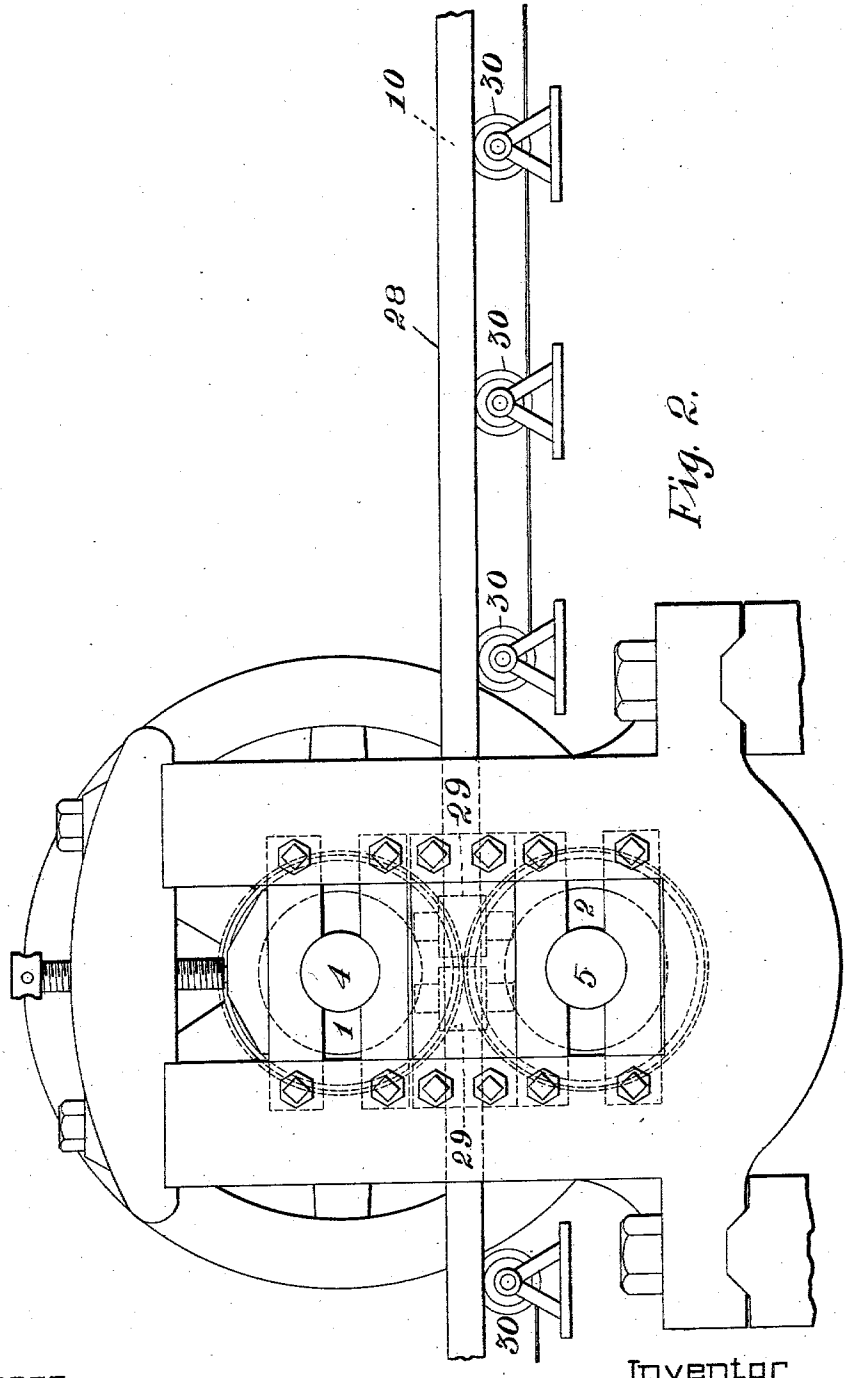

Fig. 2.

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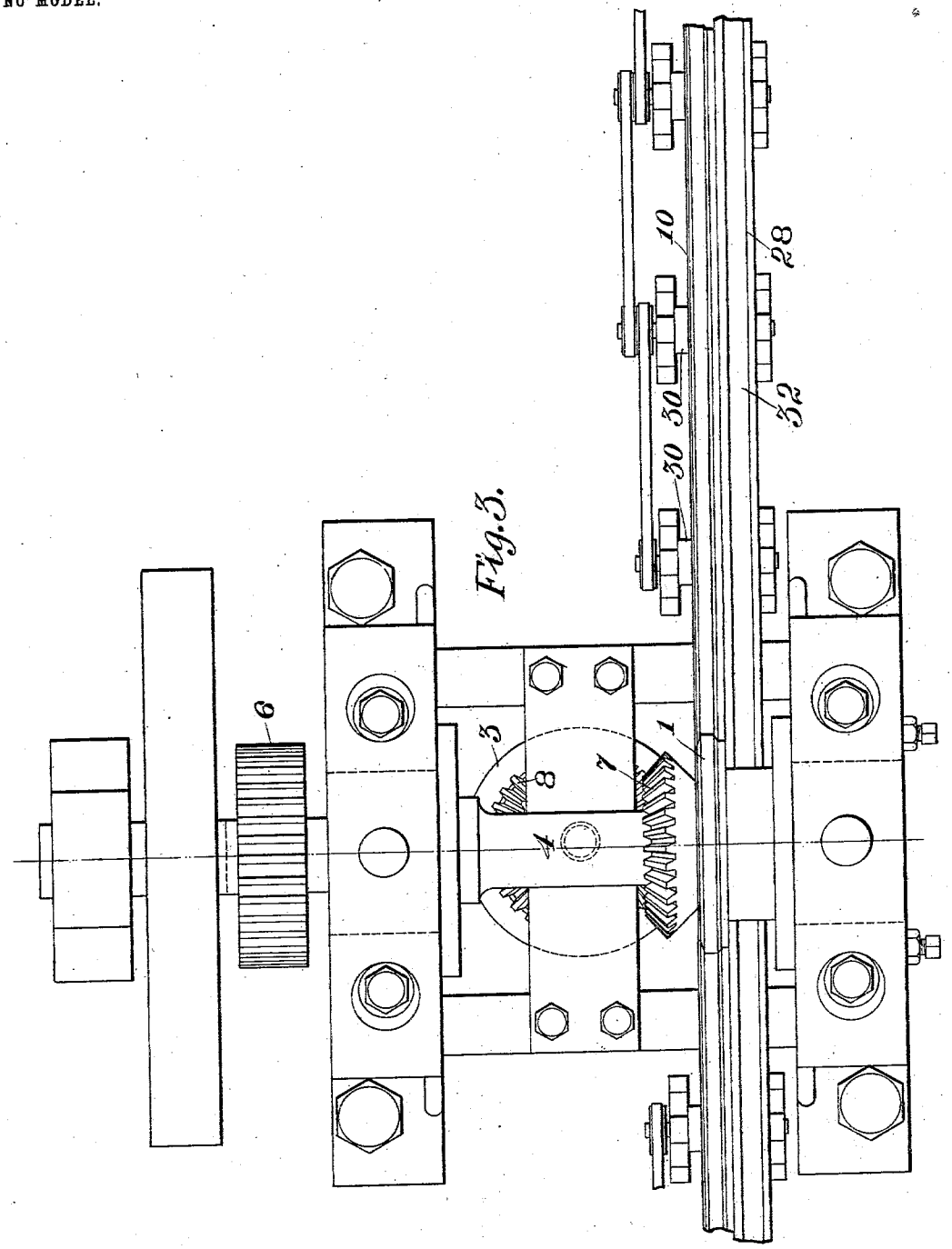
PROCESS OF RENEWING TRACTION RAILS.

APPLICATION FILED MAY 3, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 3.



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No. 753,409. Patented March 1, 1904.

UNITED STATES PATENT OFFICE.

DAVID H. LENTZ, OF JOLIET, ILLINOIS.

PROCESS OF RENEWING TRACTION-RAILS.

SPECIFICATION forming part of Letters Patent No. 753,409, dated March 1, 1904.

Application filed May 3, 1902. Serial No. 105,793. (No specimens.)

To all whom it may concern:

Be it known that I, DAVID H. LENTZ, a citizen of the United States, residing at Joliet, in the county of Will and State of Illinois, have invented a certain new and useful Improvement in Processes of Renewing Traction-Rails, (Case No. 12,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to process for transforming double-headed traction-rails into single-headed flanged traction-rails.

In Europe the traction-rails most largely employed are those provided with double heads interchangeable as traction-heads, the object of this rail construction being to use one of the heads for a traction-head until it becomes too worn for further good service, whereafter the rail is reversed in position and the remaining head then used as a traction-head. Heretofore after this double use of such rails they have been discarded from further use as rails. Bull-headed rails (another form of double-headed rails not designed for reversal) are also contemplated in connection with my invention, as indeed is the ordinary type of rail, which may have its single head treated in accordance with my invention.

One of the objects of my invention is to readapt this form of rail for use where single-headed rails are employed, which is altogether the case in the United States and some other countries, and to this end I change the cross-section of one of the heads to that of a flange.

In practicing the method I preferably employ a rolling train which is adapted to act upon one of the heads of a rail to transform the same into a flange. There are certain peculiar steps that are desirable to follow in practicing the invention to secure the desired dimensions of the web and to secure a rail free of folds, as it is not permissible to raise the rail that is to be reshaped to a welding heat, as this would result in a decarbonization of the steel and would render the rail totally unfit for further service. I preferably first heat the rail to a temperature near to but below the point at which the carbon contained therein would be materially affected, which temperature, however, may be such as to permit a remolding or shaping of the rail. After the rail has been thus heated it is preferably first passed through rollers, which cause a groove in the bottom of the rail to be formed, this operation causing that portion of the rail which was previously a head portion to spread into an embryo flange. The roller that forms the groove is preferably V-shaped, so as to secure a decided spreading action, whereafter the rail is preferably passed through a train in which is included a roll having a bead which engages the flange-to-be and further spreads the same. The rail is next passed through rolls which further flatten the base of the flange, and finally subjected to the action of a roll which completely flattens the base of the flange. In each of these operations there are preferably employed two additional rolls, which engage between them the web of the rail and which determine the shape of the upper surfaces of the flange and act in coöperation with the rolls that engage the base of the flange to shape the same. These additional rolls are requisite, as the fishing angles between the heads and the web of a double-headed rail are not usually the same as the fishing angles between the flange and web of a standard rail, such as is used in the United States. In any event they would be useful in so constraining the flow of the metal as to preserve or secure the proper fishing angles and the desired shape of the flange.

The various steps of practicing the preferred embodiment of my invention will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 diagrammatically indicates a furnace within which the rails may be heated prior to reshaping. Fig. 2 is a side elevation of a rolling-machine for reshaping rails. Fig. 3 is a plan view of the machine shown in Fig. 2. Fig. 4 is a side elevation of a pair of rolls, including their housing, that preferably forms a part of my improved structure. Fig. 5 is a sectional view on line *a a* of Fig. 4. Fig. 6 is a detailed view in elevation showing certain parts in section of the rolling mechanism employed in the first pass. Fig. 7 is a detailed view of the rolls employed in the second pass.

Fig. 8 is a detailed view of the rolls employed in the third pass. Fig. 9 is a detailed view of the rolls employed in the fourth pass. Fig. 10 is a plan view on line *b b* of Fig. 6. Fig. 11 is a view of a double-headed rail of the kind which may be reworked into a single-headed rail.

Like parts are indicated by similar characters of reference throughout the different figures.

There are preferably employed in each roll-train for each pass three rollers, two of which engage one head and the web, while the third engages the other head to form it into a flange. The first set of rolls is shown in Fig. 6, comprising an upper roll 1, a lower roll 2, the axes of these rolls preferably lying horizontally in the same vertical plane, and an intermediate roll 3, whose axis is vertical.

The machine illustrated in Figs. 2 and 3 is the kind that is preferably employed for each set of rolls, there being preferably as many machines as there are sets of rolls. I have deemed it essential to illustrate but one machine, as the adaptation of other rolls to similar machines will be readily apparent. In such a machine as that illustrated in Figs. 2 and 3 the upper roll 1 may be directly mounted upon a driving-shaft 4, while the lower roll, mounted upon a shaft 5, may be driven by gearing 6 intervening between the shafts 4 and 5, this arrangement serving to drive the rolls 1 and 2 in opposite directions, and preferably operating in addition to forming rolls as feeding-rolls. The intermediate roll 3 may be driven from the shaft 4 by means of a spur-gear 7 engaging a corresponding gear 8, that is keyed upon the shaft 9, to which shaft the roll 3 is also keyed. This shaft is located within such proximity to the rolls 1 and 2 as to cause the roll 3 to engage that which is the horizontal surface of the head of the worn rail 10, as said rail is disposed in the railroad adjacent thereto. The roll 3 (indicated in Fig. 6) is shown as one of the rolls of the first train and is preferably provided with a **V**-shaped periphery 11, which forms in the contiguous tread-surface of the head of the rail 10 a corresponding groove, this head being somewhat flattened or spread in the formation of the groove, as indicated in Fig. 6. The second set of rolls through which the rail is passed after issuing from between the rolls 1, 2, and 3 is shown in Fig. 7, wherein the upper roll 12, the lower roll 13, and the intermediate roll 14 may be driven in the same manner as rolls 1, 2, and 3. (Shown in Fig. 6.) The roll 14 in place of having a **V**-shaped rim 11 is provided with a rim 15, which is curved in cross-section and which serves, further, to spread what has now become an embryonic flange 16. The third set of rolls (illustrated in Fig. 8) employs an upper roll 17, a lower roll 18, and an intermediate roll 19, which may be operated as the rolls 1, 2, and 3 of Fig. 6. The intermediate roll 19 has its periphery shaped in cross-section, with a longer but less prominent curve than the periphery of the roll 14 to further flatten the flange. The fourth set of rolls that serves to complete the shape of the re-formed rail employs an upper roll 20, a lower roll 21, and an intermediate roll 22, which may also be driven as the rolls 1, 2, and 3 of the set shown in Fig. 6. The intermediate roll in this last instance, however, is preferably provided with a cylindrical periphery to engage the bottom of the flange and flatten the same. The rolls 1, 12, 17, and 20, 2, 13, 18, and 21 are preferably uniformly shaped, each having five peripheries 23, 24, 25, 26, and 27, which correspond to the side walls of the head of the rail, the surfaces that unite the side walls of the web of the rail, the surfaces that unite the web of the rail with the side walls of the flange, and the surfaces which correspond to the side walls or edges of the flange.

In the steps illustrated in Figs 6, 7, and 8 the peripheral surfaces 26 and 27 are not fully engaged by the flange of the rail; but the rolls 3, 14, and 19 press the flange portion of the rail toward these peripheral surfaces, these peripheral portions 26 and 27 thus constituting shaping means and which serve to limit the flow of the metal so that when the final roll 22 is applied to the base of the flange the space between the roll 22 and the rolls 20 and 21 is completely filled, securing thus a proper shape.

The furnace illustrated in Fig. 1 is simply a diagrammatic illustration of one that may be employed for heating the rails to a temperature near to but below the point at which the carbon contained therein would be materially affected, which temperature, however, may be such as to permit a remolding or shaping of the rail. If desirable, the rails in process of reconstruction may be heated between passes, so as to be readily worked.

It is desirable not to reroll the portion of the rail that is to constitute the tread while the flange is being formed. This rerolling of the tread may be done by processes that have hitherto been devised for just this purpose.

Where the rail is to be subject to transverse pressure in a direction coincident with the plane of the web, there is a tendency to upset parts thereof which are not at the particular stage of the process to be upset. I have provided improved means for opposing this tendency. The head of the rail is engaged underneath and on the sides by the peripheral surfaces 24 and 23, respectively. To prevent the tread-surface of the rail from being thrust beyond the rolls, thus engaging the head thereof, there is preferably provided in association with each pair of rolls thus engaging the head an abutment 28, which engages the tread of the rail and preferably extends on both sides of the same into engagement with the

rolls, so that this abutment, in combination with the peripheral surfaces 23 and 24, forms a space that corresponds approximately to the cross-section of the rail-head. This abutment is preferably in the form of a flat bar, and it is preferably moved at the same rate of speed as the rail passing through the rolls, so that there will be no relative motion between the rail and bar, which might result in friction and an improper displacement of the metal. In order that the bar may be pressed firmly against the rail where the same is acted upon by the part of the machine where the roll 3 is in engagement with the rail, I preferably employ two idlers 29 29 in line with the space between which is located the web of the rail. In order that this bar, which is preferably coextensive in length with the rail may accompany the rail in its travel, I preferably drive the same by means of belt-driven friction-pinions 30, which are shaped at their peripheries to correspond to the channel 31 in the abutment-bar 28. To effect a return of the abutment bar after the rail which it accompanies has been passed through a machine, the direction of rotation of the rolls 30 may be reversed or the bar otherwise reciprocated. As the heat of the rail is likely to be communicated to the bar 28 to an undesirable extent, a groove 32 is formed in the upper side of the bar, within which water may be passed to cool the bar.

The diameter of the reshaping-rolls is made slightly larger than that of the feed or gripping rolls, and the axes thereof are placed slightly in advance of the plane containing the axes of the gripping-rolls. The rate of revolution of all the rolls is equal, and the peripheral speed of the reshaping-rolls is consequently greater than the speed of the rail passing through the gripping-rolls, and on account of the longitudinal compression created thereby between the reshaping-roll and the rail the material of the rail tangent to the reshaping-roll is pushed and worked forward into the short section of the rail extending from the reshaping-roll to the gripping-rolls. This longitudinal compression may cause distortion or bulging out of the material in the short section; but the material passing between the gripping-rolls is worked and transversely compressed back to its proper caliber. The rail is thus subjected simultaneously to longitudinal and transverse compression. In other words, short successive sections of the rail are subjected to an upsetting treatment.

The process of my invention will thus be readily understood by the foregoing specific description of the apparatus which is preferably employed for effecting the same.

I do not wish to be limited to all of the steps described nor to the manner of carrying the same into effect; but,

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The process of changing the form of a traction-rail, which consists in heating the rail to a suitable temperature and reshaping a head thereof into a flange by subjecting the metal thereof simultaneously to transverse and to longitudinal compression, substantially as described.

2. The process of re-forming a double-headed traction-rail into a single-headed traction-rail, which consists in heating the rail to a suitable temperature, subjecting the metal in a head thereof simultaneously to transverse and longitudinal compression to form a groove in its horizontal surface and then effecting a further redistribution of the metal by such combined transverse and longitudinal compression to transform the head into a flange, substantially as described.

3. The process of re-forming a double-headed traction-rail, which consists in heating the rail to a suitable temperature, then subjecting the metal in a head thereof simultaneously to transverse and to longitudinal compression to form a groove in its horizontal surface, thereafter widening said groove by such combined transverse and longitudinal compression, and thereafter flattening the groove to transform the rail into a single-headed flanged traction-rail, substantially as described.

4. The process of changing the form of a traction-rail, which consists in heating the rail to a suitable temperature and reshaping a head thereof into a flange by subjecting successive short sections of the material in the head thereof to simultaneous longitudinal and transverse compression, substantially as described.

5. The process of re-forming a double-headed traction-rail into a single-headed traction-rail, which consists in heating the rail to a suitable temperature subjecting successive short sections of the material in the head thereof to simultaneous longitudinal and transverse compression to form a groove in its horizontal surface and then effecting a further redistribution of the metal in the head by such combined transverse and longitudinal compression to transform the head into a flange, substantially as described.

6. The process of changing the form of a traction-rail, which consists in heating the rail to a suitable temperature and reshaping a head thereof into a flange by feeding the rail between driven gripping-rolls and subjecting the top of the head to the action of reshaping-rolls having a greater peripheral speed than the gripping-rolls, whereby successive short sections of the rail-head are simultaneously subjected to longitudinal and transverse compression, substantially as described.

7. The process of changing the form of a traction-rail, which consists in heating the rail to a suitable temperature and reshaping a head thereof into a flange by feeding the rail between gripping-rolls and applying compression to the head of the rail at a point in advance

of the gripping-rolls, the successive sections of the rail-head being thus simultaneously subjected to longitudinal compression between said rolls and the point of application of said compression and to transverse compression between said gripping-rolls between which the rail passes, substantially as described.

8. The process of changing the head of a traction-rail into a flange, which consists in heating the rail to a suitable temperature, then feeding the rail between gripping-rolls and applying compression to the head of the rail at a point in advance of the gripping-rolls to subject successive small sections of the rail-head to compression between said rolls and point of application of the compression as the rail passes through said rolls, substantially as described.

In witness whereof I hereunto subscribe my name this 5th day of April, A. D. 1902.

DAVID H. LENTZ.

Witnesses:

GEORGE L. CRAGG,

HARVEY L. HANSON.