

No. 611,603.

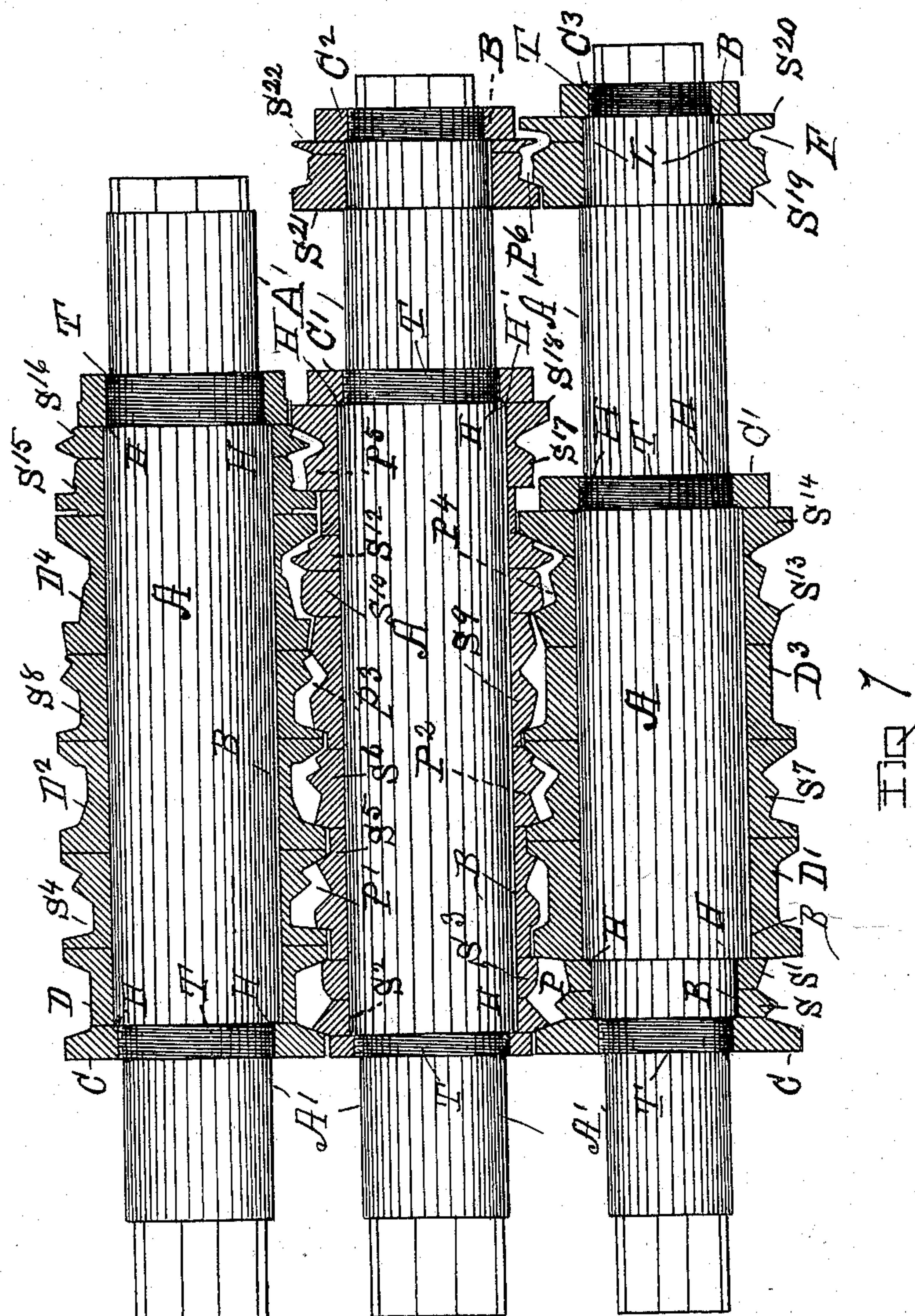
Patented Oct. 4, 1898.

W. J. BRADLEY.  
METAL ROLLING MACHINERY.

(Application filed Jan. 28, 1898.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES

William A. Sweet

Charles S. Brintnall

INVENTOR

William J. Bradley  
by W. E. Hagan atty

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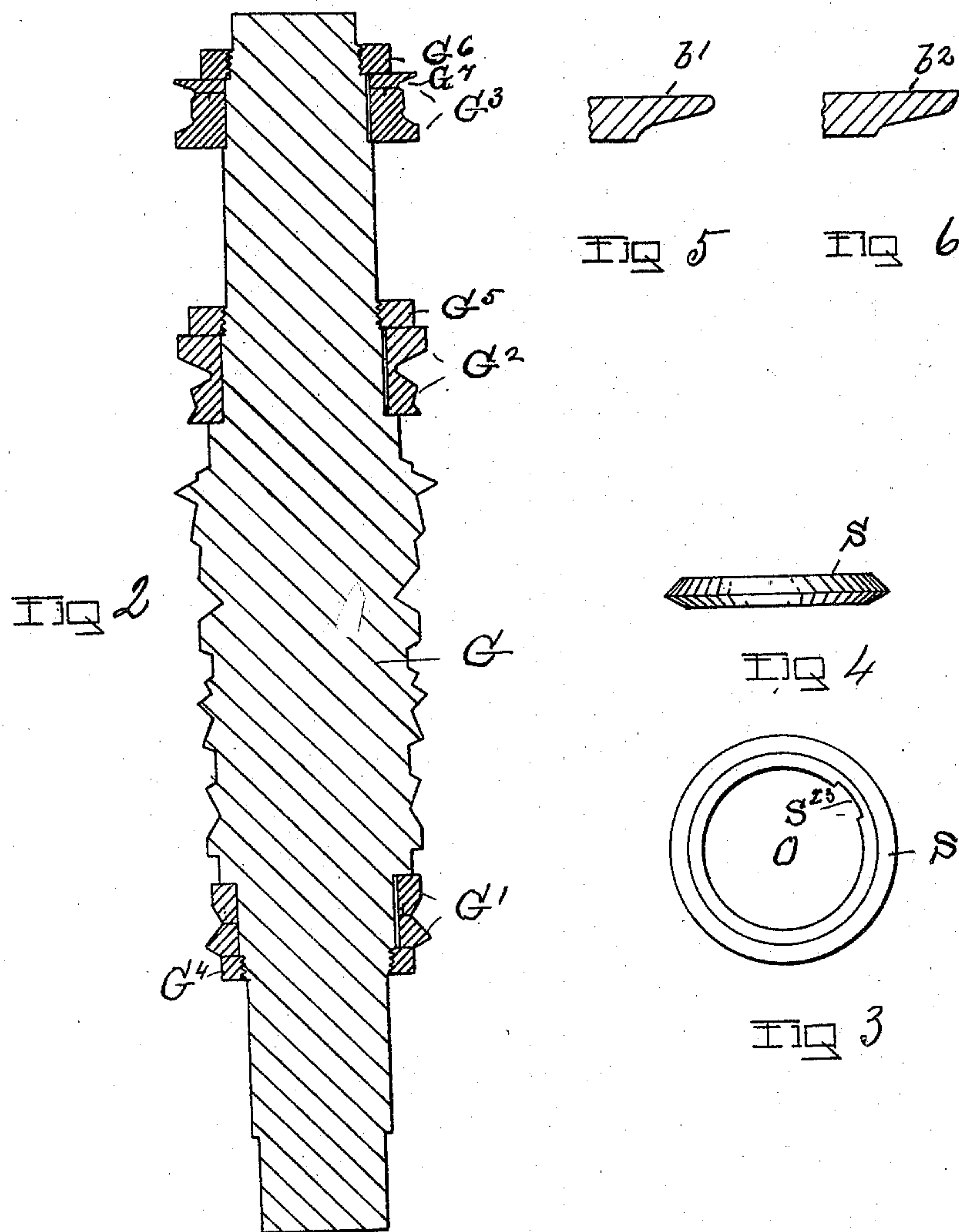
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# UNITED STATES PATENT OFFICE.

WILLIAM J. BRADLEY, OF TROY, NEW YORK, ASSIGNOR TO THE CONTINUOUS RAIL-JOINT COMPANY OF AMERICA, OF NEWARK, NEW JERSEY.

## METAL-ROLLING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 611,603, dated October 4, 1898.

Application filed January 28, 1898. Serial No. 668,246. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM J. BRADLEY, of the city of Troy, county of Rensselaer, State of New York, have invented new and useful Improvements in Metal-Rolling Machinery, of which the following is a specification.

My invention relates to metal-rolling machinery for shaping the bars of metal from which, when cut in cross-section, plates are produced for connecting railroad-rails, such as are shown and described in Letters Patent No. 427,017, with my improvements more particularly relating to the mechanism shown and described in Letters Patent No. 481,697, for rolling the bars from which such connecting-plates are cut, it being the object of my improvement to make the initiatory and finishing passes by which the V-form entrant-groove made longitudinally in the bar being rolled may be varied in measurement and form to adapt this entrant-groove formed in the bar when cut into sections to receive any one of the varied form of rail-base flanges in use and to adapt the roll parts forming the initiatory and finishing passes to be repaired when worn. By making the roll parts which form the initiatory and finishing passes detachable the parts forming the initiatory pass may be given an area which will regulate the amount of metal per lineal foot to be contained in the finished bar, and by changing the tonguing part of the roll forming the finishing pass the form given to the entrant-groove of the bar being rolled will receive the base of the rail of which the tonguing part of the roll is the counterpart in cross-section.

Accompanying this specification to form a part of it there are two plates of drawings containing six figures illustrating the application of my improvements, with the same designation of parts by letter reference used in all of them.

Of the illustrations, Figure 1 is a view in side elevation of a train of rolls detached from their housings, and showing the grooved sleeve parts and the tonguing sleeve parts of the rolls forming the several passes in central vertical section. Fig. 2 is a central vertical section taken longitudinally through one of the cores or shafts of a train of rolls, shown

as detached from its housings, with the roll parts forming the initiatory and finishing passes shown as made detachable, with the roll parts between the initiatory and finishing passes formed integrally with the core or shaft. Fig. 3 is an end view of the tonguing detachable roll part of the initiatory pass. Fig. 4 is an edge view of the tonguing roll part shown at Fig. 3. Figs. 5 and 6 are sections of differing forms of tonguing roll parts of the finishing pass, with only the tonguing parts of the roll parts shown.

The several parts of the mechanism thus illustrated are designated by letters of reference, and the functions of the parts are described as follows:

The letters A designate the shafts or cores of the train, each of which is provided with journals A', arranged to be rotated in bearings in housings, which, being of the usual well-known form, are not shown.

The letters P, P', P<sup>2</sup>, P<sup>3</sup>, P<sup>4</sup>, P<sup>5</sup>, and P<sup>6</sup> designate the successive passes of the train. The initial pass P is formed by sleeve parts upon the middle and lower shafts, the sleeve on the bottom shaft of the train being composed of the two sleeve-sections S and S' and on the middle shaft of the two sleeve-sections S<sup>2</sup> and S<sup>3</sup>, with the outer side of this pass inclosed in part by the nut or collar C. The pass P' is formed by the sleeve part S<sup>4</sup> on the upper roll-shaft and the sleeve part S<sup>5</sup> on the middle roll-shaft. The pass P<sup>2</sup> is produced by the sleeve parts S<sup>6</sup> and S<sup>7</sup>, the pass P<sup>3</sup> by the sleeve parts S<sup>8</sup> and S<sup>9</sup>, the pass P<sup>4</sup> by the sleeve-sections S<sup>10</sup> and S<sup>12</sup> on the middle roll-shaft, and the sleeve-sections S<sup>13</sup> and S<sup>14</sup> on the lower roll-shaft, the pass P<sup>5</sup> by the sleeve-sections S<sup>15</sup> and S<sup>16</sup> on the upper roll-shaft, and the sleeve-sections S<sup>17</sup> and S<sup>18</sup> on the middle roll-shaft, and the pass P<sup>6</sup> by the sleeve-sections S<sup>19</sup> and S<sup>20</sup> on the lower roll-shaft, and the sleeve-sections S<sup>21</sup> and S<sup>22</sup> on the middle roll-shaft of the train.

The shaft or core A is in each instance provided with shoulders H, against which the roll parts forming the initial and finishing passes abut when attached, and the letters B designate a spline or feather longitudinally formed on each of the shafts or cores A, and the letters S<sup>23</sup> designate a slot produced on



the interior surface O of the sleeve parts, by which when the sleeve parts are entered upon the shafts A, with the spline B entered within the groove S<sup>23</sup>, the sleeve parts are prevented from turning on the roll-shafts or core.

Each of the roll-shafts or cores A is at each of its ends at T threaded to receive a retaining nut or collar C, C<sup>2</sup>, and C<sup>3</sup>, by which when screwed onto the threaded part of the roll-shaft or core the detachable sleeve parts forming the initial and finishing passes are securely held in place where abutting against the shoulders H, with the other sleeve-sections arranged on the shafts or cores A between the initial and finishing passes when these intermediate passes are formed by sleeve parts instead of being made integrally with the roll-shafts A.

The initial and finishing passes of a train of rolls wear more rapidly than the intermediate passes, and where the initial and finishing passes are constructed to roll a bar having an entrant-groove which is longitudinally formed therein the tonguing part of the roll employed to form a part of the pass to produce this entrant-groove will wear away more rapidly than any other roll parts of the pass from the fact that there is a frictional contact with both sides of the tonguing roll part which tends to reduce it in width by wear, and this so occurring has the effect to reduce the width of the groove which the tonguing roll part forms in the bar, while the wear upon the other parts of the pass tends to enlarge its cross-area. Where accuracy is desired in the cross dimensions of the entrant-groove formed in the bar being rolled and shaped by the finishing pass to adapt its cross-sections to answer the purposes for which they are designed, these attendant difficulties become very important. As the tonguing roll part of the finishing pass must from necessity have more entrant projection than the tonguing roll part of the initial pass, it wears away more rapidly than the same part of the initial pass. When new rolls are required to meet this condition, they are very expensive and greatly increase the cost of the product.

As the rails of most of the railroads have the same general shape as regards their tread and waist, yet they have varying forms of base-flange, of which one is shown at b', Fig. 5, and another at b<sup>2</sup>, Fig. 6, and require fish-plates having a corresponding form of V-form recess to fit the rail-base for which they are to be applied. By having a tonguing roll part adapted to templet with each of these differing forms of rail-bases and with the tonguing roll part adapted to detachably connect with the finishing pass the same train may be made adapted to produce the desired forms of entrant-groove without changing the other passes of the train, inasmuch as the wear of the latter merely increases the thickness of the metal outside of the V-form

groove, which until this increased thickness reaches considerable development is unimportant. In adapting this final pass P<sup>6</sup> to produce in finishing effect (by changing the tonguing roll part of the pass) such measure of angularity and shape as may be required the tonguing part of the roll to be used is made to have the same bevel or taper as the base of the rail to be fitted, with the tonguing roll part arranged to be passed on over the middle core or shaft A of the train to occupy the position shown at S<sup>23</sup> of Fig. 1 and G<sup>7</sup> of Fig. 2, with the tonguing roll part arranged on the shaft or core, with the spline B within the groove S<sup>23</sup> in the tonguing roll part, with the latter abutting against the grooved roll part S<sup>21</sup> of the same pass, and with the last-named roll part abutting against the shoulder H of the shaft or core and with the nut or collar C<sup>2</sup> screwed up on the shaft or core and with it in contact with the outer surface of the tonguing roll part of the pass to keep it in place.

All the passes of the train illustrated are provided with a tonguing roll part in differing measure of entrant projection and by which, as the bar is being rolled by the several passes, it is shaped in lateral distribution of metal at each side of the entrant-groove for the operation of the finishing pass, where the entrant-groove formed longitudinally in the bar must have a fixed measurement in cross-section to adapt it to the form of rail-base to which it is to be applied.

As the passes located intermediately of the initial and finishing passes serve only to give the rolled metal approximate form, there is less strain and wear at those points, and, if desired, the intermediate passes may be formed on the solid core or shaft, as shown at G in Fig. 2, with the initial and finishing passes formed detachably of sleeved parts, as shown at G', G<sup>2</sup>, and G<sup>3</sup>, and secured upon the core or shaft by nuts G<sup>4</sup>, G<sup>5</sup>, and G<sup>6</sup>.

When a pass-sleeve roll part contains in revolution in its circumferential face an entrant-groove, as shown at F of Fig. 1, the wear upon the sleeve tends to widen out the groove, and by dividing the sleeve part on the line L of Fig. 1 when the pass-surfaces are worn away enough to widen out the cross-area of the groove which they inclose, by removing the sleeve parts of the roll and planing down what are their contact-surfaces when in position on the roll-shaft or core the required cross-measurement may be restored to the pass and the expense of a new set of rolls avoided.

As the initial pass regulates by its form and area the amount of metal per lineal foot contained in the bar to be shaped by it and the intermediate passes and finally and accurately completed by the finishing pass, the latter and the initial pass are in a measure differently constructed as to form to do their functional part of the work, and while these passes operate connectedly they each really perform functions which would be the same



whether they were operated together or separately.

I am aware that it is not new to provide an ordinary train with rolls having passes formed therein by detachable sleeves, and I make no claim thereto, broadly considered; but with the construction herein described, wherein each pass is provided with a tongue and groove intermediate of the side walls of the pass, whereby the metal is divided according to a measured ratio which is maintained throughout the rolling of the bar, the detachable pass-sleeve rollers of the initial and finishing passes perform new functions by which I am enabled to use the intermediate passes for rolling different forms and weight of bars from which to cut sections forming rail-connecting plates adapted to various forms of rail-bases and which has not been before accomplished.

While I have shown the detachable roll-pass parts of the initial and finishing passes as secured upon the train roll-shafts or cores by nuts or collars threaded thereon, any well-known means other than that shown may be used to perform the same office.

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

1. In a rolling-mill train, and in combination a plurality of rolls provided with initial, intermediate, and finishing passes each pass having a tongue and groove intermediately of its side walls for partly dividing a bar of metal longitudinally and maintaining approximately the same given ratio of metal in the opposite sides of the bar throughout the rolling operation, with the finishing pass constructed with its tonguing member detachably secured upon the roll-shaft which operates it substantially as and for the purposes set forth.

2. In a rolling-mill train and in combination, a plurality of rolls provided with initial, intermediate and finishing passes each pass having a tongue and groove intermediately of its side walls, for partly dividing a bar of metal longitudinally, and maintaining approximately the same given ratio between the masses of metal in the opposite sides of the bar, throughout the rolling operation, with the

initial pass being formed of sleeve parts, detachably secured to the roll-shafts or cores which operate them, substantially as and for the purposes set forth.

3. In a rolling-mill train and in combination, a plurality of rolls provided with initial, intermediate and finishing passes, each pass having a tongue and groove intermediately of its side walls for partly dividing a bar of metal longitudinally, and maintaining approximately the same given ratio between the masses of metal in the opposite sides of the bar, throughout the rolling operation, and having the initial and finishing passes formed in sleeves detachably secured upon the roll-shafts by which operated, substantially as and for the purposes set forth.

4. The combination with a train of rolls having passes for rolling a bar provided with a longitudinally-arranged entrant-groove, and having approximately in cross-section the form herein described; of an initial pass having a tonguing part arranged between two separately-formed side walls, with each of the sleeve parts forming the latter and the tonguing part connected detachably to the roll-shaft which operates them substantially as, and for the purposes set forth.

5. The combination with a train of rolls provided with passes by which a bar with a longitudinally-arranged entrant-groove may be rolled to have the form approximately in cross-section herein described; of a finishing pass made with a grooving part divided centrally and circumferentially to the groove in two sleeve-form parts; and a tonguing roll part and a sleeve-form part on the cooperating roll; with the sleeve parts and tonguing parts of the pass detachably connected to the shafts or cores by which they are operated substantially in the manner as and for the purposes herein set forth.

Signed at the city of Troy, New York, this 26th day of January, 1898, and in the presence of the two witnesses whose names are hereto written.

WILLIAM J. BRADLEY.

Witnesses:

GEO. M. PAYFER,  
W. E. HAGAN.