

947,554.

I. L. HUGHES.  
METHOD OF ROLLING METAL BARS.  
APPLICATION FILED AUG. 20, 1909.

Patented Jan. 25, 1910.  
3 SHEETS—SHEET 1.

Fig. 2.

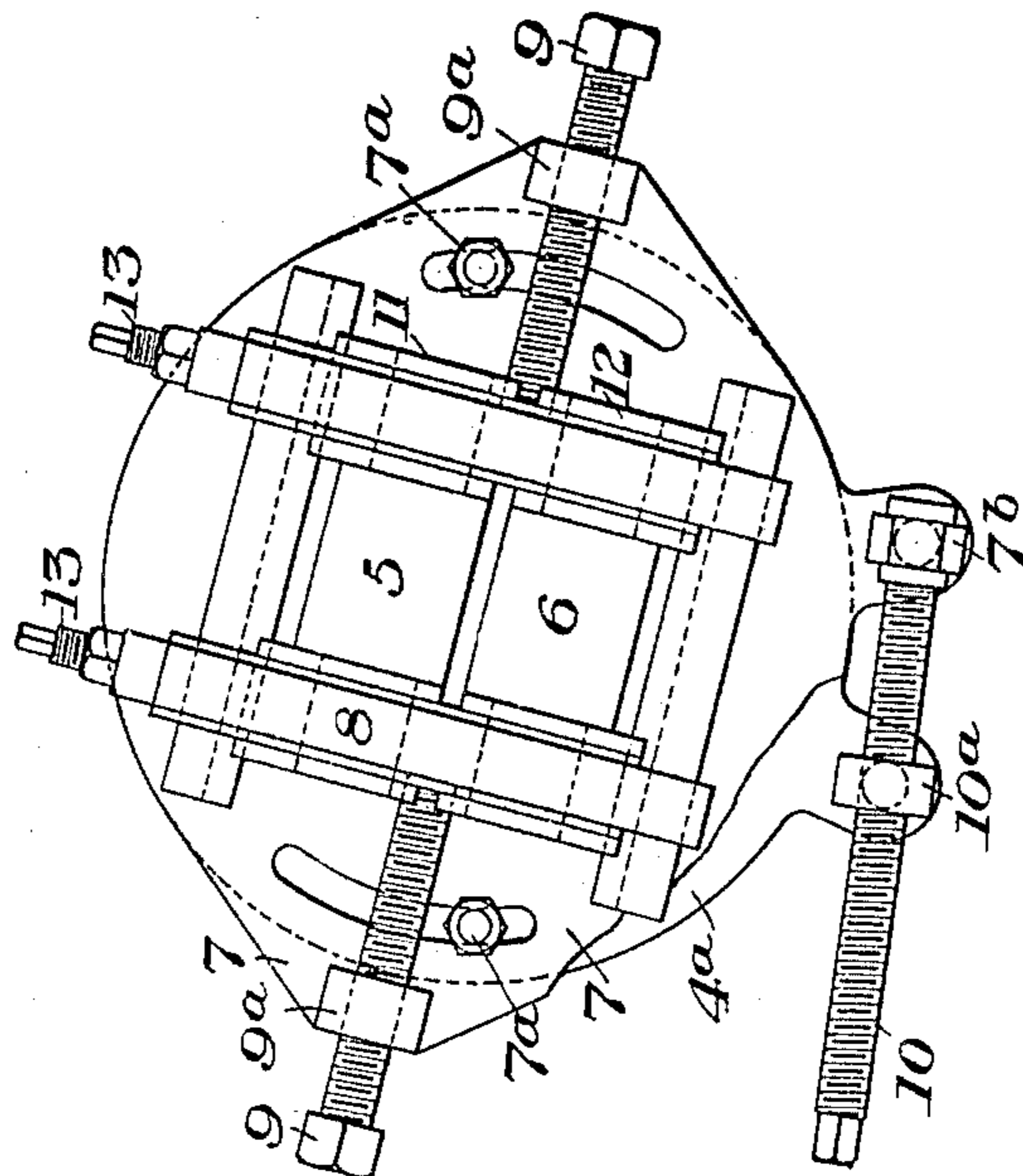
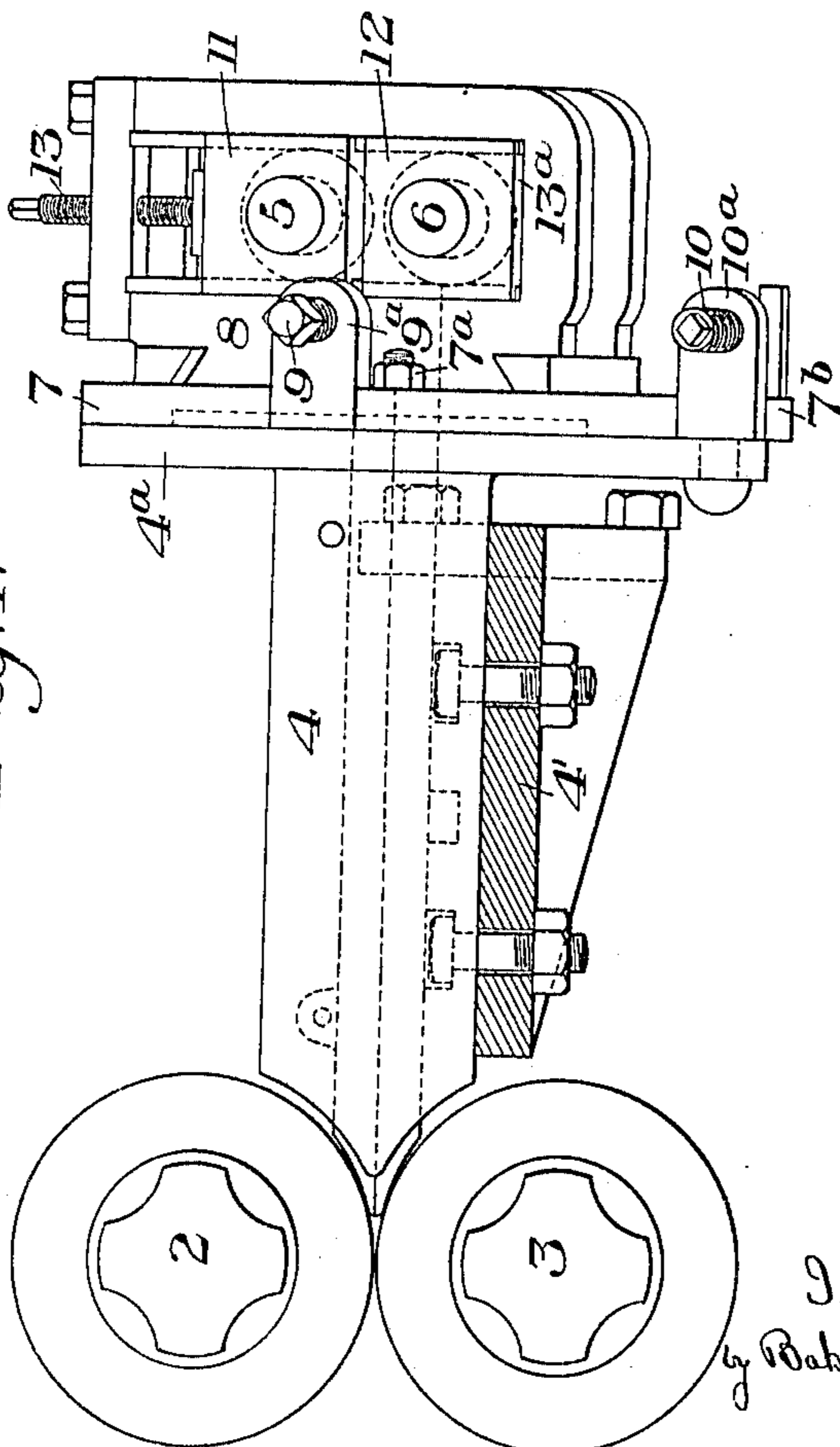


Fig. 1.



WITNESSES

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Walter Farnsworth.

INVENTOR

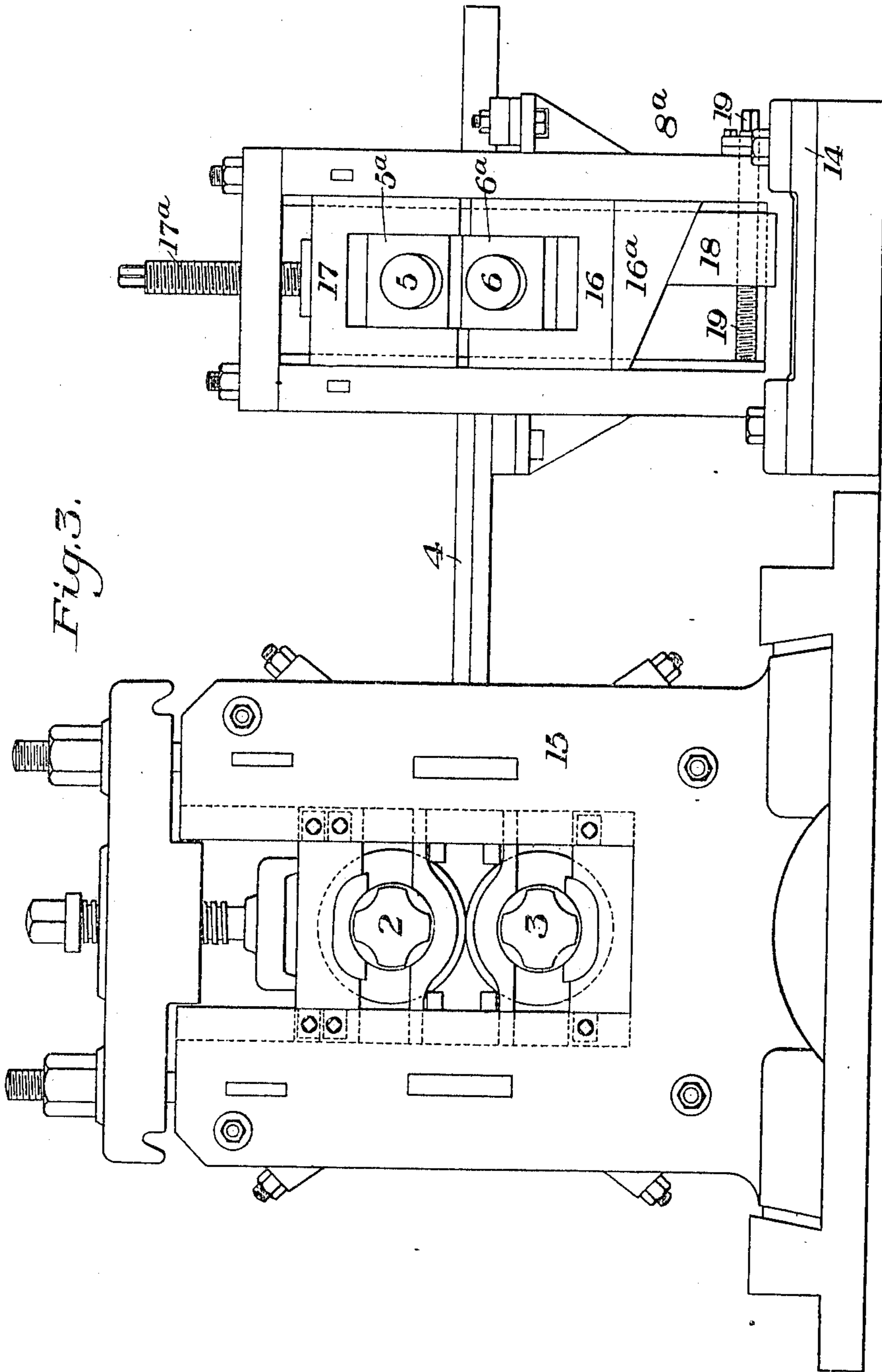
I. L. Hughes,  
by Baker, Payson & Barnes,  
his Attys.

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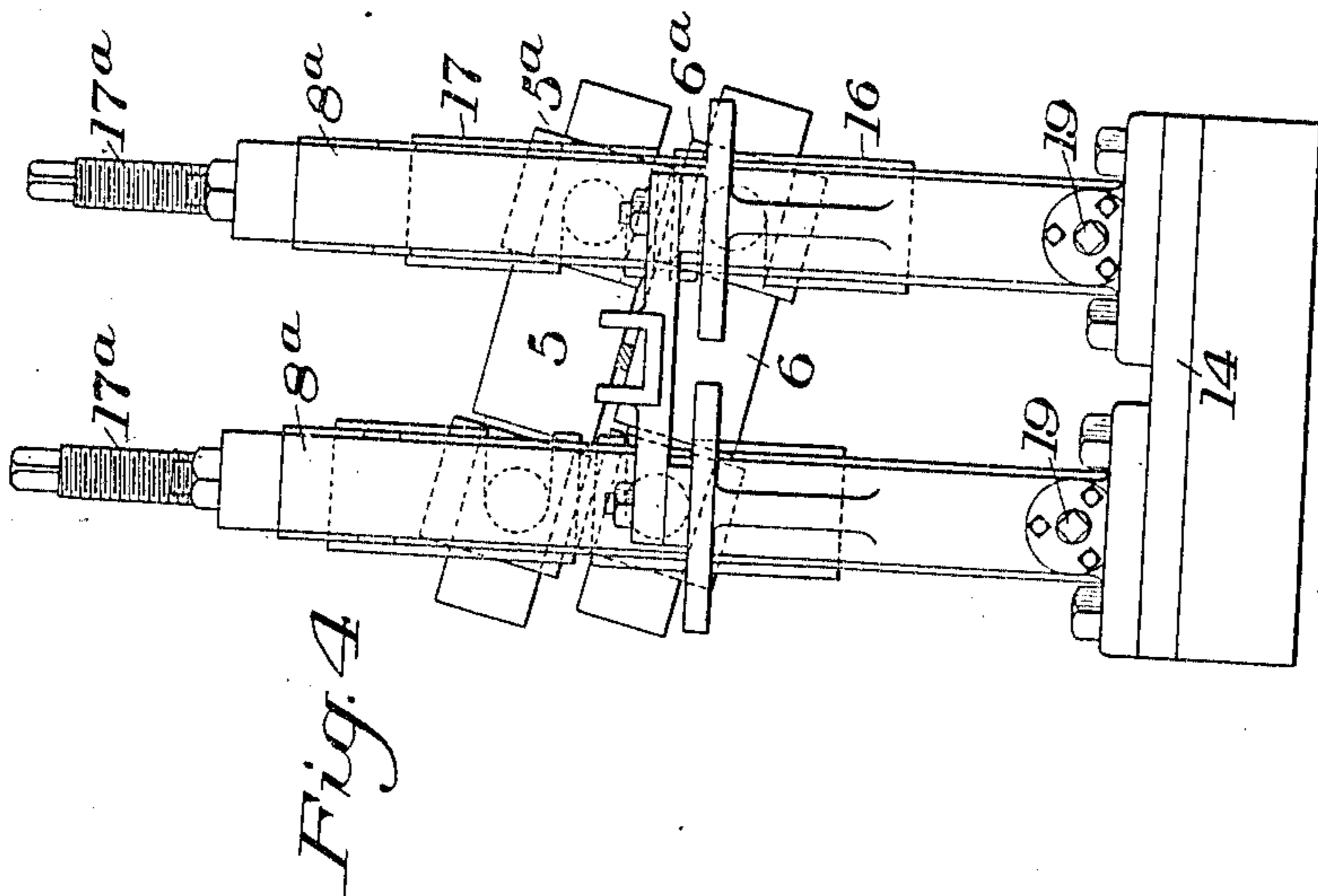
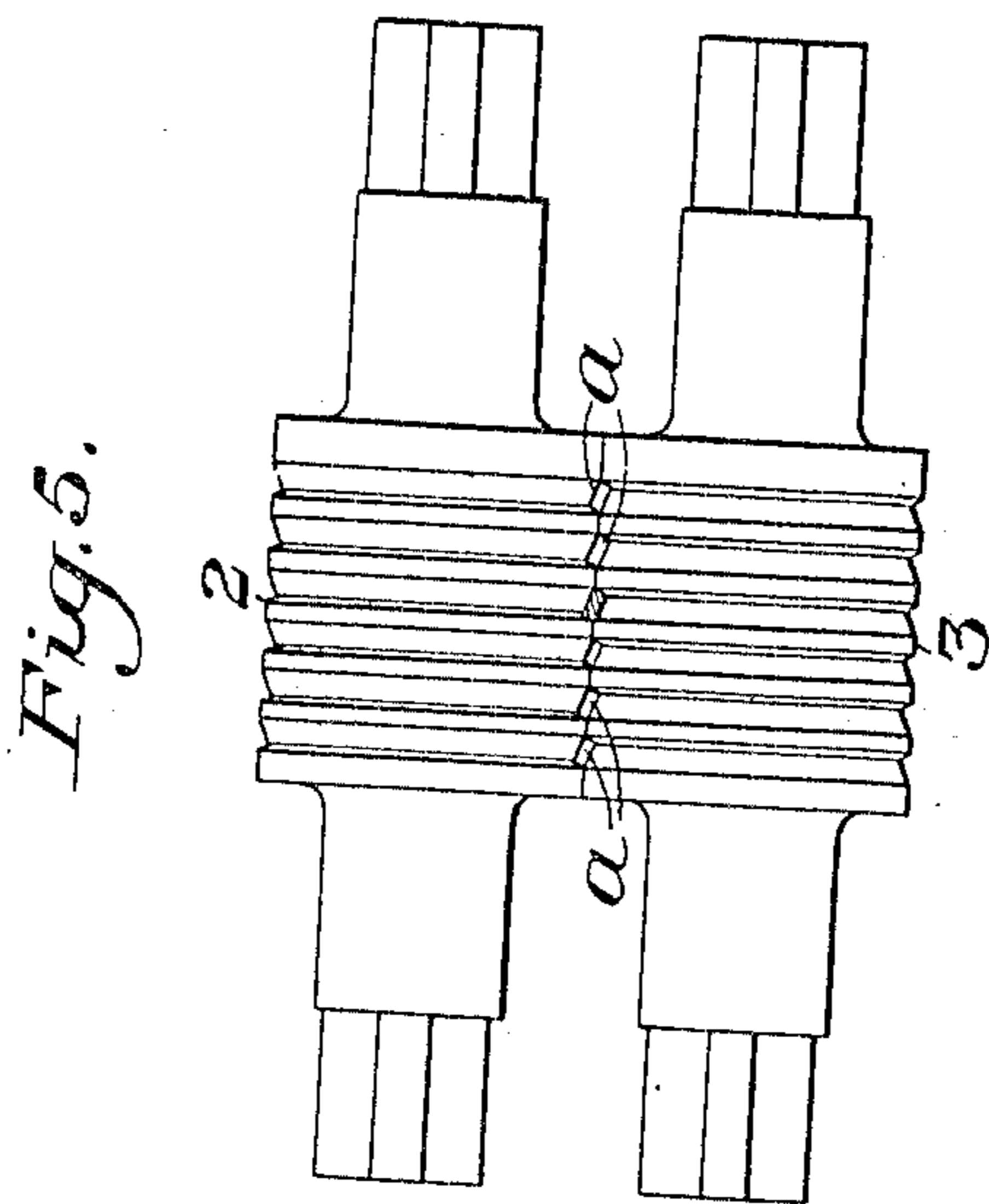
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3 SHEETS—SHEET 3.



WITNESSES

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# UNITED STATES PATENT OFFICE.

ISAAC LAMONT HUGHES, OF YOUNGSTOWN, OHIO.

## METHOD OF ROLLING METAL BARS.

947,554.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Original application filed December 7, 1908, Serial No. 466,247. Divided and this application filed August 20, 1909. Serial No. 513,763.

*To all whom it may concern:*

Be it known that I, ISAAC LAMONT HUGHES, of Youngstown, Mahoning county, Ohio, have invented a new and useful  
5 Method of Rolling Metal Bars, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—  
10 Figure 1 is a side elevation showing the preferred form of apparatus as applied to the finishing rolls of a rolling mill in carrying out my invention and Fig. 2 is an end elevation of the same; Fig. 3 is a side elevation showing a modified form of apparatus  
15 applied to the finishing rolls of a rolling mill; Fig. 4 is an elevation of the stand of ironing rolls shown in Fig. 3, used in carrying out my invention; and Fig. 5 is a front  
20 elevation of a finishing stand of rolls showing the manner in which the center line of the several finishing passes therein are arranged on an angle to the axes of the rolls in carrying out my improved method.  
25 This application, which is a division of my application Serial No. 466,247, filed Dec. 7, 1908, has relation to a novel method of rolling metal bars having a rectangular cross section and it particularly relates to a method  
30 of manufacturing bars known to the trade as nut bars. Heretofore in rolling such materials the center line of the finishing pass has usually been in a horizontal plane which is parallel with the horizontal axes of the  
35 rolls forming the finishing rolls. When the passes are formed in this manner, it is extremely difficult to get the desired sharp edges on the corners of the bars, while in cases where the center line of the finishing  
40 pass has been at an angle to the axes of the finishing rolls, the bars on emerging from the finishing pass will twist, in some cases to such an extent that the length to which the bar can be rolled must be materially  
45 lessened in order to prevent the bar twisting throughout an entire revolution during its passage through the finishing pass. Such bars, to be marketable, must be exactly straight and without any twist or wind, and  
50 where the bars are finished in a pass whose center line is at an angle to the axes of the rolls, it becomes necessary to straighten the bars while still hot after being finished in

the rolling mill in order to finish them in proper condition for the market. This  
55 straightening operation has been performed by hand, before the bars have become cooled, after the completion of the rolling operation and, being a slow operation, decreases the output of such mills and also adds greatly  
60 to the expense of finishing the bars.

The object of the invention is to provide an improved method of rolling, whereby bars of rectangular cross section are rolled  
65 with clean, sharp corners or edges and a method by which bars are finished straight and flat without having any twist in their length, that is, a center line through any transverse section in a bar will coincide with a similar center line through any other like  
70 cross section in the length of the bar.

In the drawings, in which apparatus adapted for carrying out my improved method is shown, 2 and 3 represent the top  
75 and bottom rolls of a two-high stand of finishing rolls, having a series of finishing passes *a* provided therein which are inclined at an angle to the axes of the rolls, as shown in Fig. 5 and which are duplicate passes, although the several passes may be for different  
80 sizes of bars or a single pass may be provided when desired. As the bar issues from the finishing rolls, it is delivered by the guide 4 into the pass formed between the ironing rolls 5 and 6, these rolls having  
85 plane surfaces acting upon two opposite sides of the bars and being set at a distance apart equal to the thickness of the bar coming from the finishing rolls. The center line of the pass formed by and between the ironing  
90 rolls 5 and 6 is exactly parallel with that of the pass or passes in the finishing stand of rolls and, as the angle of the passes in the finishing rolls 2 and 3, will vary with different  
95 sizes of bars, suitable means are provided to permit of the ironing rolls being adjusted toward and away from each other to suit the different thicknesses of bars rolled and to be adjusted to the different angles in  
100 which these rolls must be placed.

As shown in Figs. 1 and 2, the guide 4 is mounted on a rest bar 4' which is rigidly  
secured in place with relation to the roll housings in which the rolls 2 and 3 are  
105 mounted. The guide 4 is provided on its outer end with a flange 4<sup>a</sup> on which the slide

plate 7 is rotatably secured by the bolts or studs 7<sup>a</sup>. The outer face of the slide plate 7 is provided with a recessed dovetailed groove in which the housings 8 for the ironing rolls 5 and 6 are mounted so as to be laterally movable, the housings being adjusted side-wise and held in their adjusted position by the adjusting screws 9 which are mounted in the screw threaded lugs or bosses 9<sup>a</sup> on the side plate 7. The slide plate 7 is rotated to vary the angle of the axes of the rolls 5 and 6 and is held in its adjusted position by means of the adjusting screw 10 which is mounted on the adjusting screw nut 10<sup>a</sup> on the flange 4<sup>a</sup> and is secured to the boss 7<sup>b</sup> on the slide plate 7. The rolls 5 and 6 are rotatably secured in roll bearings 11 and 12 and these bearings with their rolls are adjustable toward and away from each other, being held in their adjusted position by means of the housing screws 13 and liners 13<sup>a</sup>.

In the modification shown in Figs. 3 and 4 the housings 8<sup>a</sup> for the rolls 5 and 6 are mounted upon supporting shoes or bed plates 14 in proximity to the finishing rolls 2 and 3 which are shown mounted in the roll housings 15, the guide 4 in this case extending between the housing 15 and the housings 8<sup>a</sup> to lead the metal from the finishing pass of the finishing rolls 2 and 3 into the ironing pass formed between the ironing rolls 5 and 6. The rolls 5 and 6 must be adjusted so as to bring the angle of the sides of the pass formed between these rolls to exactly the same angle as the angle of the corresponding sides of the passes formed in the finishing rolls 2, 3. The manner of adjusting these rolls in the apparatus shown in Figs. 3 and 4 is slightly different from that shown in Figs. 1 and 2. In this case, the bearings 5<sup>a</sup>, and 6<sup>a</sup> for the rolls 5 and 6 are mounted in the carriers 16, 17, so as to rock in these carriers. The lower carriers 16 are adjusted vertically by means of the tapering wedge blocks 18 which contact with the tapering faces 16<sup>a</sup> of the bottom bearing carriers 16 which are mounted so as to be vertically movable in the windows of the housings 8<sup>a</sup>. The top carriers 17 are carried on the housing screws 17<sup>a</sup>, 17<sup>a</sup>, and are adjusted vertically by turning these screws. In adjusting the rolls 5 and 6 in the apparatus shown in Figs. 3 and 4, the wedge blocks 18 are moved sidewise in the windows of the housings 8<sup>a</sup> by means of the wedge adjusting screws 19—19, this operation raising or lowering the carriers 16 independently of each other. The housing screws 17<sup>a</sup> are then adjusted separately so as to bring the axis of the roll 5 exactly parallel with that of the roll 6, the roll 6 having first been brought to exactly the same angle relative to the axis of the finishing roll in front of the ironing rolls 5 as the center lines of the pass in the

finishing rolls, and care is taken to keep the rolls 5 and 6 separated the right distance apart to permit of the finished bar passing between them without causing any reduction to its thickness.

In carrying out the method of rolling bars by my improved apparatus, the bar is reduced in the roughing rolls in the usual manner. In the last two passes the bar is finished to the desired cross sectional area and shape, and by reason of the passes being arranged at an angle with the axes of the rolls, the corners of the bar are formed with sharp, clean edges, diagonally opposite corners being finished in the finishing pass after the other two diagonal corners have been finished in the preceding pass. When the bar emerges from the finishing stand of rolls, it is delivered between the ironing rolls 5 and 6, these rolls being set so as to form a pass having its center line coinciding with the center line of the finishing pass in the finishing rolls. By this means the speed at which the four corner portions of the bar is moving is equalized, twisting of the bar due to the unequal surface speeds of the contacting faces of the finishing pass is prevented, and any tendency to twist present in the bar as it leaves the finishing rolls is removed by the action of the ironing rolls and the bar is delivered from the rolls in a flat and straight condition and without any twist or wind whatever.

The ironing rolls are preferably placed as closely to the finishing rolls as is permissible, in order that the momentum of the bar in leaving the finishing rolls 2 and 3 will cause the bar to be carried through the ironing rolls 5 and 6 and avoid the necessity for positively driving the ironing rolls although the ironing rolls may be positively driven when desired.

The advantages of my invention will be appreciated by those skilled in the art. By the use of my improved method bars of rectangular cross section can be finished with much cleaner and sharper edges or corners than has heretofore been possible and the bars can be finished without any twist. The bars being finished without twisting, the necessity for hot straightening the bars is avoided and, as this has always been the cause of delay in the operation of the mill, the output of the mill is very largely increased, there being no delays at the finishing end of the mill. As there is no twisting of the finished bars, the mill can be operated at a faster speed and in this way bars can be finished hotter than heretofore which is an advantage in that it results in sharper corners being formed than has heretofore been possible and fins are prevented from forming, as is the case when the bars are finished at a lower temperature. By providing the ironing rolls the surface speed of the

corner portions of the bar is equalized and twisting of the bars is overcome and prevented.

5 Modifications in the construction and arrangement of the apparatus used in carrying out my improved method may be made without departing from my invention, and changes may be made in the parts relative to each other. In some cases with a high speed  
10 mill having an extra long hot bed, the ironing rolls may be used in connection with a stand of pinch rolls, in which case the bars will be finished and will then be caused to pass through the stand of pinch rolls and its ad-  
15 joining ironing rolls, in order to iron the bars and prevent or remove any twist present in the bars after being finished in the finishing pass of the rolling mill.

I claim:

20 1. The method of rolling bars, consisting in fixing the area and finishing the corners of the partly rolled blank in a finishing pass having its center line on an angle to the axes of the finishing rolls, and passing the  
25 blank issuing from the finishing rolls through an ironing pass in which the surface speed of the corners of the bar is equal-

ized and twisting of the bar is prevented; substantially as described.

2. The method of rolling bars, consisting  
30 in fixing the area and finishing the corners of a partly rolled blank in a finishing pass having its center line on an angle to the axes of the finishing rolls, and passing the blank issuing from the finishing rolls simul-  
35 taneously through an ironing pass and equalizing the surface speed of the corners of the bars therein; substantially as described.

3. The method of rolling bars, consisting  
40 in fixing the area and finishing the corners of a partly rolled blank in a finishing pass having its center line on an angle to the axes of the finishing rolls, and passing the blank issuing from the finishing rolls continuously  
45 through an ironing pass and equalizing the surface speed of the corners of the bars therein; substantially as described.

In testimony whereof, I have hereunto set my hand.

ISAAC LAMONT HUGHES.

Witnesses:

R. McLAUGHLIN,  
TOD A. CRUM.