No. 718,974.

PATENTED JAN. 27, 1903.

C. W. BRAY.

APPARATUS FOR ROLLING SHEET AND TIN PLATE.

APPLICATION FILED JAN. 20, 1902.

NO MODEL.

6 SHEETS—SHEET 1.

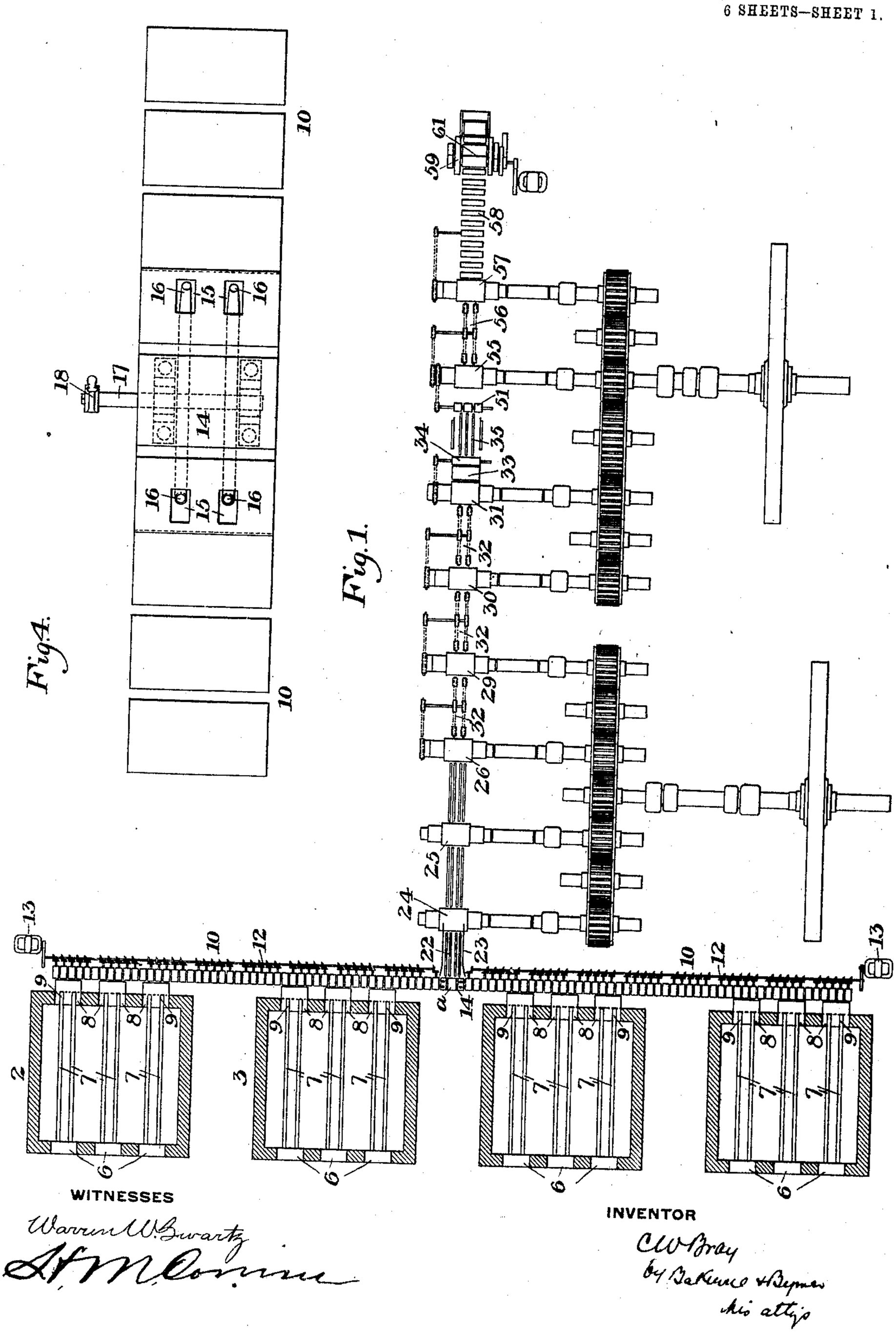

Fig. 1.

Fig. 4.

No. 718,974. PATENTED JAN. 27, 1903.

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NO MODEL. 6 SHEETS—SHEET 2

Fig. 2.

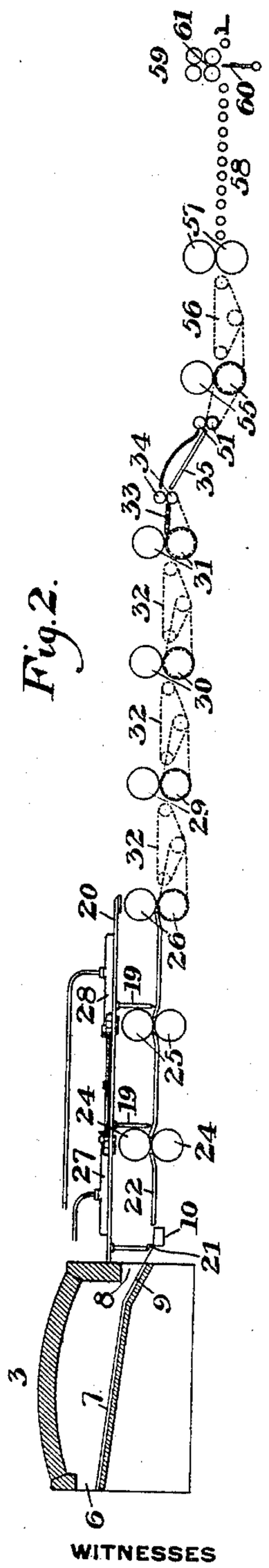


Fig. 3.

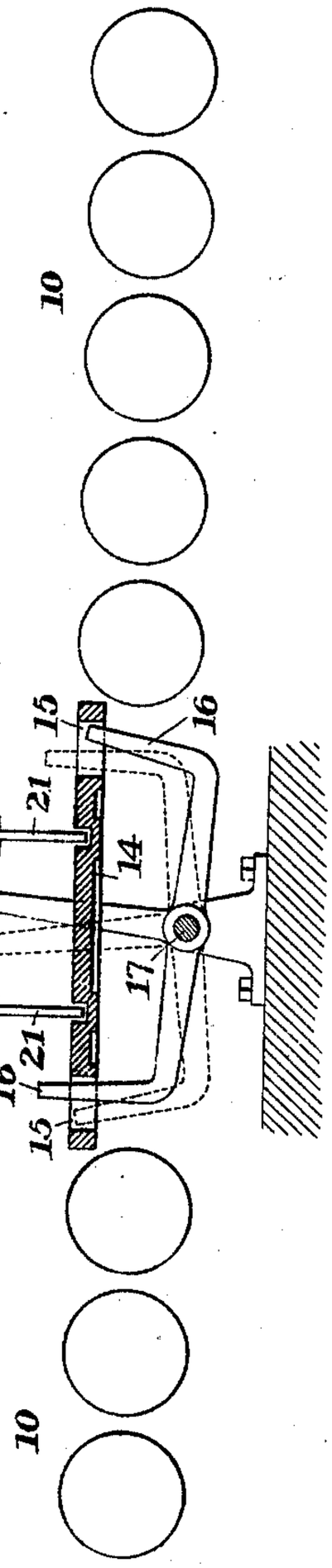
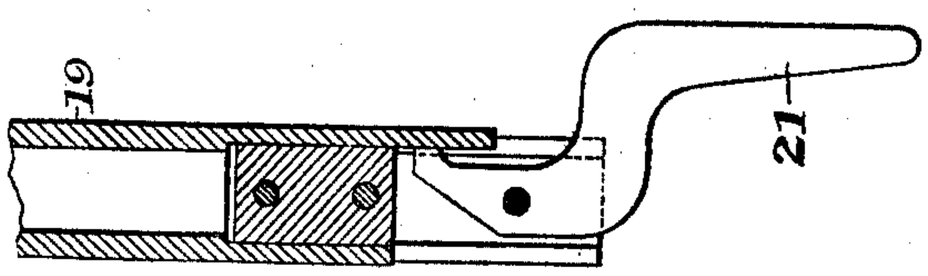


Fig. 5.



WITNESSES

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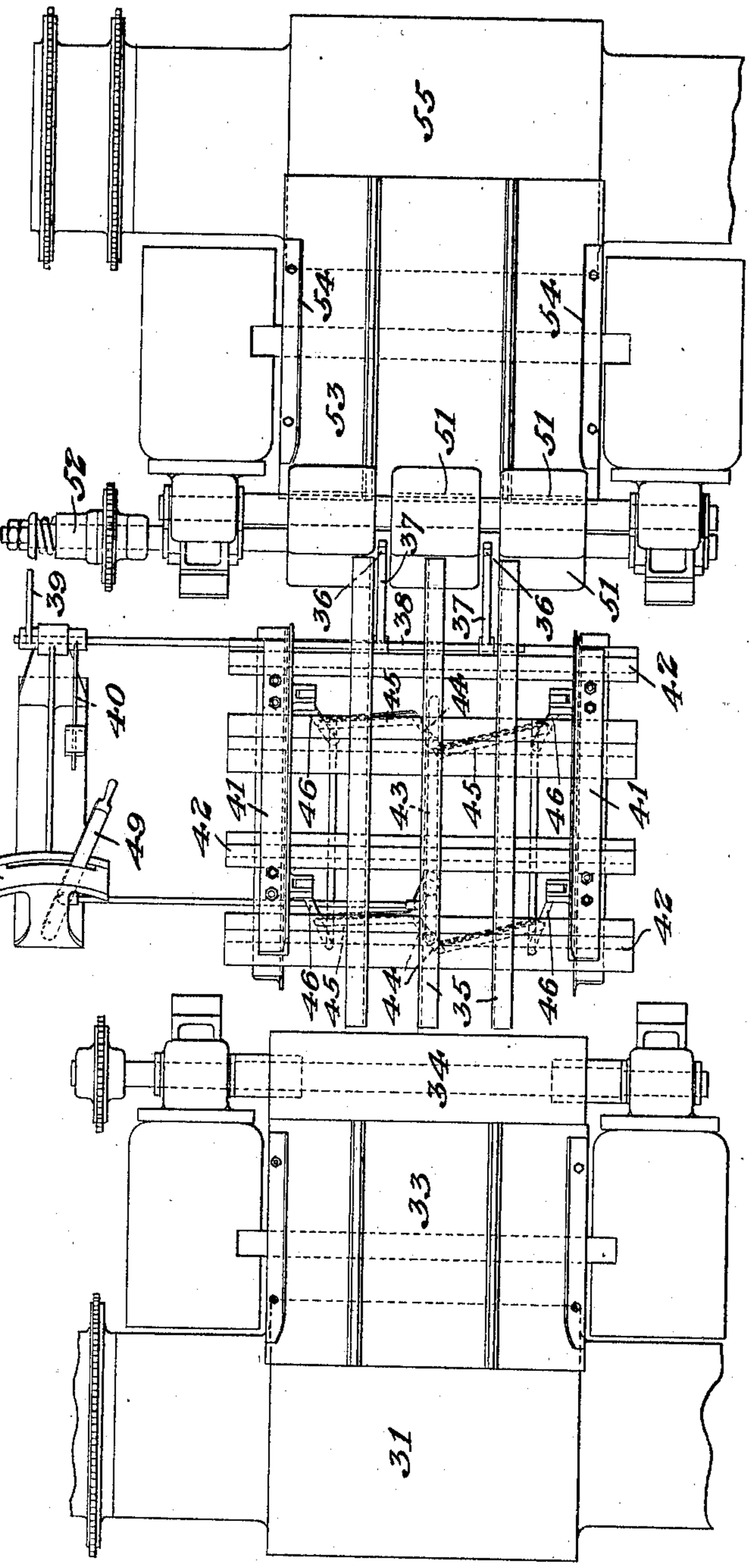
NO MODEL. 6 SHEETS—SHEET 3.

Fig. 6.



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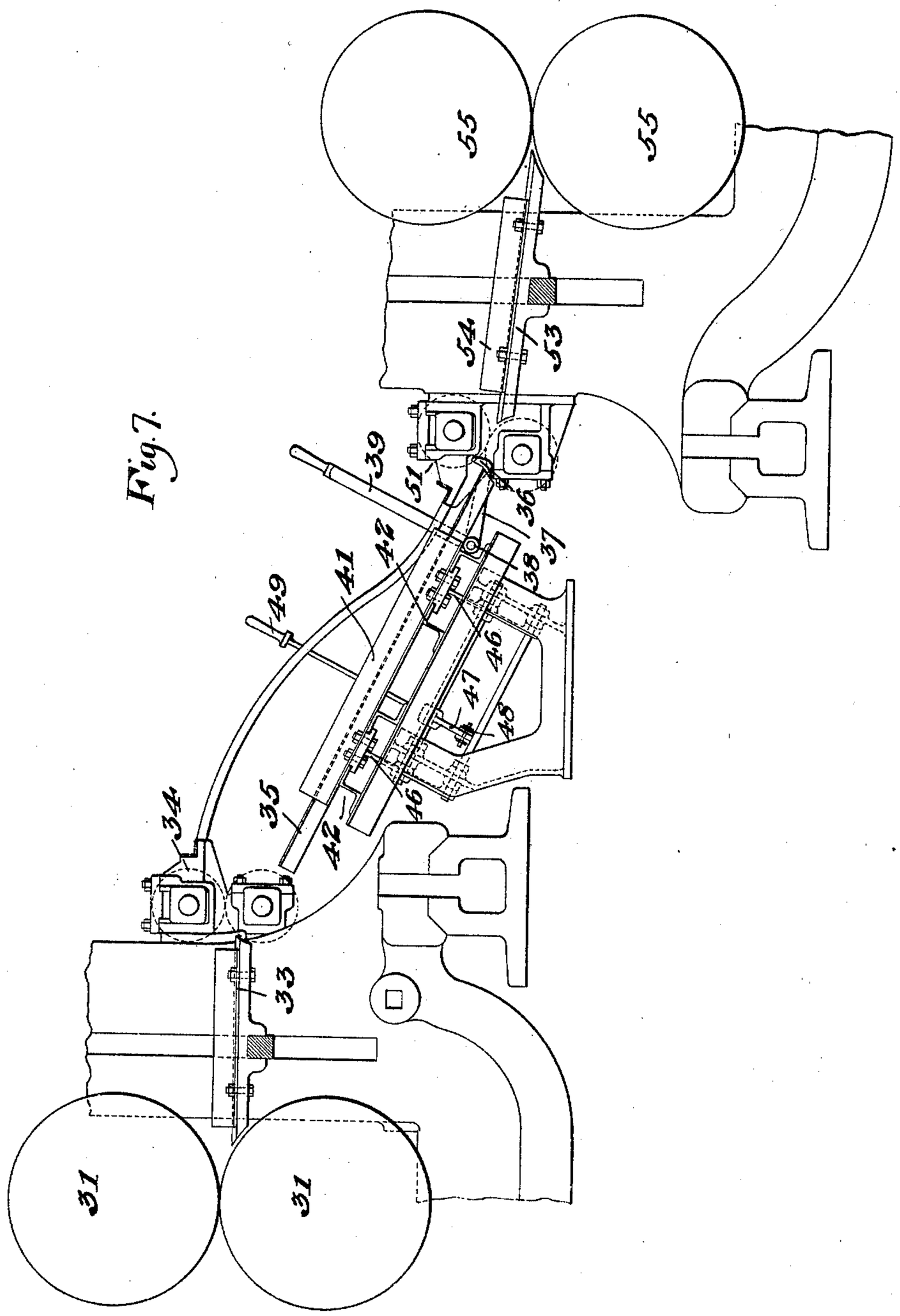
APPARATUS FOR ROLLING SHEET AND TIN PLATE.

APPLICATION FILED JAN. 20, 1902.

NO MODEL. 6 SHEETS—SHEET 4.

Fig. 7.



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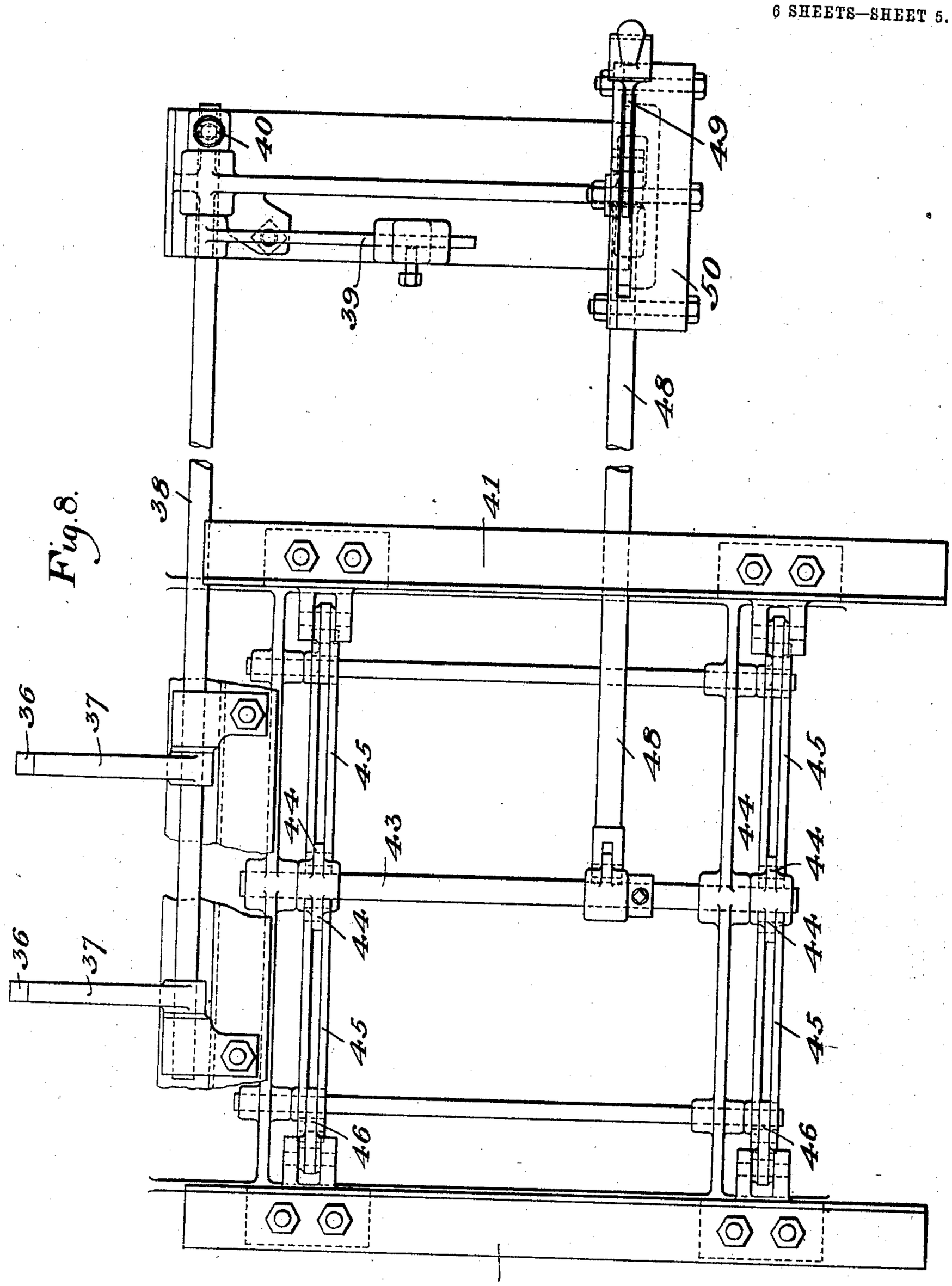
APPLICATION FILED JAN. 20, 1902.

NO MODEL.

6 SHEETS—SHEET 5.

Fig. 8.



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APPARATUS FOR ROLLING SHEET AND TIN PLATE.

APPLICATION FILED JAN. 20, 1902.

NO MODEL. 6 SHEETS—SHEET 6.

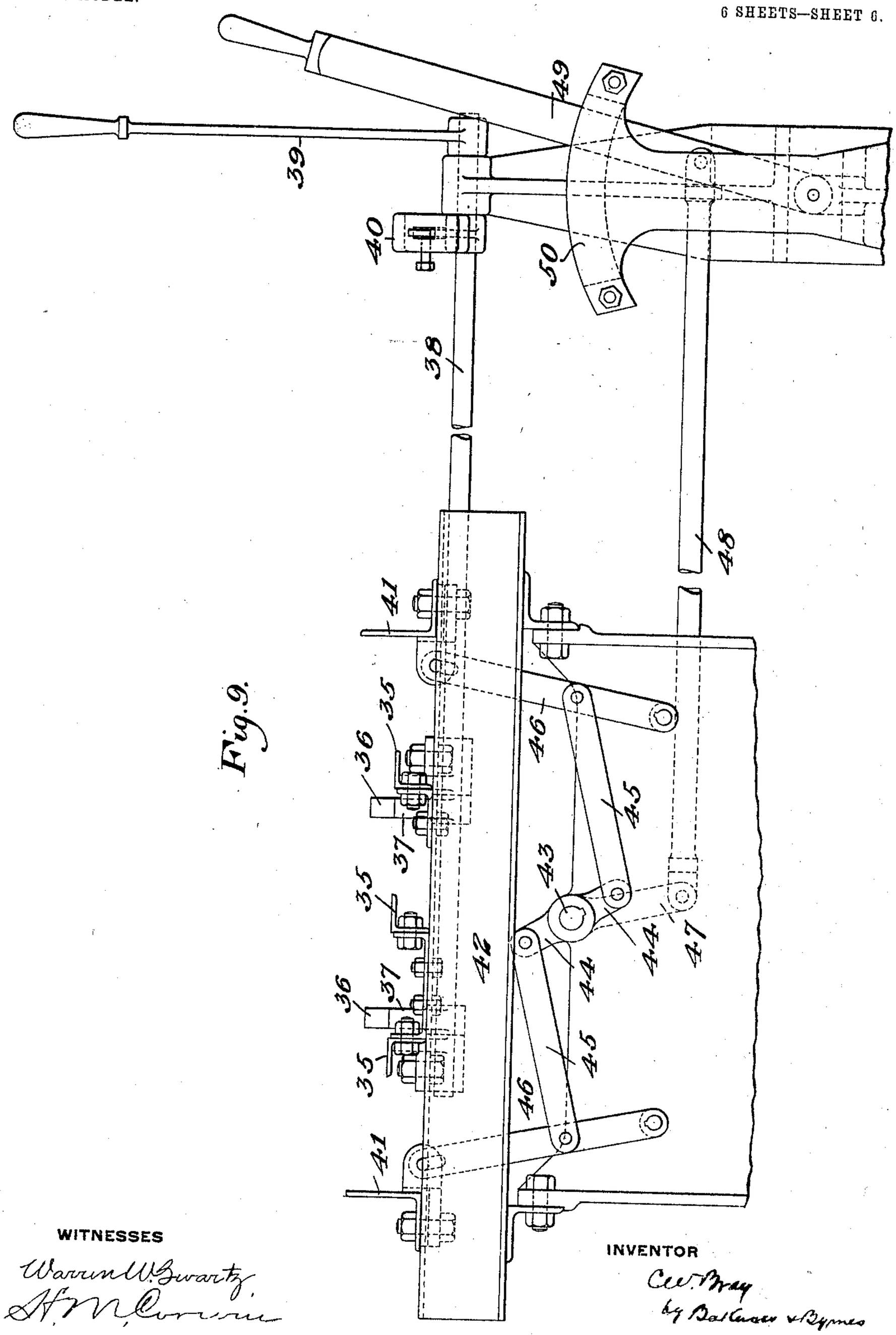

Fig. 9.

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UNITED STATES PATENT OFFICE.

CHARLES W. BRAY, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO AMERICAN TIN PLATE COMPANY, OF ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR ROLLING SHEET AND TIN PLATE.

SPECIFICATION forming part of Letters Patent No. 718,974, dated January 27, 1903.

Application filed January 20, 1902. Serial No. 90,379. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. BRAY, of Pittsburg, Allegheny county, Pennsylvania, have invented a new and useful Apparatus for Rolling Sheet and Tin Plate, 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—

Figure 1 is a diagrammatic top plan view of a rolling plant embodying my invention. Fig. 2 is a diagrammatic side elevation of the same. Fig. 3 is a detail view, on a larger scale, showing the table mechanism at the point where the plates start into the continuous mill. Fig. 4 is a top plan view of Fig. 3. Fig. 5 is a detail view showing one of the pushing-fingers for starting the plates into the rolls. Fig. 6 is a top plan view of the matching apparatus. Fig. 7 is a side elevation of the same. Fig. 8 is a plan view, on a larger scale, showing the matching mechanism with the upper parts removed; and Fig. 9 is an enlarged side elevation of the matching mechanism.

My invention relates to the rolling of bars of metal, such as ordinary tin-plate bars, into sheets and packs, and is designed to provide an improved mill wherein the bars are reduced at a continuous operation to such gage that they can be afterward reduced at one operation to the lighter gages used for tin-plate with one heating.

A further object is to produce at a single heat a doubled pack which will hold itself together in proper condition to be afterward reheated and finished at a single operation.

The mill is also adapted for finishing the heavier gages, such as eighteen to twenty-four gage, at one heat and without further rolling.

In the drawings, 2, 3, 4, and 5 represent heating-furnaces, into the rear ends of which the tin-plate bars of the usual size are introduced through openings 6. These bars rest upon suitable supports 7, extending through the furnace to the exit-openings 8, and in order to prevent the bars, which lie side by side against each other and which are comparatively thin, from climbing upon each other as they are pushed through the furnace I arrange the supports at an angle to the horizontal, as shown in Fig. 2. This angle is less than the angle of repose, and the supports may either extend upwardly or downwardly from the feed-opening, though I prefer a downwardly-inclined arrangement, as shown in the drawings. In either case gravity acting upon each bar will hold it against the next bar and prevent the thin bars from riding over each other as the ordinary pusher acts upon the end of the row. At the outlet end of the furnace the supporting-bars have a sharp downward incline, as shown at 9, which is greater than the angle of repose, and as the foremost bar reaches this incline it will slide down and out of the furnace and upon a roller-table 10. Two of these roller-tables 10 are provided, one for each pair of furnaces, these tables extending in front of the several exit-openings and having their ends adjacent to each other at a middle point, (marked *a*,) where the bars start into the continuous mill. I have shown each table as having its rollers driven by bevel-gear shafting 12, actuated by an engine or motor 13. A table 14 is located at the point *a* and the bars pass from both roller-tables onto it. The table, as shown in Figs. 3 and 4, consists of a platform having oppositely-located slots 15, through which stops 16 are raised or lowered to stop the bar in its proper position. The stops 16 are secured to opposite arms projecting from a shaft 17, having an operating-handle 18, and by swinging the handle either pair of stops may be raised above the table to act upon the bar coming from the roller-table on the opposite side. The heated bar thus being stopped upon this table is pushed forward into the bite of the first pair of rolls by means of depending pushers 19, secured to a reciprocating upper frame 20. At the lower end of the pushers are provided tilting fingers 21, which swing freely as the upper frame is drawn backwardly and engage the rear edge of the bar and push it forward as the frame moves forwardly. These fingers enter suitable transverse grooves in the table (shown in Fig. 3) and push the bar forwardly over supports 22 and between guides 23, having

flaring front ends, as shown in Fig. 1. The reciprocating upper frame is provided with three sets of these pusher-bars, which act to force the heated bars forwardly into the successive sets of two-high rolls 24, 25, and 26. The frame is reciprocated by means of two single-acting cylinders 27 and 28, having a common piston-rod intermediately connected to the pusher-frame. After the heated bars are passed in succession through these sets of rolls they are fed through further sets of rolls 29, 30, and 31 by suitable conveyers or feed-tables 32. I have shown this first mill as made up of six sets of rolls made in tandem; but I may vary this number as desired without departing from my invention. The bars are thus reduced to preferably about eighteen gage, and two or more of the bars are then matched before further rolling. The matching apparatus which I employ is shown in Figs. 6 to 9, inclusive. As the bars emerge from the last set of rolls 31 they pass over a supporting-plate 33 into the bite of a pair of feed-rolls 34, and emerging from these rolls they drop upon an inclined table having longitudinal separated supporting-bars 35. The plate slides down upon these supports until its front edge strikes stop-fingers 36, carried on levers 37, secured to a shaft 38, provided with a hand-lever 39. To the shaft is secured a balance-weight 40, which normally holds the fingers in raised operative position and returns them to this position when the hand-lever is released. After the plate is thus stopped they are centered sidewise by means of sliding squaring devices 41, which slide upon transversely-located supports 42, extending beneath the table. These squaring-up devices are moved toward or from each other simultaneously by means of a central shaft 43, having oppositely-projecting levers 44 with link connections 45 to oppositely-located levers 46, having loose connections with the squaring-up devices. The operating-links are arranged in pairs, so that parallel movement is given to each guide or squaring-up device. The central rock-shaft is actuated by a lever 47, having a pivoted-rod connection 48 with a hand-lever 49, working within an arc-shaped guide 50, which supports the handle in angular position at right angles to the plane of the table. After the sheet has reached the stops the operator swings this handle, and thus brings the center line of the sheets to the center line of the table and matches them sidewise. After the two or more plates which have dropped upon each other upon this table are thus matched the stop-fingers are depressed by the hand-lever and the matched plates slide down into engagement with the collar portions of feed-rolls 51, which are grooved to receive the fingers. These feed-rollers are driven through a yielding or slip clutch connection 52 and the sheets passed therefrom upon a feed-table 53, having side guides 54 leading to rolls 55. The rolls 55 are driven at a higher rate of speed than the feed-rollers 52, and consequently pull upon the matched plates, this pull being resisted by the yielding pressure of the clutch on the feed-rollers, giving an action similar to that where an operator holds back a plate with a pair of tongs as it enters the rolls. This prevents the displacing of one plate relatively to the other and holds them in matched position until they are firmly gripped by the reducing-rolls. After passing through the rolls 55 the matched pack passes over the feed-table 56 into another pair of rolls 57 and emerges upon a roller-table 58, which carries the pack to a doubler 59. This doubler may be of any desired form, though I prefer to use that type of doubler shown in my Patent No. 695,873, dated March 18, 1902, wherein a vertically-movable blade 60 forces the intermediate part of the sheet upwardly between doubling-rolls 61, as indicated in Fig. 2. The doubled pack is then ready for reheating and finishing. The sheets in this doubled pack would be from about twenty-two to twenty-six gage, though this gage will of course depend upon the number of sets of reducing-rolls used and the thickness of the bar which is employed. If it is desired to finish the sheets at these gages, the sheets are either not taken to the doubler or are passed through the doubler, whose stop is removed.

The advantages of my invention result from the automatic action of the plant, there being no hand manipulation of the bars or packs except through the special mechanisms above described. The single heating and reducing the pack to a doubled pack of twenty-two to twenty-six gage takes the place of three heatings, two doublings, and one matching, as in the ordinary method now employed in making like gages. The output is greatly increased and the use of skilled labor largely obviated.

Many variations may be made in the form and arrangement of the furnaces, the transfer mechanisms, the rolls, both in number and arrangement, the particular matching mechanism shown, and the other parts without departing from my invention.

I claim—

1. In apparatus for feeding bars or plates to rolls a table having side guides, a plurality of rear pushers, and mechanism for actuating the pushers to move the metal forwardly between the squaring-guides and into the bite of the rolls; substantially as described.

2. In apparatus for feeding bars or plates to rolls; a feed-table having a pair of adjustable side guides, a rear pushing device, and mechanism for actuating the pushing device to force the metal forwardly between the squaring-up guides, and into the bite of the rolls; substantially as described.

3. The combination with a feed-table having longitudinal supports and side guides, of an overhead reciprocating frame having depending pushers arranged to move between

the supports to force the bar forward and into the bite of the rolls; substantially as described.

4. The combination with two sets of reducing-rolls arranged in tandem, of a matcher located between them mechanism for feeding plates into the matcher at an upper level, and feeding-out mechanism arranged to feed the pack from the matcher into the next pass at a lower level, substantially as described.

5. The combination with a pair of reducing-rolls, of a matching device arranged in front of the rolls and extending downwardly at an angle to the horizontal, and a pair of reducing-rolls at a lower level in front of the matcher; substantially as described.

6. The combination with two pairs of reducing-rolls arranged in tandem, of a matching device located between and in line with the rolls, said matcher having suitable stop mechanism; substantially as described.

7. The combination with two pairs of reducing-rolls arranged in tandem, of a matching device between and in line with the rolls, stops for the front ends of the plates, and movable guides for squaring up the edges of the plates on the matching device; substantially as described.

8. A pair of reducing-rolls for packs, in combination with yieldingly-driven feed-rollers arranged to retard the forward movement of the pack, and mechanism for driving the feed-rollers at a lower rate of speed than the reducing-rolls; substantially as described.

9. The combination with a mill, of two sets of continuous heating-furnaces located at opposite sides thereof, feed mechanism arranged to transfer the heated bars from the furnace on either side to the entrance end of the mill, and stop mechanism in front of the mill arranged to stop the bars coming from either direction; substantially as described.

10. A continuous mill having a series of sets of rolls arranged in tandem, and matching mechanism interposed between two of the sets of rolls; substantially as described.

11. In apparatus for rolling black plates or sheets, a continuous mill having sets of rolls arranged in tandem, matching mechanism located between two of the sets of rolls, and a doubling apparatus located in line with the sets of rolls; substantially as described.

In testimony whereof I have hereunto set my hand.

C. W. BRAY.

Witnesses:
H. M. CORWIN,
GEO. B. BLEMING.