No. 770,195. PATENTED SEPT. 13, 1904.

R. C. STIEFEL & J. H. NICHOLSON.

METHOD OF ROLLING TUBING.

APPLICATION FILED DEC. 26, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

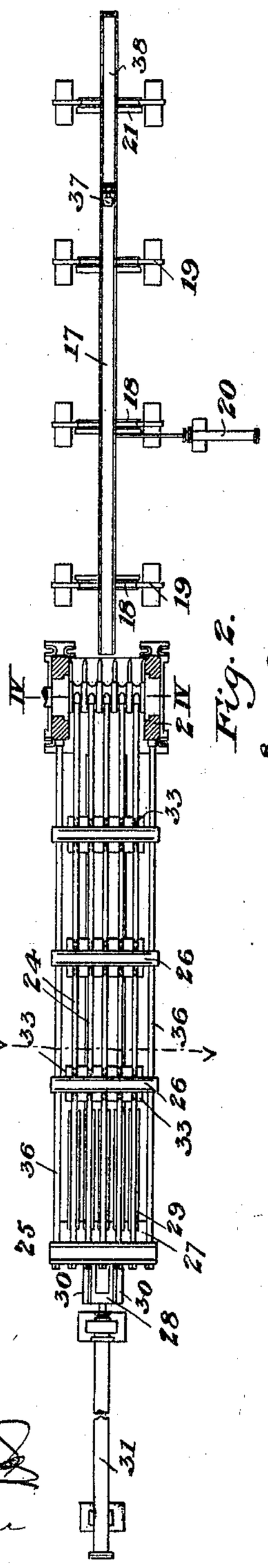


Fig. 2.

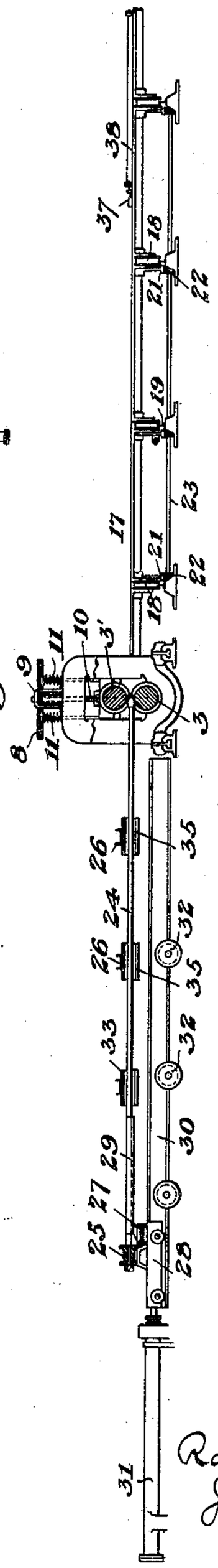
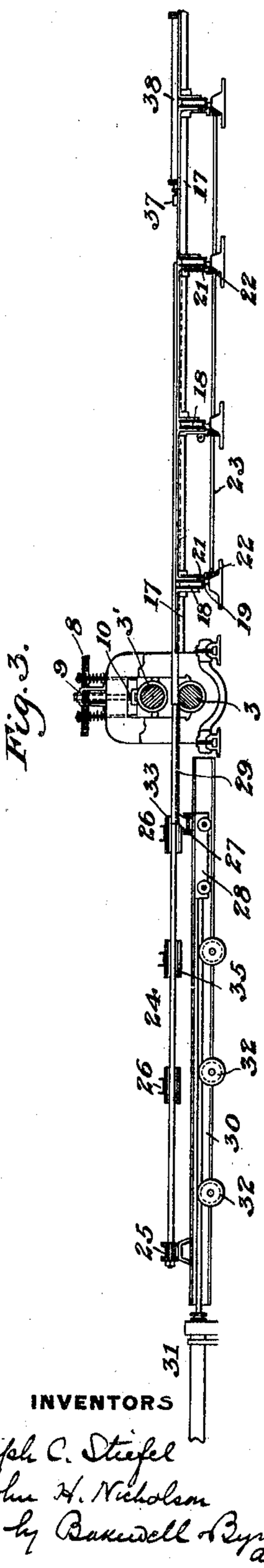


Fig. 3.



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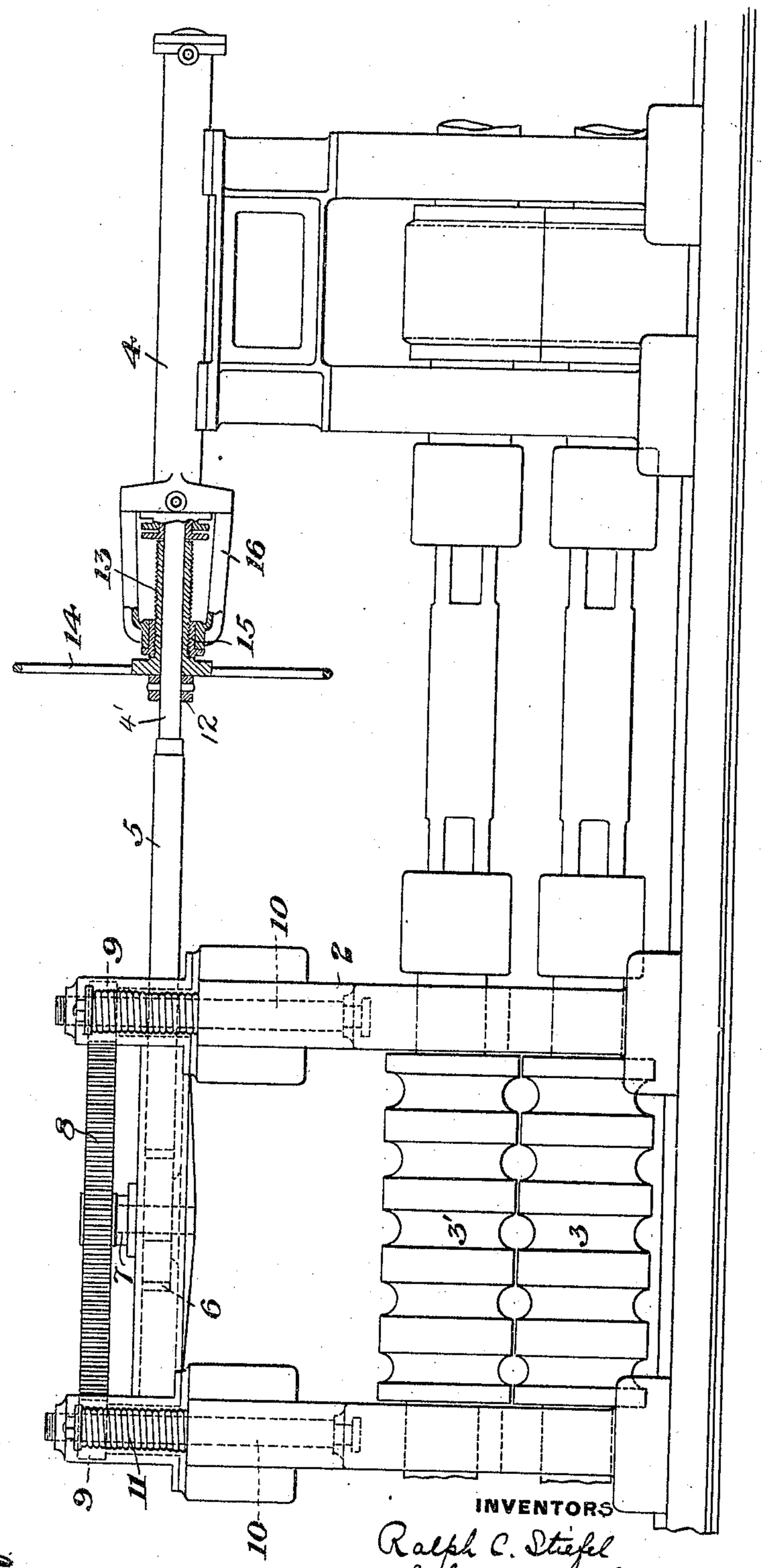
NO MODEL. 3 SHEETS—SHEET 2.

Fig. 4.



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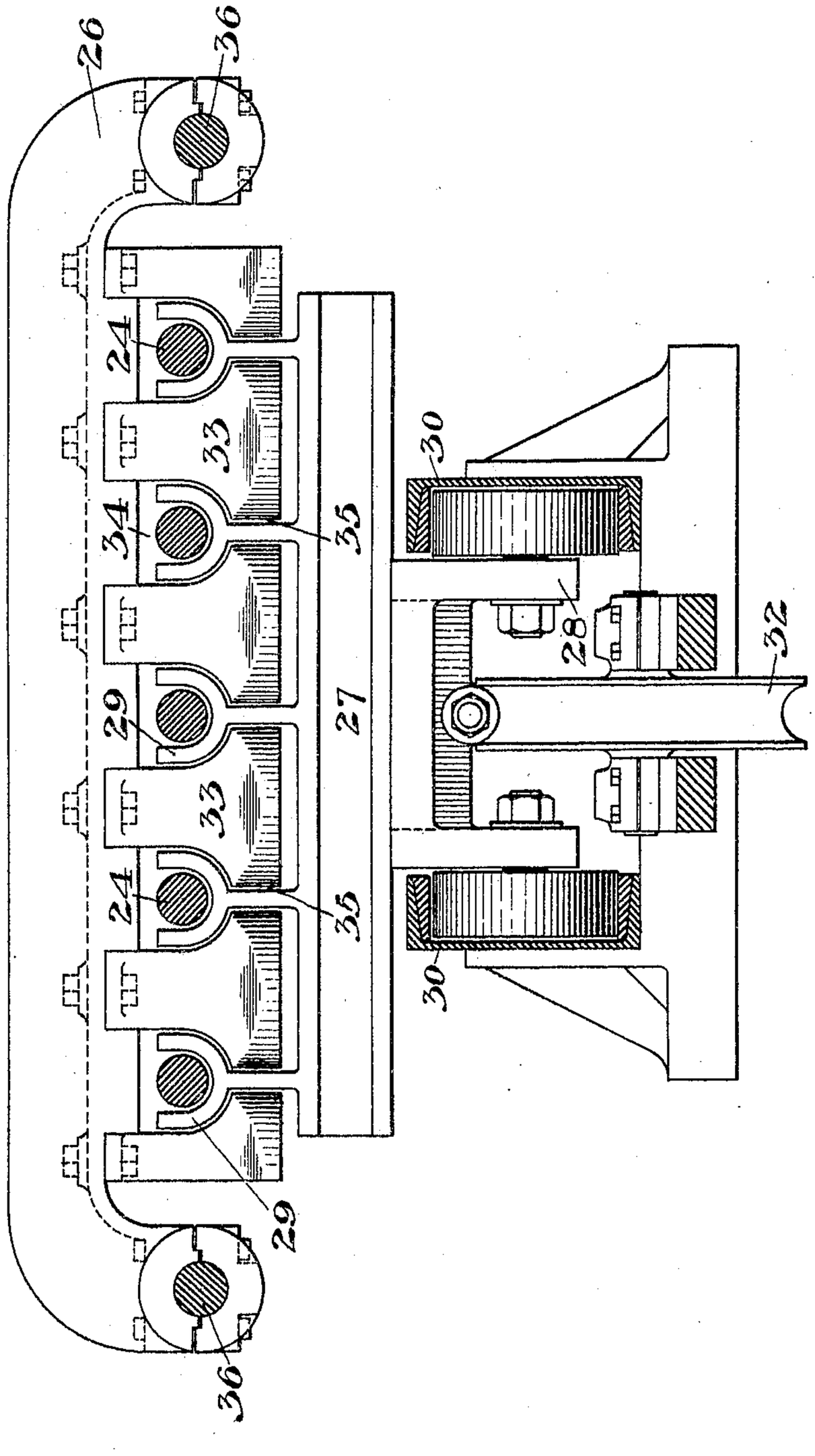
NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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METHOD OF ROLLING TUBING.

SPECIFICATION forming part of Letters Patent No. 770,195, dated September 13, 1904.

Application filed December 26, 1903. Serial No. 186,519. (No model.)

To all whom it may concern:

Be it known that we, RALPH C. STIEFEL, of Ellwood City, and JOHN H. NICHOLSON, of Pittsburg, Allegheny county, Pennsylvania, have invented a new and useful Method of Rolling Tubing, 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 plan view of a mill adapted for the practice of our invention. Fig. 2 is a longitudinal central section thereof. Fig. 3 is a view similar to Fig. 2, showing the parts in the position which they occupy when the tube is being fed back to the feeding side of the rolls; and Fig. 4 is a cross-section on the line IV IV of Fig. 1. Fig. 5 is a vertical cross-section, on a larger scale, on the line V V of Fig. 1.

In the manufacture of seamless tubes much time has been lost because of the difficulty and delay incident to removing the tubes from the rods upon which they are delivered as they pass from the rolls and returning them to the feeding side of the rolls. This has greatly increased the cost of manufacture and has limited the length to which the tubing can be rolled.

Our invention provides simple means for overcoming the difficulties heretofore experienced and enabling the rolling operation to be expedited and to be accomplished with a very considerable saving of labor and expense.

Our invention may be practiced with apparatus of various forms. The preferable form is shown in the drawings, in which—

2 represents the roll-housing, containing a pair of rolls 3 3′, which are arranged to be driven continuously in a single direction, the upper roll being vertically movable in the housing in order to separate it from the lower roll sufficiently to provide a space for the return feeding of the tube. Variously-constructed mechanism may be employed for this purpose; but we prefer, as shown in Fig. 4, to use a power cylinder or motor 4, connected with a rack 5, which drives a pinion 6 on the shaft 7 of a pinion 8, which in turn meshes with toothed nuts 9 on the adjusting-screws 10 of the upper roll, the upper roll being counterbalanced by springs 11 or otherwise, so that when the rack 5 is projected or retracted the upper roll will be correspondingly moved down rapidly toward the lower roll or permitted to be raised by the counterbalancing mechanism.

For the purpose of adjustably determining the exact distance from the lower roll to which the upper roll is moved in its down motion we employ a collar 12, fixed to the piston 4′ of the cylinder 4, and a threaded sleeve 13, adapted to be rotated by a hand-wheel 14 and working in a stationary nut 15, which is connected by a frame 16 to the cylinder 4 or other fixed portion of the apparatus. By turning the wheel 14 the sleeve 13, working in the nut 15, will cause it to be projected or retracted to the desired extent, and the wheel 14 will then constitute a stop, with which the collar 12 will engage and will thus limit the downward motion of the upper roll to the point desired. We are thus enabled by the cylinder 4 to raise the upper roll rapidly to the desired extent and after adjustment of the hand-wheel 14 to move said roll back toward the lower roll and bring it to the exact distance of separation therefrom which may be required. By adjusting the roll between the passes we are enabled to complete the rolling of a tube in a single groove of the rolls, and this is our preferred practice.

On the feeding side of the rolls is a feed-table comprising a trough 17, mounted on wheeled carriages 18, the wheels of which run upon parallel transverse tracks 19. These carriages and the feed-table can be moved laterally into line with any of the roll-passes by a power-cylinder 20 or the other suitable motor, the parallelism of movement of the carriages being secured by racks 21 thereon, in gear with pinions 22 on a shaft 23, which extends along the table and connects the pinions of the several carriages. On the delivery side of the rolls we employ a series of

rods 24, which are fixed at the rear end to a stop 25 and extend forward through supports 26 to the respective roll-passes, being suitably formed at the ends to receive the mandrel-plugs over which the tubes are rolled. The use of a number of these rods is desirable, though not essential to our invention, as we may employ only one rod and may shift it laterally from time to time to the roll-pass at which the tube is to be rolled.

For the purpose of returning the rolled tube back to the feeding side of the rolls we do not lift the mandrel-rod and pull the tube over the rolls; but we employ a stripping mechanism which strips the tube longitudinally from the rod and returns it to the feeding side of the rolls through the same roll-groove and in the same axial line in which it has been delivered from the rolls. This stripping mechanism when adapted for a series of parallel rods, as shown in the drawings, comprises a cross-head 27, carried by a wheeled buggy 28 and having upwardly-projecting troughs or forks 29, which fit the rods 24. The wheels of the buggy 28 move in suitable channel-guides 30, and they are actuated by a pushing cylinder-motor 31, the rod 31′ of which is supported from sagging by rollers 32.

In order that the rod-supports 26 may not interfere with the operation of the stripper, we prefer to construct them of yokes or frames 33, having openings 34, in which the rods rest, the yokes being slotted at 35 in order to permit the shanks of the troughs or forks 29 to pass the yokes as they travel along the rods during their londitudinal motion when actuated by the cylinder. The yokes 26 are supported by side rods 36, which extend from the back stops 25 to the roll-housing and are suitably supported at intermediate points. The feeding of the tube to the rolls is effected by a pusher 37, forming a part of the piston of a power-cylinder 38, which is mounted on and moves with the feed-table 17.

The operation is as follows: The tube to be rolled having been suitably heated is placed on the feed-table 17, and the latter is brought opposite to the pass of the rolls in which the rolling is to be effected, a mandrel having been placed on the end of the rod 24 at that pass. The pusher 37 is then projected and advances the tube into the roll-pass over the mandrel. It is then engaged by the rolls and is delivered upon the rod 24, which is in line with that pass. When the rear end of the tube has emerged from the rolls, the rolls are separated, as above explained, the mandrel-plug is removed, and the stripper 29, which was in the retracted position, (shown in Fig. 2,) is then projected by the motor 31 and is caused to engage the end of the tube, which it pushes along the rod, stripping it therefrom, returning it through the roll-pass in the same axial line in which it was delivered, and finally depositing it upon the feed-table. The stripper is then retracted, the mandrel-plug replaced on the rod, the rolls brought together after having been adjusted so as to approach somewhat more closely than before, and the tube is then fed back into the roll-pass by the pusher 37 and delivered again upon the rod 24, after which it may be returned, as before described, to the feeding side of the rolls. At each return of the tube the stripper preferably passes between the rolls, so as to clear the tube therefrom. The operation of rolling the tube through a single roll-groove may be repeated as often as is necessary to complete the finishing of the tube. We prefer, as above described, to finish the tube in a single groove and to employ the several grooves or passes, respectively, for rolling tubes of different size; but it will be understood that after rolling the tube once or oftener at a single groove it may be shifted laterally and finished at another groove or grooves.

We believe we are the first to roll tubes by passing the tube between rolls over a mandrel-plug, delivering it from the rolls upon a rod, and then after separating the rolls and removing the mandrel and preferably while the rolls are still rotating in the same direction passing the tube back to the feeding side of the rolls in the same axial line as that in which it was delivered. It is obvious that other forms of stripping devices may be used to return the tube to the feeding side of the rolls after they have been separated. Within the scope of our invention as broadly claimed before passing the tube back between the continuously-driven rolls the tube and mandrel-rod may be moved laterally to a pass or portion of the rolls other than the working pass through which it is delivered.

We claim—

1. The method herein described of rolling tubes which consists in passing the tube between rolls over a mandrel-rod, separating the rolls, removing the mandrel-plug, and passing the tube back to the feeding side of the rolls in the same axial line as that in which it was delivered; substantially as described.

2. The method of rolling tubes, which consists in continuously-rotating rolls in the same direction, feeding the tube forwardly into a working pass of the rolls and over a mandrel-rod, separating the rolls, removing the mandrel-plug, returning the tube between the rolls, placing a mandrel-plug on the rod, bringing the rolls into working position and again feeding the tube forwardly and over a mandrel-plug; substantially as described.

In testimony whereof we have hereunto set our hands.

RALPH C. STIEFEL.
JOHN H. NICHOLSON.

Witnesses:
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H. M. CORWIN.