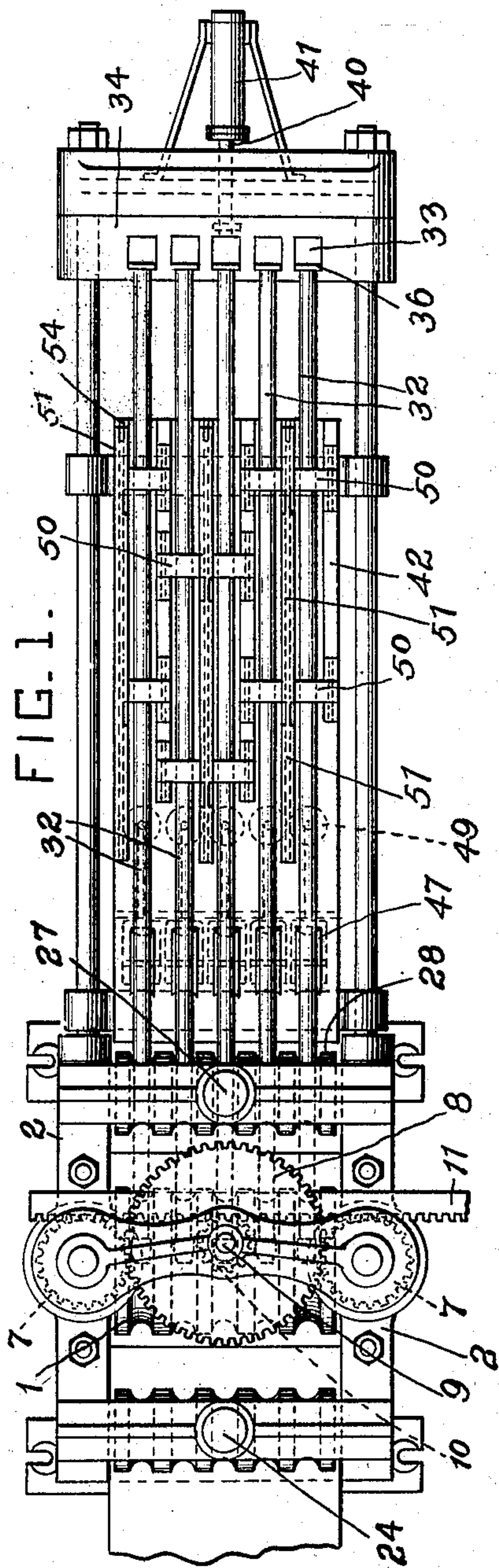


M. F. CAPRON.
MILL AND METHOD FOR ROLLING TUBES.
APPLICATION FILED APR. 25, 1907.

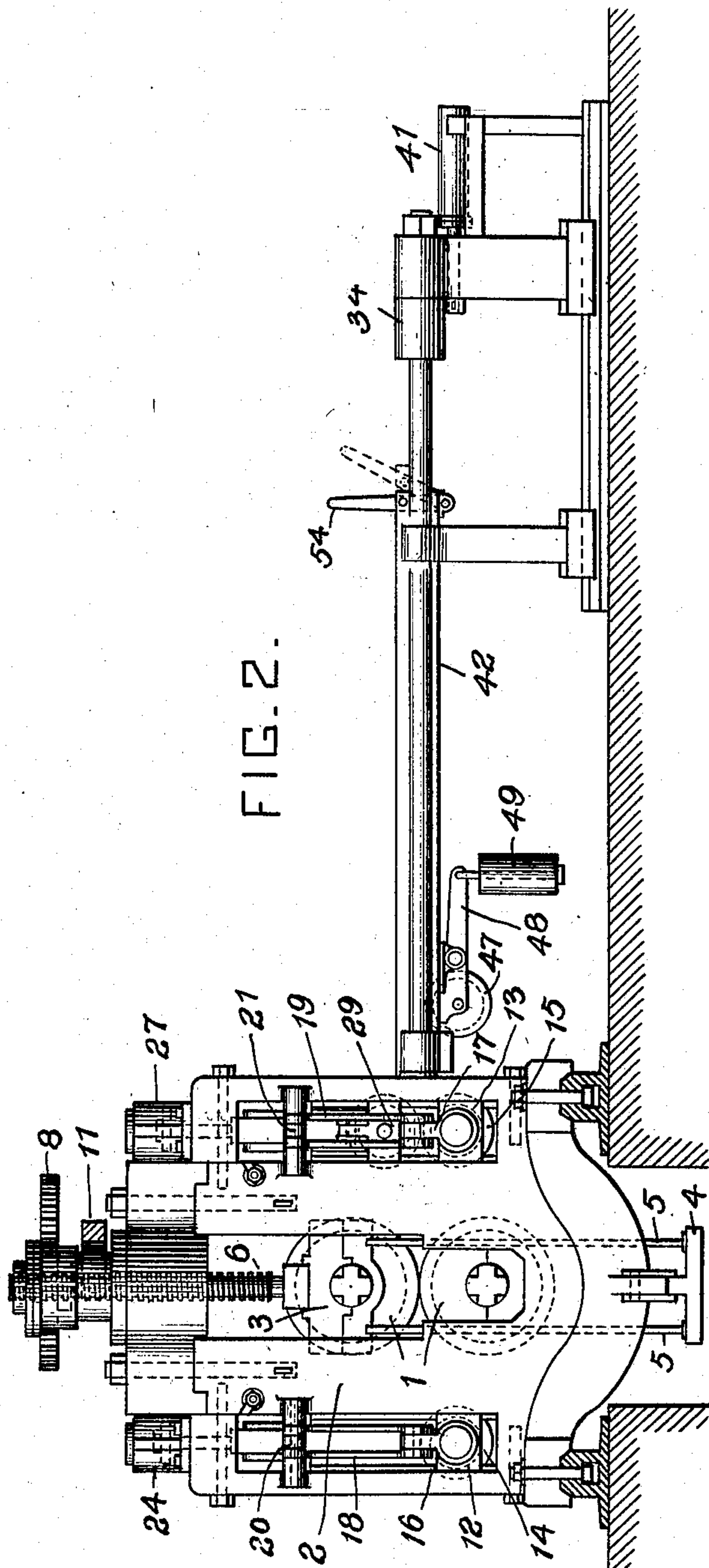
923,944.

Patented June 8, 1909.

4 SHEETS—SHEET 1.



WITNESSES:
J. Herbert Bradley
Frank Rogers



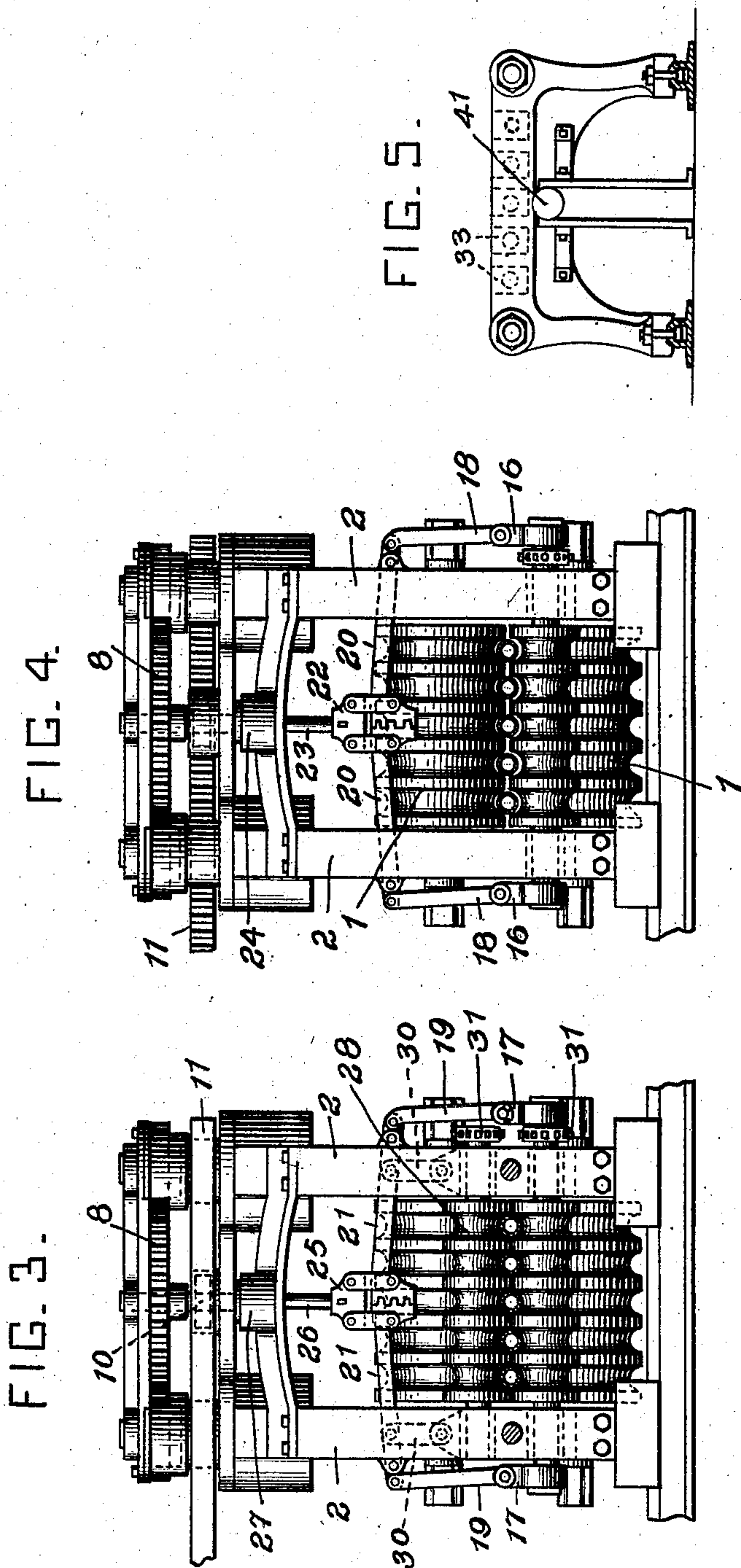
INVENTOR
Marshall F. Capron
Christy & Christy, Atty's

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4 SHEETS—SHEET 2.



WITNESSES:

J. Herbert Bradley.
Frank Rogers

INVENTOR

Manuel F. Capron,
by Christy & Christy, Attys

M. F. CAPRON.
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4 SHEETS—SHEET 3.

FIG. 6.

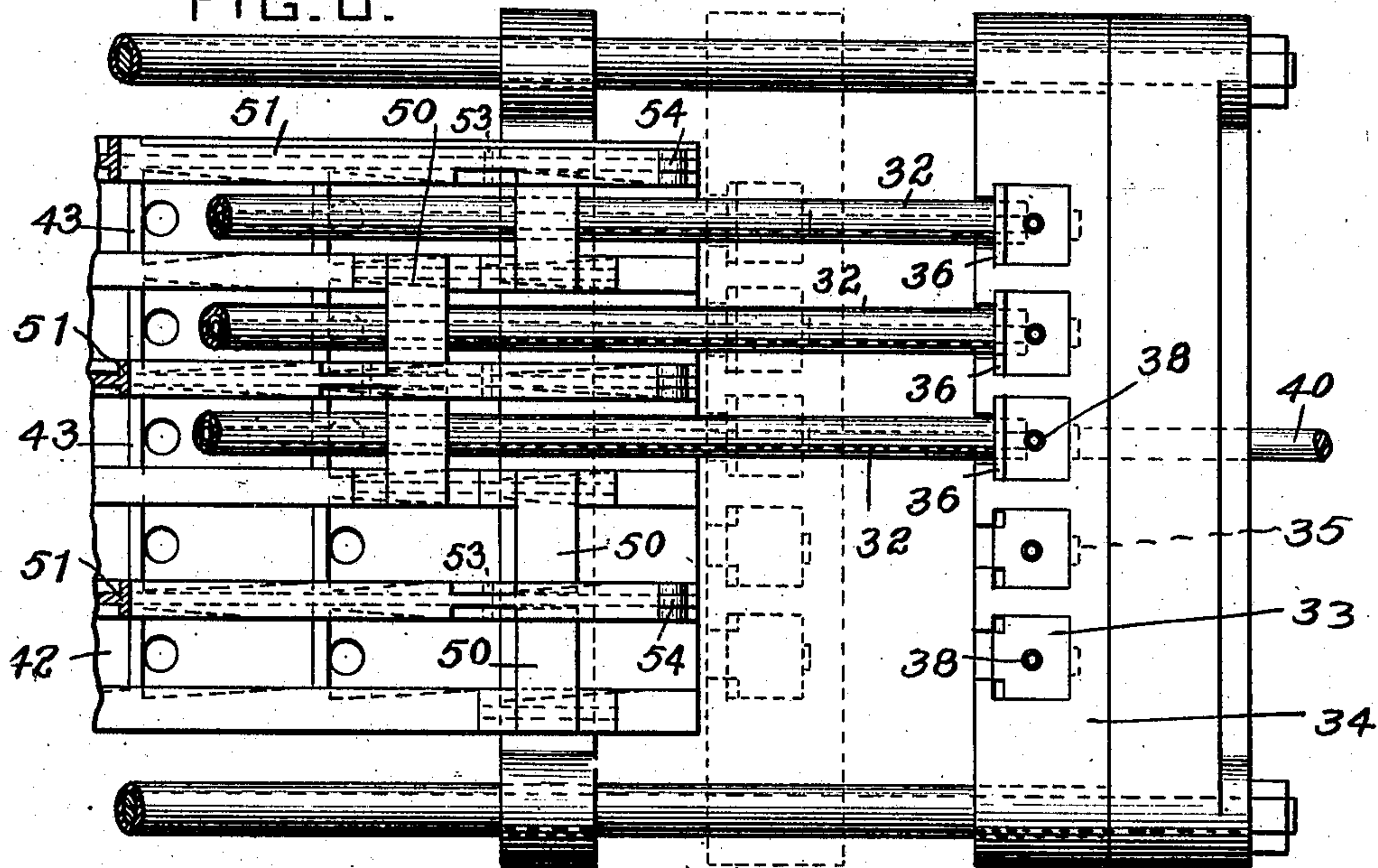


FIG. 7.

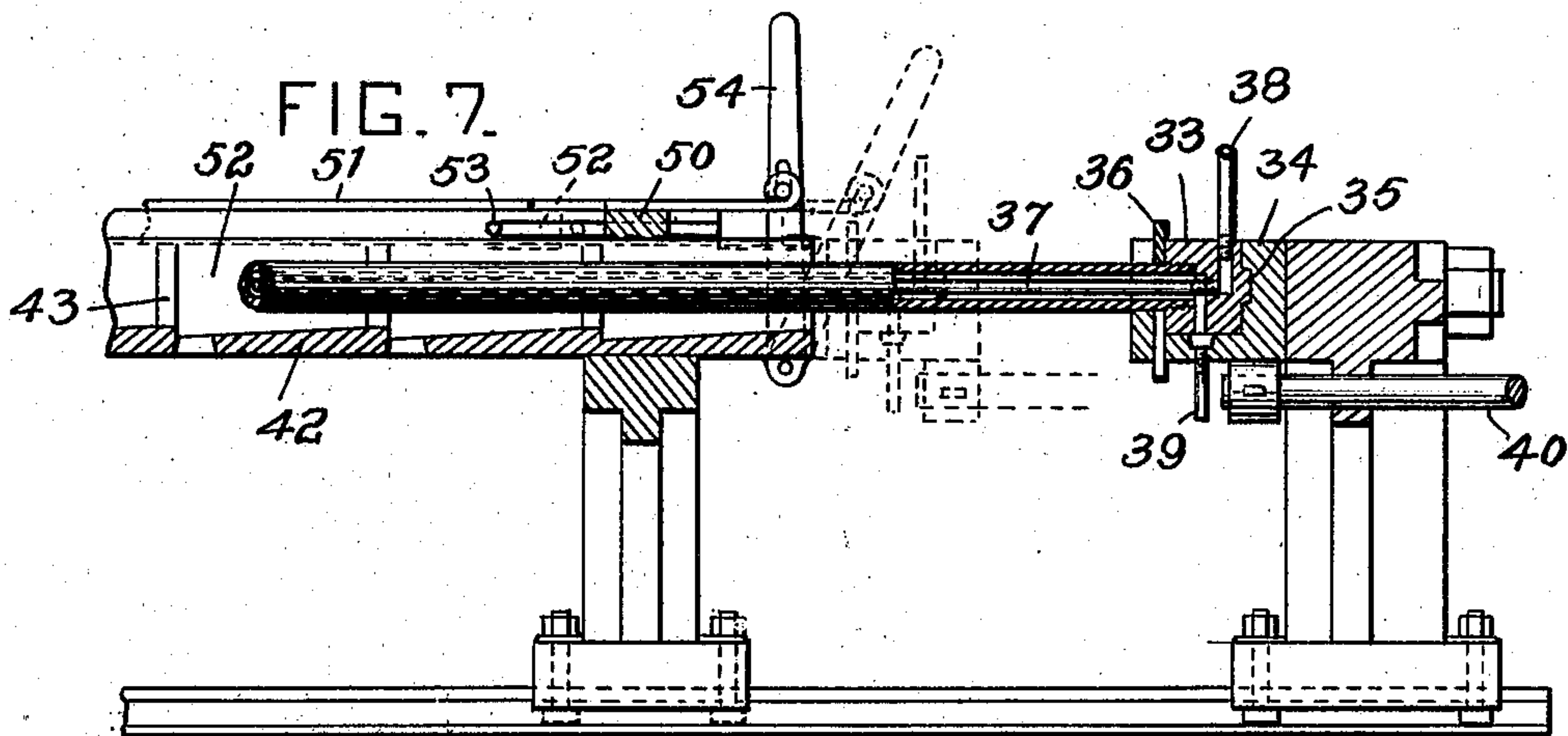
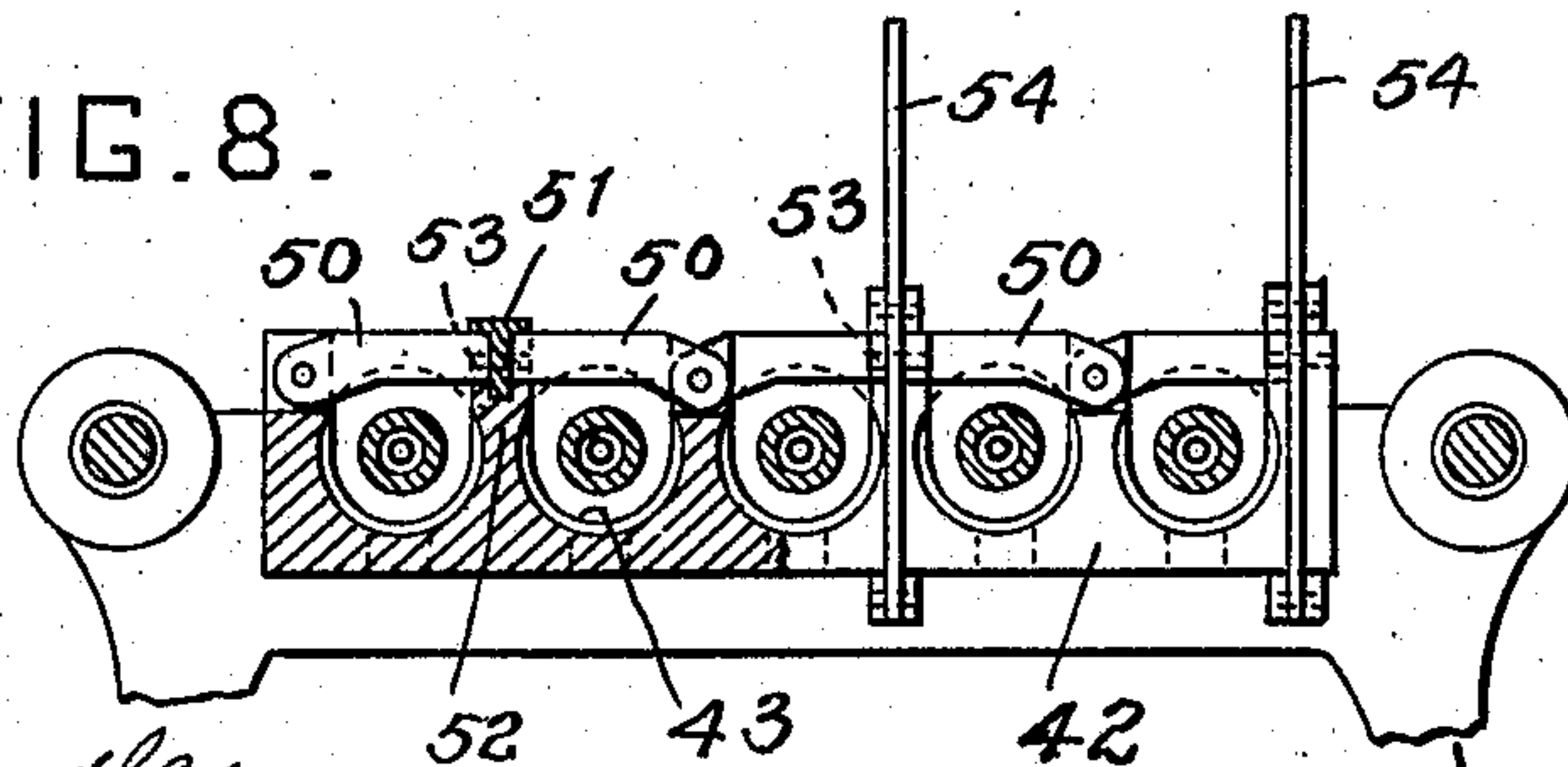


FIG. 8.



WITNESSES:

J. Herbert Bradley.
Frank Rogers

INVENTOR

Marshall F. Capron,
Christy & Christy, Atty's

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4 SHEETS—SHEET 4.

FIG. 9.

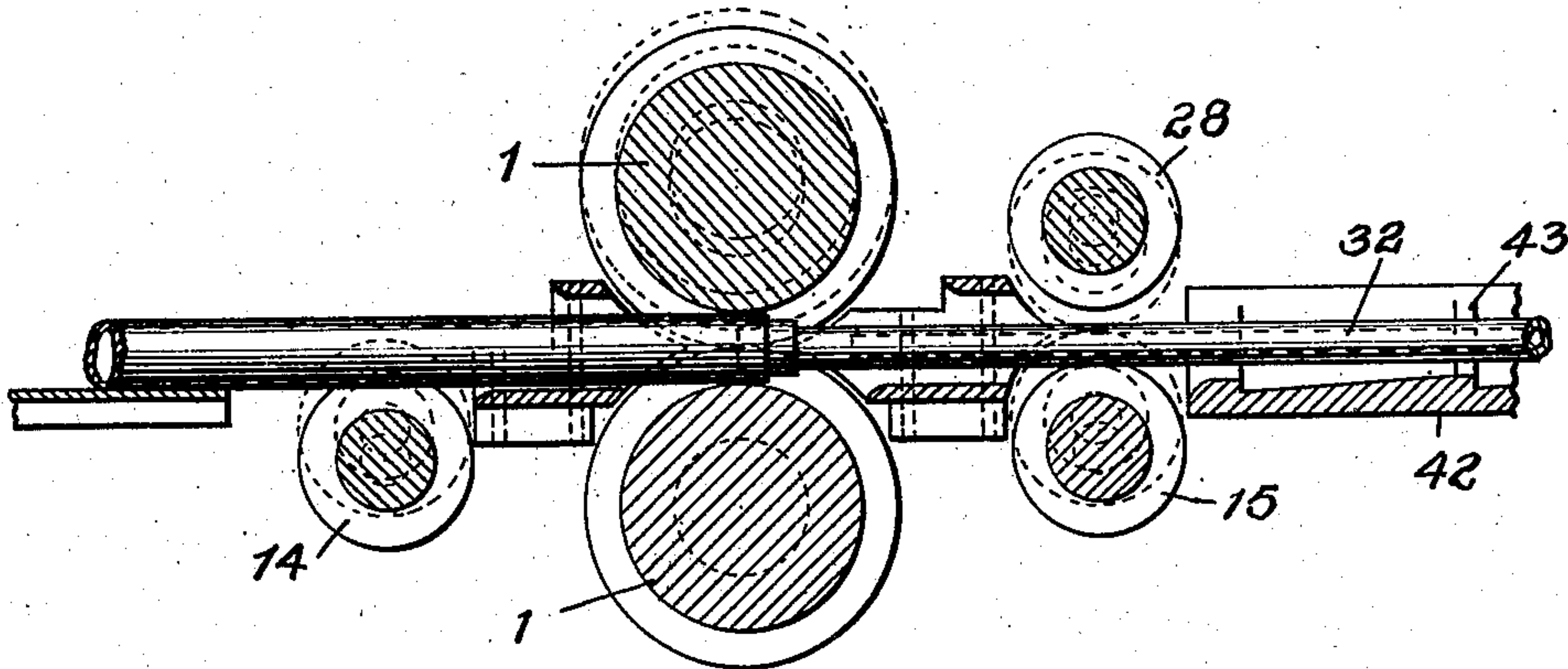


FIG. 10.

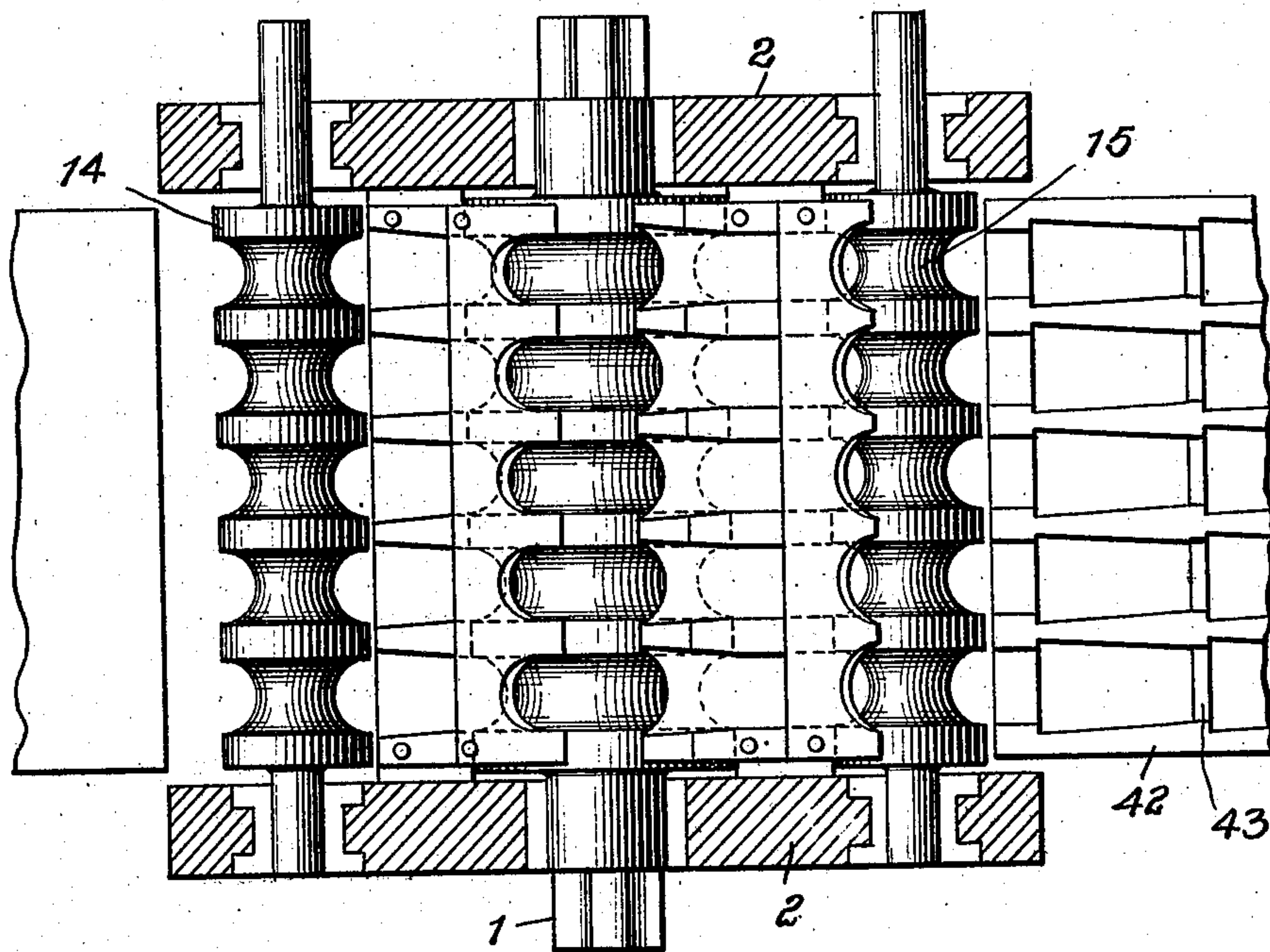


FIG. 11.



WITNESSES:
J. Herbert Bradley.
Frank Rogers

INVENTOR
Marshall F. Capron,
by
Christy & Christy, Atty's

UNITED STATES PATENT OFFICE.

MARSHALL F. CAPRON, OF ELYRIA, OHIO.

MILL AND METHOD FOR ROLLING TUBES.

No. 923,944.

Specification of Letters Patent.

Patented June 8, 1909.

Application filed April 25, 1907. Serial No. 370,316.

To all whom it may concern:

Be it known that I, MARSHALL F. CAPRON, residing at Elyria, in the county of Lorain and State of Ohio, a citizen of the United States, have invented or discovered certain new and useful Improvements in Mills for and Methods of Rolling Tubes, of which improvements the following is a specification.

The invention described herein relates to certain improvements in mills for rolling tubes, etc., and has for its object among other things the provision of means whereby the tube may be returned to the feed side of the rolls out of contact with the rolls so as to permit of the tube being passed through other groove or grooves for further reduction.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming part of this specification, Figure 1 is a top plan view of my improved mill; Fig. 2 is a side elevation of the same; Fig. 3 is a sectional view indicated by the line III—III Fig. 1; Fig. 4 is a similar view of the opposite side of the mill; Fig. 5 is an end elevation of the receiving table; Fig. 6 is a plan view on an enlarged scale of the rear portion of the receiving table showing the means for shifting the billet; Fig. 7 is a sectional elevation of the construction shown in Fig. 6; Fig. 8 is a transverse view partly in section and partly in elevation of the receiving table; Fig. 9 is a detail view showing the reducing rolls, the billet returning rollers and portions of the guides for the mill; Fig. 10 is a view partly in section and partly in top plan of the parts shown in Fig. 9; and Fig. 11 shows the guides arranged on the delivery side of the delivery rolls.

In the practice of my invention the reducing rolls 1, provided with suitable grooves for operating on the hollow billet, said grooves being of the same or varying in diameter, are arranged in suitable housings 2. The boxes 3 carrying the upper rolls are pressed upward by the usual and well known means consisting of weighted levers or counterbalancing yokes 4 supporting rods 5, whose upper ends bear against the boxes 3. The upper roll is forced down against the upward pressure exerted by the levers or yoke 4 by means of screws 6 having pinions 7 on their upper ends, said pinions intermeshing with the gear wheel 8 mounted on a short shaft 9 to which is also secured a pinion 10. This pinion intermeshes with a rack bar 11 adapt-

ed to be shifted by any suitable means, as a fluid pressure cylinder (not shown), so as to rotate the screws 6 and thereby permit the upward movement of the upper rolls, or force it down into operative relation with the lower roll. Windows are formed in the housings on each side of the reducing rolls for the reception of journal boxes 12 and 13 of the rollers 14 and 15 which are arranged parallel with the axes of the reducing rolls, but are normally in such position as to be out of contact with an article passing through the grooves of the reducing rolls. Straps 16 and 17 are mounted on the projecting journals of these rollers and are connected by links 18 and 19 with the ends of levers 20 and 21 which are pivotally mounted upon the housing 1 as clearly shown in Figs. 3 and 4. The levers 20 are connected at points adjacent to their inner ends with the head 22 on the stem 23 of a piston operating in the cylinder 24, and the levers 21 are similarly connected to a head 25 on the stem 26 of the piston in the cylinder 27, the cylinders 24 and 27 being arranged on the top of the housings.

In order to insure the equal and simultaneous movements of both pairs of levers, the inner ends of each pair are provided with interlocking teeth as shown in Figs. 3 and 4. A grooved roller 28 has its journal boxes 29 movably mounted in the slot in which the roller 15 moves and these boxes 29 are connected by links 30 with the levers 21 at points inside of their pivotal support or fulcrum. By reason of the manner of connecting the rollers 15 and 28 to the levers 21, said rollers can be caused to approach each other and grip the billet or pipe when the lower roller is raised and can be moved away from each other out of the plane of movement of the pipe or billet when the lower roller is dropped down below the plane of movement of the billet passing through the reducing rolls.

Simultaneous with the gripping of the billet or pipe the roller 14 on the feed side of the rolls is also raised so that when the billet or pipe is returned to the feed side of the rolls, it will not come into contact with either of the reducing rolls, the upper reducing roll having been raised sufficiently for the proper movement of the billet or pipe. The gripping rollers 15 and 28 are positively driven by chains passing over sprockets 31 or their journals, as shown in Fig. 3, said chains being driven from any suitable part or parts of the mill. As indicated at Fig. 4, the roller

14 may also be driven. These rollers are driven in a direction the reverse of the direction of rotation of the reducing rolls.

The plug or ball onto which the billet is rolled by the reducing rolls is carried on a hollow mandrel 32, said mandrels being secured at their rear ends in blocks 33 carried by the cross head 34. These blocks are detachably secured in position in any suitable manner preferably by means of a lug or projection 35 engaging a recess in one of the walls of pockets or chambers formed in the cross head, the projection being held in engagement with the said recess by a key 36 as shown in Fig. 7. This construction permits of the ready removal of the block and the mandrel carried thereby. In order to keep the mandrel cool a tube 37 is arranged therein and extends to a point adjacent to the front end of the mandrel, said tube being connected by a pipe 38 to a suitable source of supply. The backward flow of water is between the tube 37 and the mandrel and escapes by a pipe 39. The cross head 34 is connected to the piston rod 40 or a fluid pressure cylinder 41 clearly shown in Figs. 1 and 2. The mandrels extend along grooves in a table or bed 42 whose inner walls are so shaped as to form shoulders or projections 43 at intervals, thus reducing the area of contact between the wall of the grooves and the tube or billet under reduction. The forward ends of the mandrels are supported by rollers 47, projecting through slots in the bed 42 and mounted in one end of levers 48, the opposite ends of which are connected to weights 49. The upward movement of the rollers 47 and consequently of the mandrels carried thereby is limited by a flattened portion of the levers abutting against the underside of the table adjacent to the slots through which the rollers project. These rollers will hold the mandrel in proper alignment vertically with the grooves in the rolls, but will yield down and permit of the movement of the billet along the mandrels. In order to prevent an upward buckling or bending of the mandrel with the tubes, a series of dogs 50 are pivotally mounted on the upper edges of the ribs between adjacent grooves in the table, as shown in Fig. 8. In order to lock these dogs in proper position a T-shaped bar 51 is mounted in a groove formed longitudinally of the ribs 52 and is provided at intervals with notches which when in line with the dogs will permit the latter to swing upward. These rails or bars 51 are preferably held in position by means of pins 53 secured in the bar transversely of the web and projecting into longitudinal grooves in the ribs 52, as shown in Fig. 7. The longitudinal movement of the bars or rails is effected by means of levers 54, connected to the rear ends of the rails and pivotally mounted upon the bed.

I claim herein as my invention:

1. In a rolling mill the combination of reducing rolls, means for moving one of said rolls from and toward the other roll, rollers arranged on the delivery side of the rolls and normally outside of the pass defined by planes tangential to adjacent portions of the rolls when operating on the article, means arranged to shift said rollers toward each other to positively grip and shift the article being rolled to a position between planes tangential to adjacent portions of the reducing rolls when separated or in inoperative positions, and means for rotating said rollers reversely to the direction of rotation of the reducing rolls.

2. In a rolling mill, the combination of reducing rolls, means for moving one of said rolls toward and from the other roll, rollers arranged on the delivery side of the rolls, means arranged to simultaneously shift said rollers toward each other to grip and move the article being rolled out of contact with the rolls and to shift the rollers out of the path of movement of the article while being reduced, and means for rotating said rollers reversely to the direction of rotation of the reducing rolls.

3. In a rolling mill, the combination of reducing rolls, means for moving the upper roll toward and from the lower roll, rollers arranged on the feed and delivery sides of the rolls, means for shifting said rollers to positions above and below a plane tangential to that portion of the lower roll which defines the lower portion of the pass between the rolls and means for rotating one of said rollers reversely to the direction of rotation of the reducing rolls.

4. In a rolling mill, the combination of reducing rolls, means for moving one of said rolls toward and from the other roll, a pair of rollers, means for rotating said rollers, a pair of levers, connections from the rollers to the levers, the connections from the respective rollers being attached to the levers on opposite sides of the fulcrums of said levers.

5. In a rolling mill, the combination of reducing rolls, a roller arranged on one side of the lower roll, means for changing the relative positions of the roller and one of the rolls relative to the other roll whereby the article being rolled will be in contact with only the rolls or the roller at the same time, and means for rotating the roller reversely to the direction of rotation of the rolls.

6. In a mill for rolling tubes, the combination of grooved working rolls, a movable cross-head, mandrel bars carried by said cross-head so as to register with the grooves of the rolls, plugs or balls carried by said mandrel bars, means for shifting said cross-head whereby said mandrel bars may be simultaneously thrust forward from their working position to positions with their for-

ward ends on the charging side of the rolls to permit of the removal and replacement of the plugs or balls.

7. In a mill for rolling tubes, the combination of a movable cross-head provided with recesses or chambers, blocks arranged in said chambers or recesses, mandrel bars secured to said blocks and means for locking the blocks within the cross head.

8. In a mill for rolling tubes, etc., the combination of grooved rolls, a receiving table having grooves therein in alinement with the grooves of the rolls, a series of locking dogs for each groove of the table pivotally attached to the ribs between the grooves and a lock for holding the locking dogs in operative position with relation to the pipes or tubes being rolled.

9. In a mill for rolling tubes, the combination of grooved reducing rolls, a receiving table having grooves therein for the reception of the tubes to be rolled, a series of locking dogs pivotally connected to the ribs between the grooves, a sliding T-shaped bar

mounted in said ribs provided with notches to permit of the passage of the ends of the locking dogs and means for shifting the T-shaped bars.

10. As an improvement in the art of rolling pipe the method herein described which consists in passing the article through between a pair of rolls, the article during such reduction being free from distorting pressure outside of the bite of said rolls, moving one of said rolls from the other without reversing the direction of rotation, gripping the article between feed rollers arranged in operative relation to the rolls, but rotating in reverse direction, and by the operation of said rollers passing the article back between the separate rolls and out of contact therewith.

In testimony whereof, I have hereunto set my hand.

MARSHALL F. CAPRON.

Witnesses:

ESTELLE CULLIN,
J. L. BIRDSALL.