

(No Model.)

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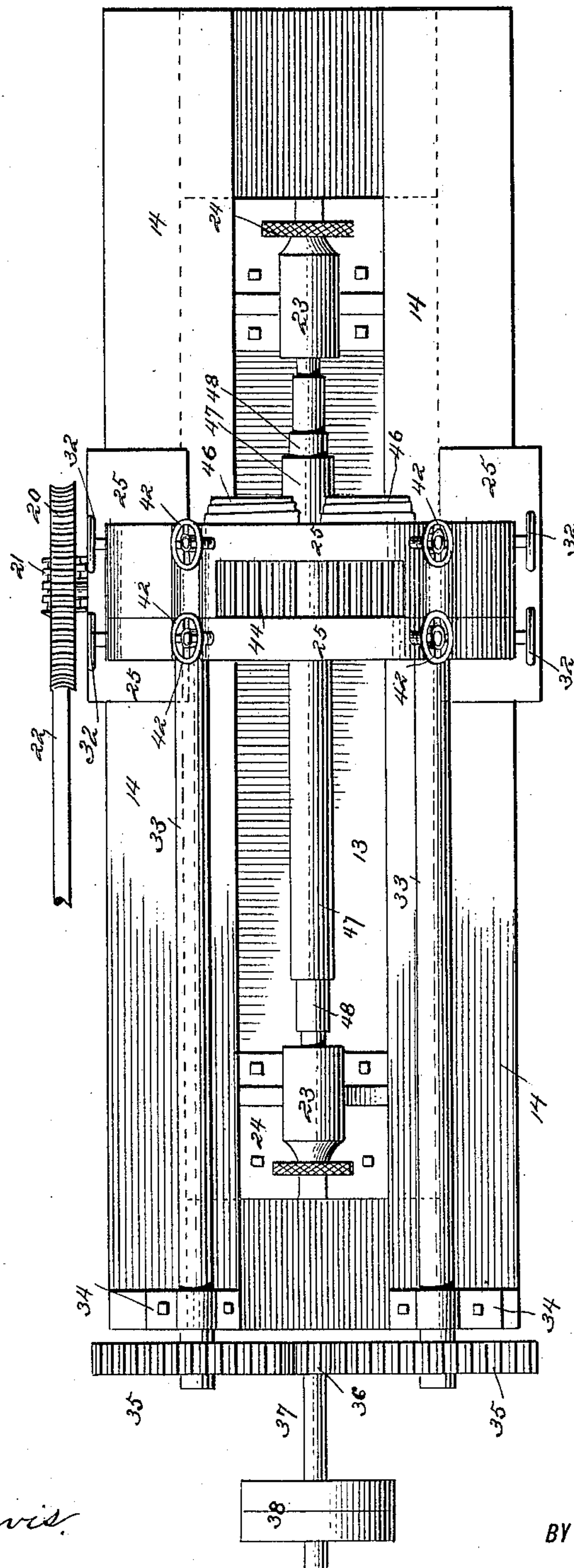
L. WHITE.

MACHINE FOR ROLLING SEAMLESS TUBES.

No. 432,464.

Patented July 15, 1890.

Fig. 1.



WITNESSES:

*W. R. Davis*  
*& Sedgwick*

INVENTOR:

*L. White*

BY

*Munn & Co*

ATTORNEYS.

(No Model.)

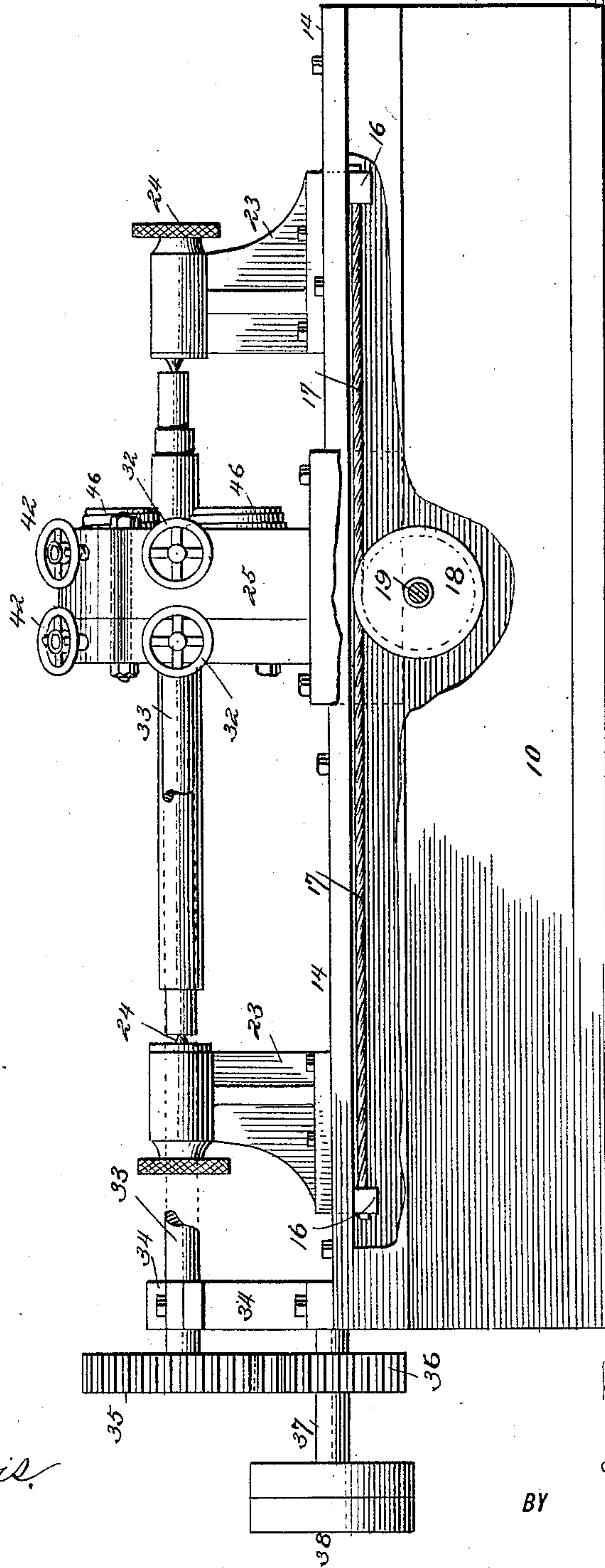
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Fig. 2.



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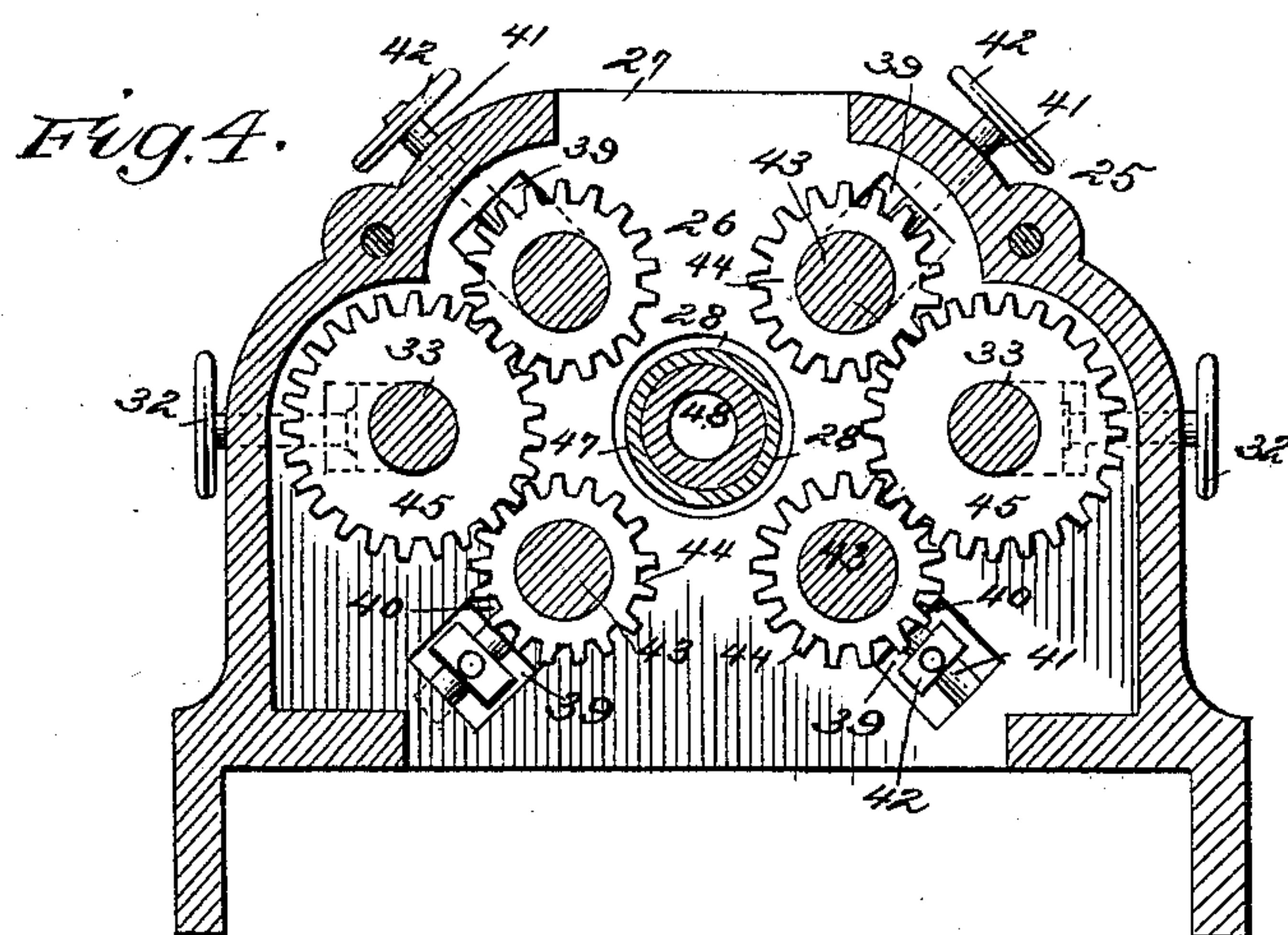
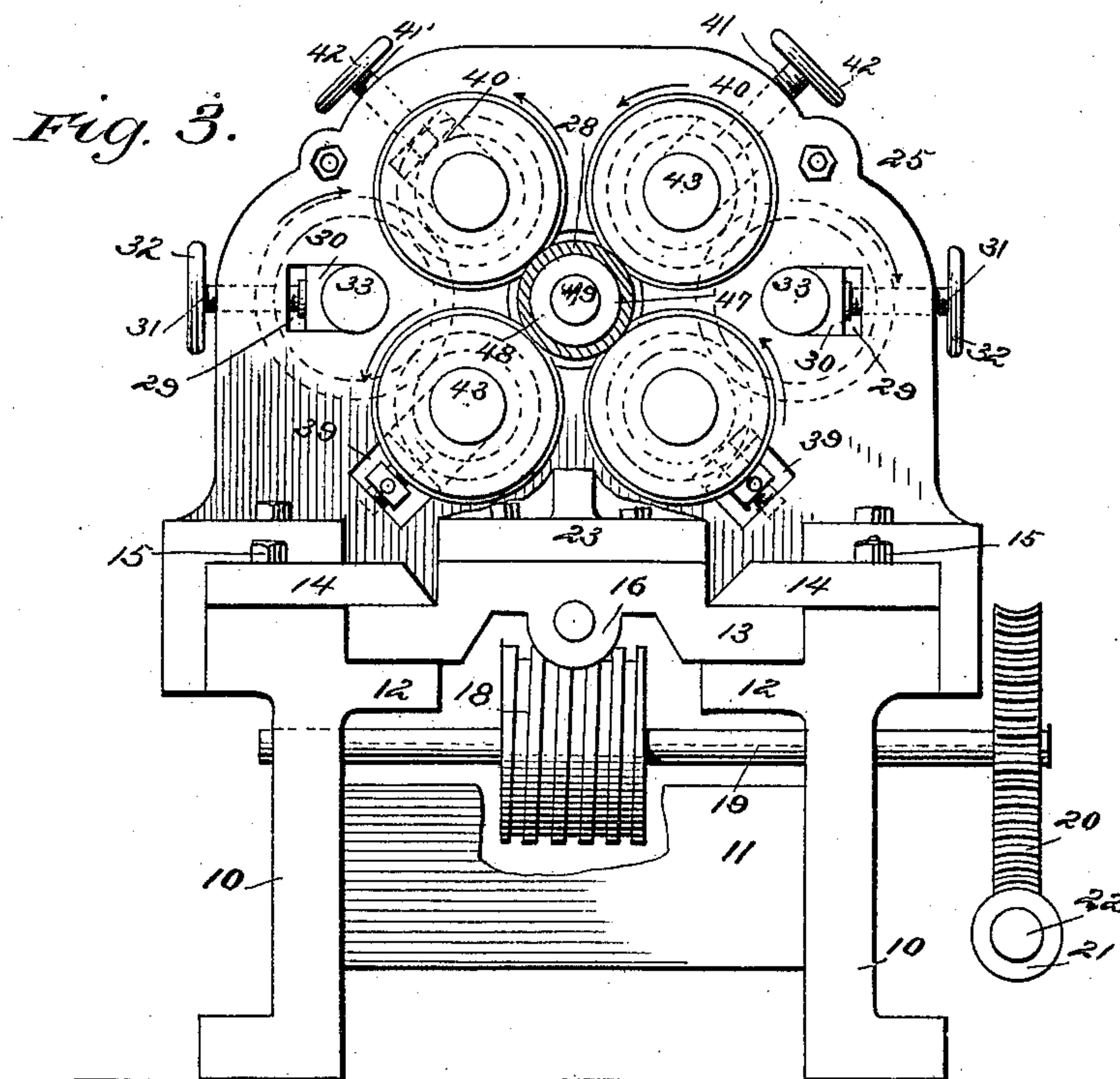
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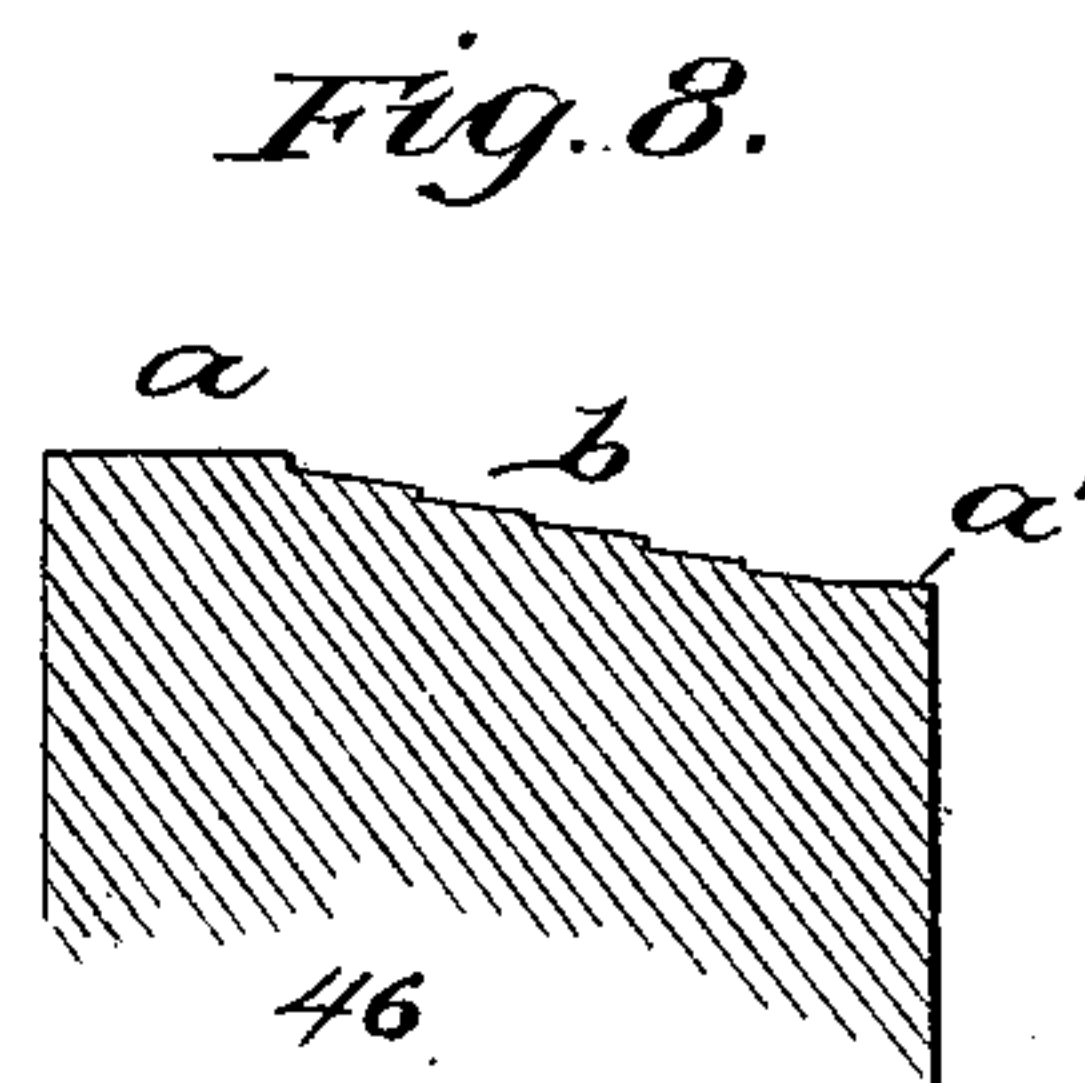
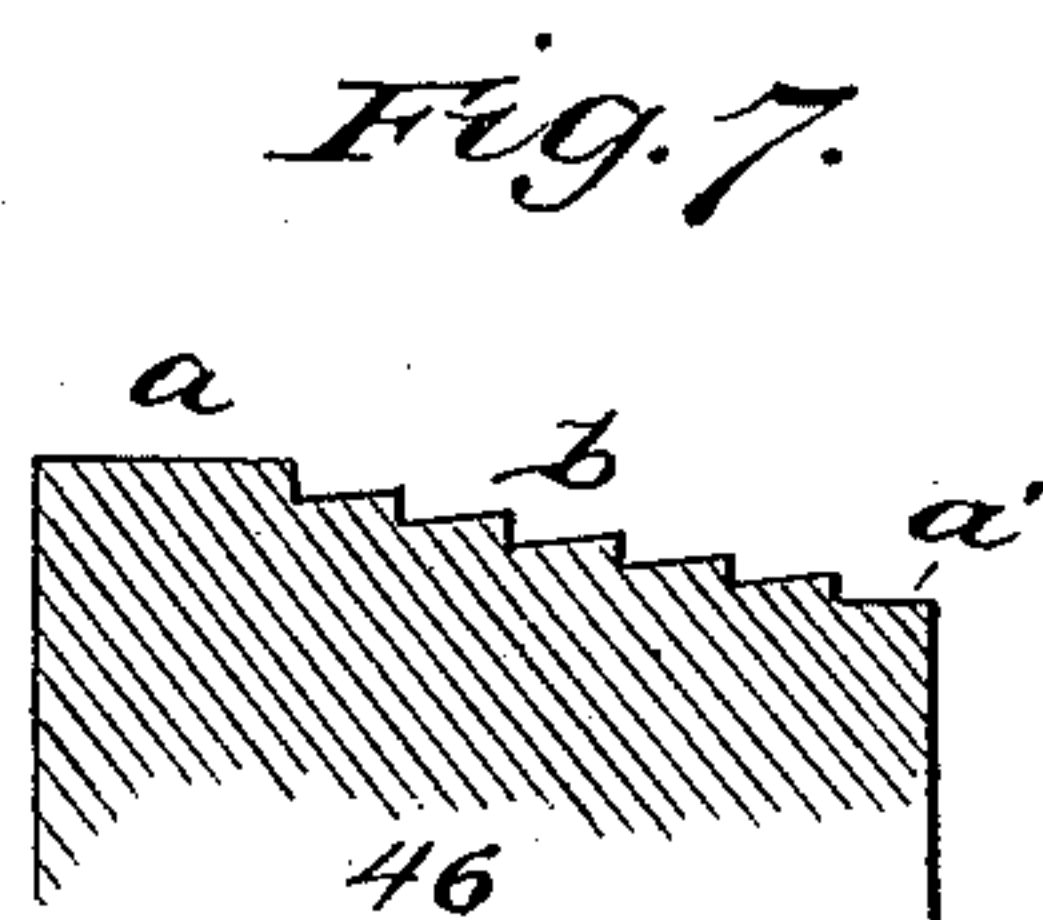
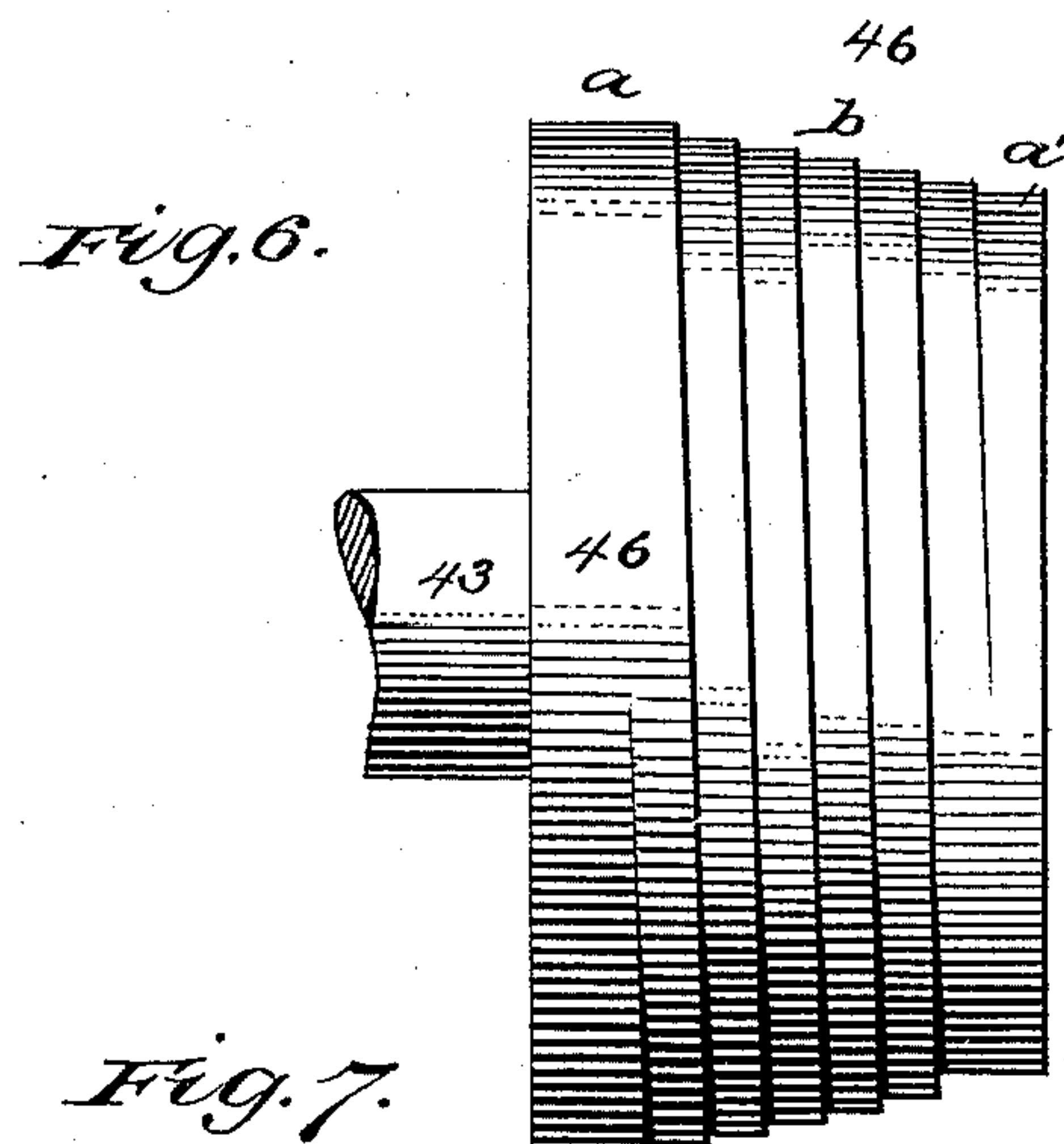
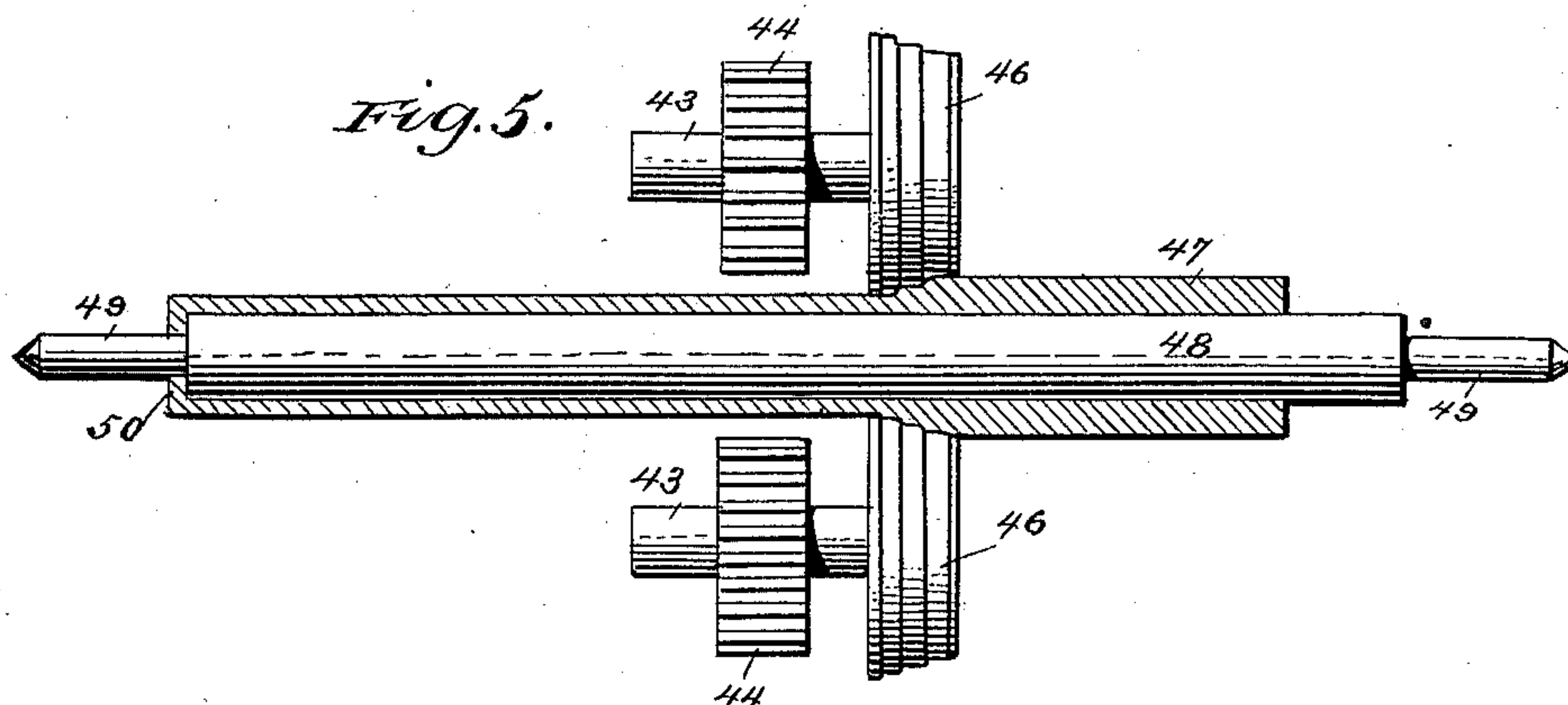
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# UNITED STATES PATENT OFFICE.

LYMAN WHITE, OF WATERBURY, CONNECTICUT, ASSIGNOR TO RANDOLPH  
& CLOWES, OF SAME PLACE.

## MACHINE FOR ROLLING SEAMLESS TUBES.

SPECIFICATION forming part of Letters Patent No. 432,464, dated July 15, 1890.

Application filed December 4, 1888. Renewed April 12, 1890. Serial No. 347,591. (No model.)

*To all whom it may concern:*

Be it known that I, LYMAN WHITE, of Waterbury, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Machines for Rolling Seamless Metal Tubes, of which the following is a full, clear, and exact description.

My invention relates to an improvement in machines for rolling seamless metal tubes from cylindrical castings, and has for its object to provide a machine of simple and effective construction, and a series of rolls adapted for attachment to the machine and capable of simultaneously reducing and lengthening the castings to produce a perfect tube.

The invention consists in the combination and construction of the several parts of the machine adapted to carry said rolls, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and figures of reference indicate corresponding parts in all the views.

Figure 1 is a plan view of the machine. Fig. 2 is a side elevation, partly broken away and disclosing the cable-drum and cable. Fig. 3 is an end view illustrating a partially-rolled casting in position and the mandrel in transverse section. Fig. 4 is a vertical section through the roll-head. Fig. 5 is a detail view illustrating a partially-rolled casting upon the mandrel and the bearing of the rolls thereof, the casting being in section. Fig. 6 is a side elevation of a roll, and Figs. 7 and 8 are partial sections of modified forms of the rolls.

The frame of the machine consists of two parallel side pieces 10, which side pieces are united by suitable webs 11 and provided near the top, upon their inner contiguous faces, with integral projecting horizontal ribs 12, adapted to form a seat or way for the longitudinal sliding carriage 13, as best illustrated in Fig. 3. The carriage is held in position upon the side pieces 10 by means of tie-plates 14, secured to the top of the side pieces by means of suitable tie-bolts 15, or in any other approved manner.

At each end of the carriage 13, upon the under side and preferably at the center, ears

16 are formed, in which ears the ends of a cable 17 are rigidly secured. The cable 17 is coiled upon a suitable cable-drum 18, secured to a shaft 19, journaled in the side pieces of the frame at the center and transversely of the same, as best illustrated in Figs. 2 and 3.

The cable-drum shaft 19 projects beyond one of the side pieces 10 of the frame, and upon the projecting extremity a worm-wheel 20 is rigidly secured, which worm-wheel is adapted to mesh with a worm 21, produced upon a line-shaft 22, as best shown in Figs. 1 and 3. The line-shaft 22 may be rotated in any suitable or approved manner.

Upon the upper face of the carriage 13, at or near the ends, a suitable stock or center post 23 is constructed, the said center posts being either rigidly or adjustably or detachably attached to said carriage and provided with the ordinary screw-points 24. The center points are adapted to hold the mandrel in position carrying the casting to be rolled, as will be hereinafter fully described.

At or near the center of the frame, upon the upper face, a roll-head 25 is rigidly attached, which roll-head preferably consists of two castings recessed upon the inner face, which castings are bolted together in any approved manner to produce an interior chamber 26, as best illustrated in Fig. 4. The roll-head 25 may or may not be provided with an opening 27 at the top, as illustrated in the drawings. In the center of the roll-head, transversely of the same, a circular opening 28 is produced, and at each side of the central opening and in horizontal alignment therewith a horizontal slot 29 is formed in each section of the said head, and in the said slots 29 a bearing-block 30 is held to slide, rendered adjustable through the medium of a screw 31, passing through the sides of the head into the block, the outer extremity of which screw is provided with an attached hand-wheel 32, or equivalent device for conveniently manipulating the screw. In the sliding blocks 30, at each side of the roll-head, a longitudinal shaft 33 is journaled, which shafts are carried rearward from the roll-head, and the rear extremity of each shaft is held to revolve in suitable bearings 34 rigidly attached to the rear end of the frame, as best illustrated in Figs. 1 and 2. At the



rear extremity of each of the said drive-shafts 33 a spur-wheel 35 is secured, adapted to mesh with the lower gear 36, mounted upon a short main drive-shaft 37, extending at a right angle from the rear of the frame, as best shown in Figs. 1 and 2, which main drive-shaft 37 is provided with suitable driving-pulleys 38. I do not, however, confine myself to this particular means for driving the shafts 33, as other equivalent mechanism may be substituted without departing from the spirit of this invention.

Above and below each of the horizontal slots 29 of the roll-head a diagonal slot 39 is produced, in which bearing-blocks 40 are held to slide, which blocks are manipulated by a screw 41 and hand-wheel 42, or its equivalent, in similar manner to the horizontal blocks 30, journaling the forward extremity of the shafts 33. In each aligning pair of the bearing-blocks 40 a short shaft 43 is journaled, the forward end of which shaft is carried beyond the roll-head. Each of the short shafts 43 is provided with a rigidly-attached pinion 44, as best shown in Figs. 4 and 5, the pinions upon the right being adapted to mesh with the spur-wheel 45, rigidly secured to the right-hand shaft 33 within the roll-head, and the pinions upon the left mesh in like manner with a similar spur-wheel 45, rigidly secured to the left-hand shaft 33.

It will be observed that, as the several shafts 33 and 43 are provided with two adjustable bearings in the roll-head, the adjustment of the said shafts may be accurately and minutely accomplished.

Upon the outer forward end of each of the short shafts 43 the rolls 46 are secured, adapted to reduce and form the tube. By reference to Fig. 3 it will be observed that the rolls 46 are arranged quartering and equidistant from the center of the central roll-head opening 28.

The construction of the drawing-rolls is fully illustrated in Figs. 6, 7, and 8, from which drawings it will be observed that the rear end is of greater diameter than the forward end, and that the two peripheral end surfaces  $a$   $a'$  are connected by a spiral inclined plane  $b$ , and that the surface intervening the two end surfaces is spirally stepped. The plane of the spiral may be either parallel with the axis of the roll, as illustrated in Fig. 6, or may verge slightly toward the axis, as shown in Fig. 7, or from the axis, as shown in Fig. 8. The purpose of this construction of the roll is to more readily draw in the tube while revolving and rolling it. The surfaces  $a$  and  $a'$  of the roll are parallel with the axis of the same, and the diameter of the inner end surface  $a'$  is such as just to meet the outer surface of the unrolled portion of the tube, while the diameter of the rear end surface  $a$  is such that it will finish the tube, or, in other words, remove any irregularities left therein by the spiral surface of the roll. The cylindrical casting 47 to be extended and re-

duced is placed upon a mandrel 48, provided with reduced extremities or necks 49, and the said casting at one end is bent, rolled, or otherwise manipulated and lapped over the rear end of the mandrel, as best illustrated at 50 in Fig. 5. The mandrel, with the tube upon it, is adapted to pass through the center opening 28 of the roll-head, and is held in a horizontal position parallel with the sliding carriage 13 by means of the centering screws of the center posts 23, as best illustrated in Figs. 1 and 2.

In operation the close-fitting cylindrical casting 47 is placed upon the mandrel 48, and the rear end of the mandrel is passed through the aperture 28 of the roll-head and supported by the centers. The drum-shaft 19 is then manipulated to cause the carriage 13 to travel rearward, whereupon the rear end of the casting is brought in contact with the peripheral surface  $a'$  of the roll, and the said roll being revolved will in turn revolve both the casting and the mandrel, and owing to the peculiar form of the said rolls above described and by the assistance of the cable attached to the carriage the two are passed through the head between the rolls and reduced in thickness and elongated thereby, as illustrated in Fig. 5.

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

1. The combination, with the mandrel, of a head having drawing-rolls journaled therein, with their axes parallel with the mandrel, each roller having its surface formed into a spiral inclined plane and having a cylindrical end surface at the base of the inclined plane and into which said inclined plane vanishes, substantially as set forth.

2. The combination, with the mandrel, of a head having conical drawing-rolls journaled therein, with their axes parallel with the mandrel, and each roll having a cylindrical end surface at the base of the cone and a spirally-stepped surface leading from the smaller end of the roller and vanishing into said cylindrical surface, substantially as set forth.

3. The combination, with the mandrel, of a head having conical drawing-rolls journaled therein, with their axes parallel with the mandrel, and each roll having a cylindrical end surface at the base of the cone and a spirally-stepped surface leading from the smaller end of the roller and vanishing into said cylindrical end, the said step being inclined, substantially as set forth.

4. The combination, with the frame and the reciprocating mandrel, of the head mounted on the frame and having an opening through which the mandrel passes, reducing or compressing rolls journaled in the said head equidistant from the mandrel, and gearing for rotating said rolls, substantially as set forth.

5. The combination, with a reciprocating mandrel, of a stationary head and a series of reducing-rolls journaled in the said head around



said mandrel and having their peripheral surface in two diameters connected by a spiral inclined plane, all combined for operation, substantially as shown and described.

5 6. The combination, with a horizontally-reciprocating mandrel, and a fixed head provided with adjustable bearings located in a plane transverse to the axis of the mandrel, of reducing-rolls journaled in said adjustable  
10 bearings around the mandrel, said rolls having their peripheral surface in two diameters connected by a spiral inclined plane, and means, substantially as shown and described, for revolving said rolls, as and for the purpose  
15 specified.

7. The combination, with a horizontally-reciprocating carriage provided with center posts, and a fixed head vertically extending above said carriage and provided with a series of adjustable bearing-blocks equidistant  
20 from the central opening of the head, of a series of reducing-rolls journaled in the said bearing-blocks around the opening in the head, said rolls having a peripheral surface,  
25 two diameters connected by a spiral inclined plane, a mandrel held between the center posts of the carriage and passing through the central opening of the head, and means, substantially as shown and described, for re-  
30 ciprocating the carriage and revolving the said rolls, as and for the purpose specified.

8. The combination, with the frame, a reciprocating carriage provided with center posts, and the mandrel held thereby, of a head on the frame transverse to the mandrel and having a central opening through which the mandrel passes, bearing-blocks in the head equidistant around said mandrel, compressing or reducing rolls journaled in said blocks, and means, substantially as described, for reciprocating the carriage and rotating the rolls, substantially as set forth. 35 40

9. The combination, with the mandrel, of the stationary head through which the mandrel passes, rolls journaled in said head, with their axes parallel and provided with pinions, and parallel shafts having pinions on their inner ends meshing into the roll-pinions, substantially as set forth. 45

10. The combination, with the frame and the roll-carrying head, of the reciprocating carriage having center posts, a mandrel held between said posts, a cable connected to the ends of the carriage, a drum around which the cable is wound, and a worm-gearing for  
50 55 rotating the drum, substantially as set forth.

LYMAN WHITE.

Witnesses:

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STEPHEN W. KELLOGG.