

(No Model.)

5 Sheets—Sheet 1.

H. DENNEY.  
MACHINE FOR MAKING PAPER TUBES.

No. 549,667.

Patented Nov. 12, 1895.

Fig: 1.

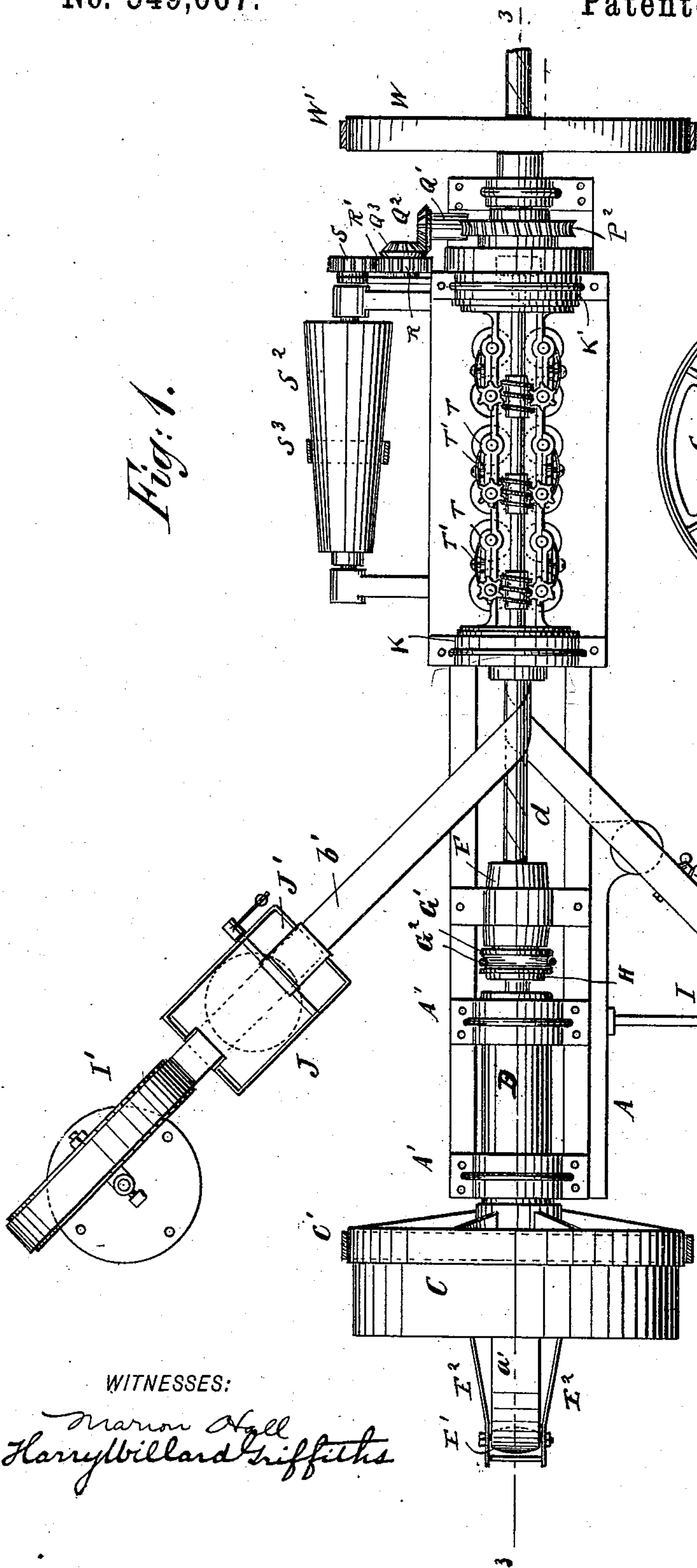
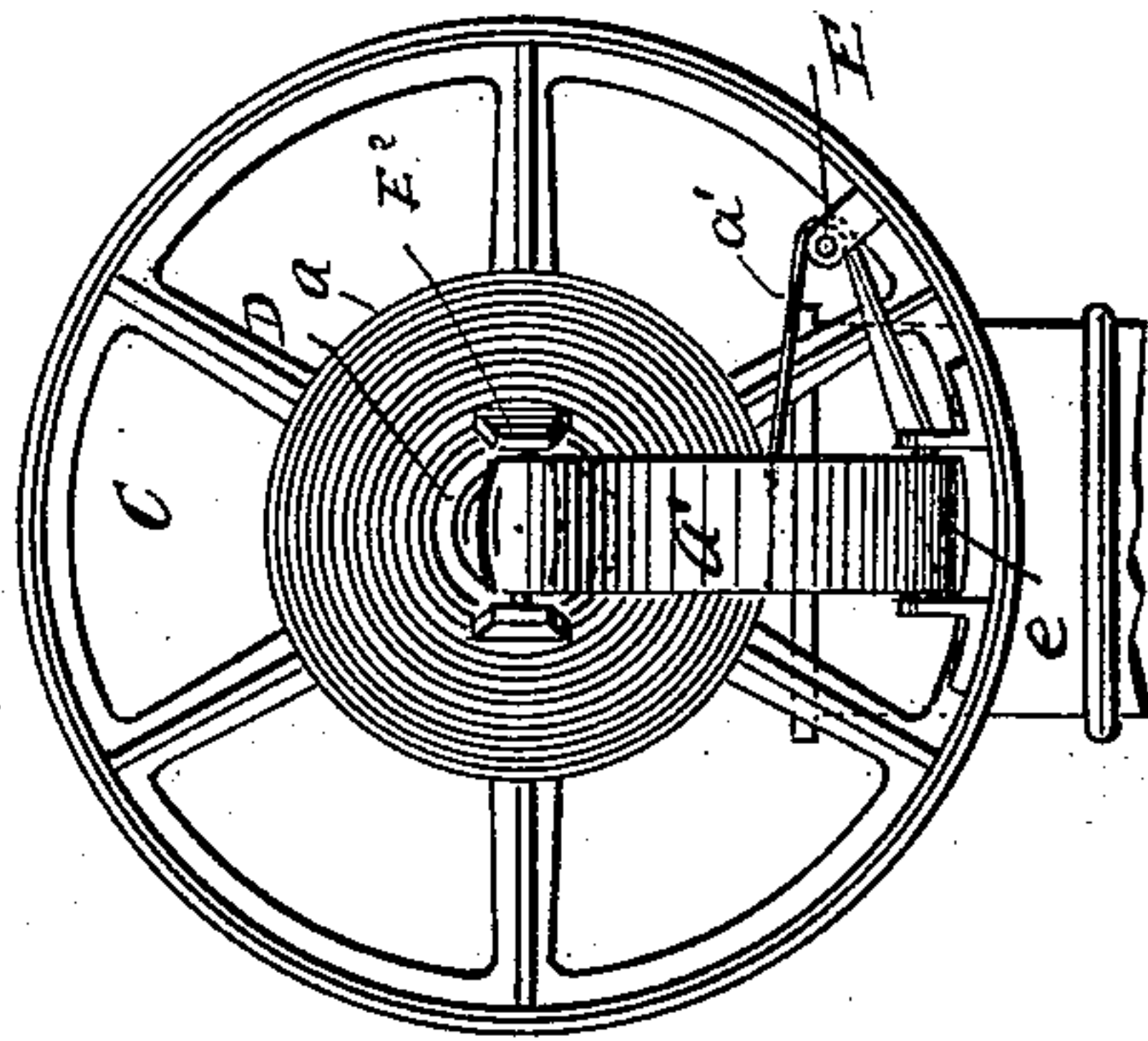


Fig: 2.



WITNESSES:

Marion Hall  
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INVENTOR

H. Denney.

BY

Georgel R. Rogers

ATTORNEYS.

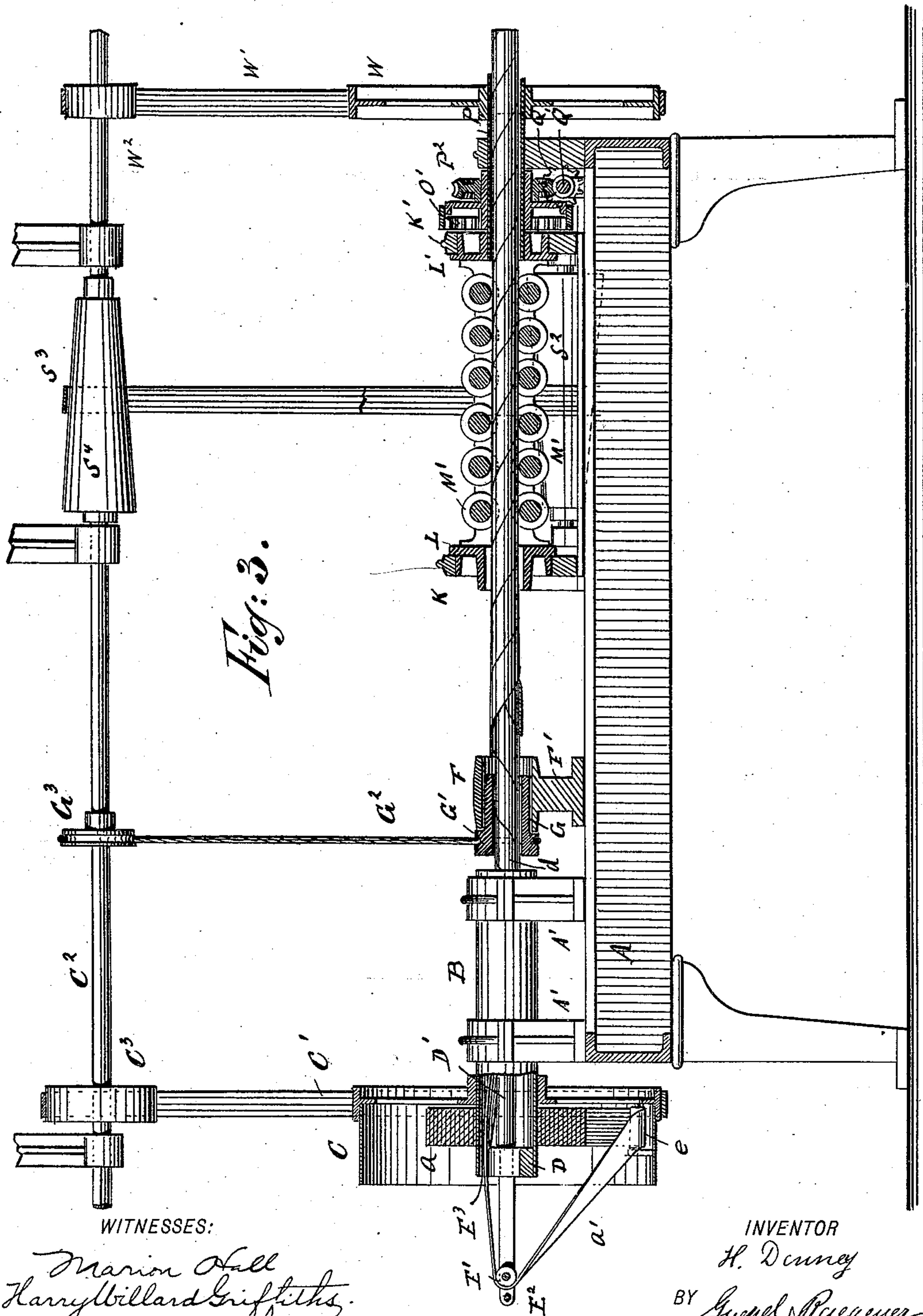
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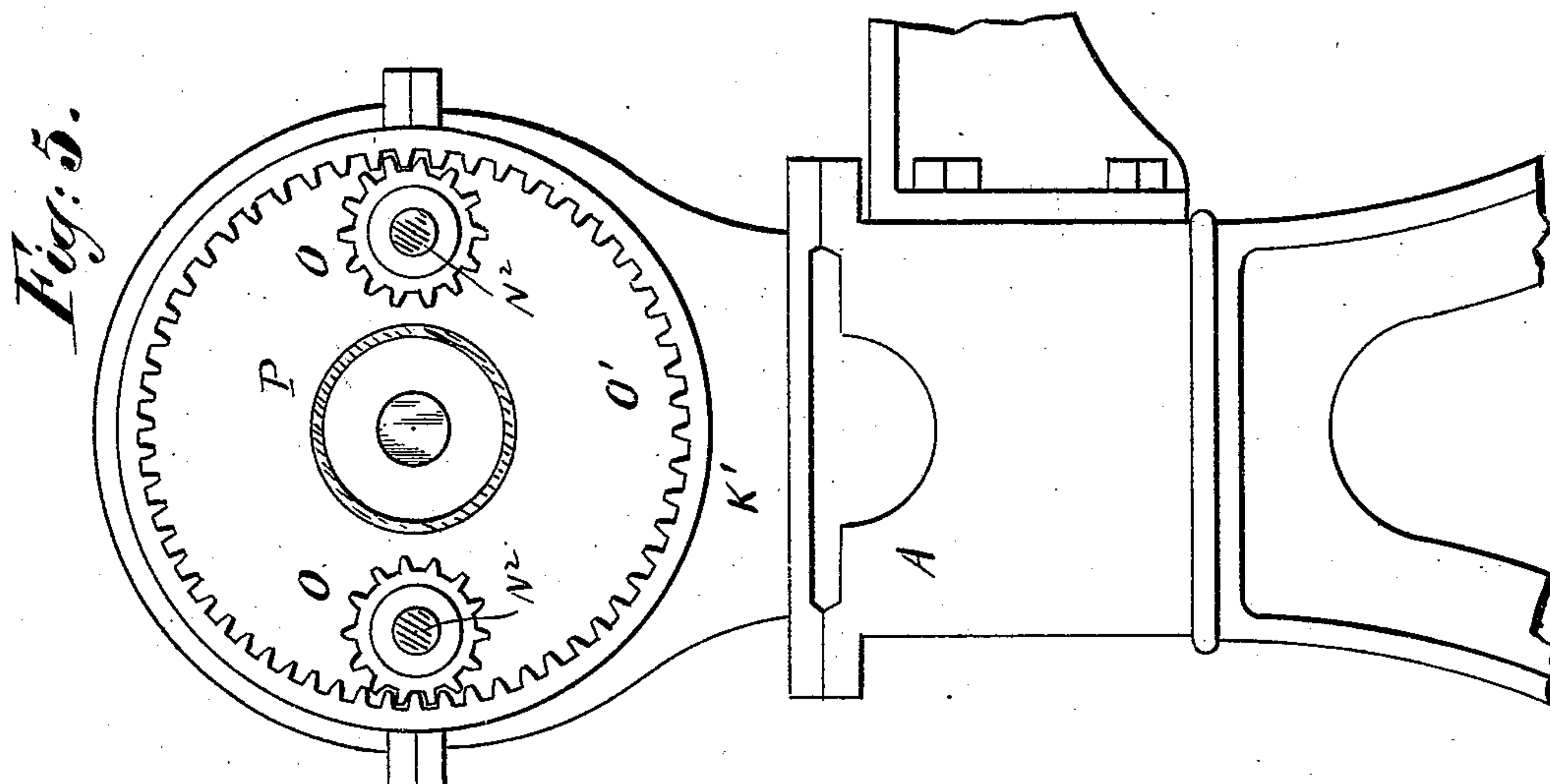
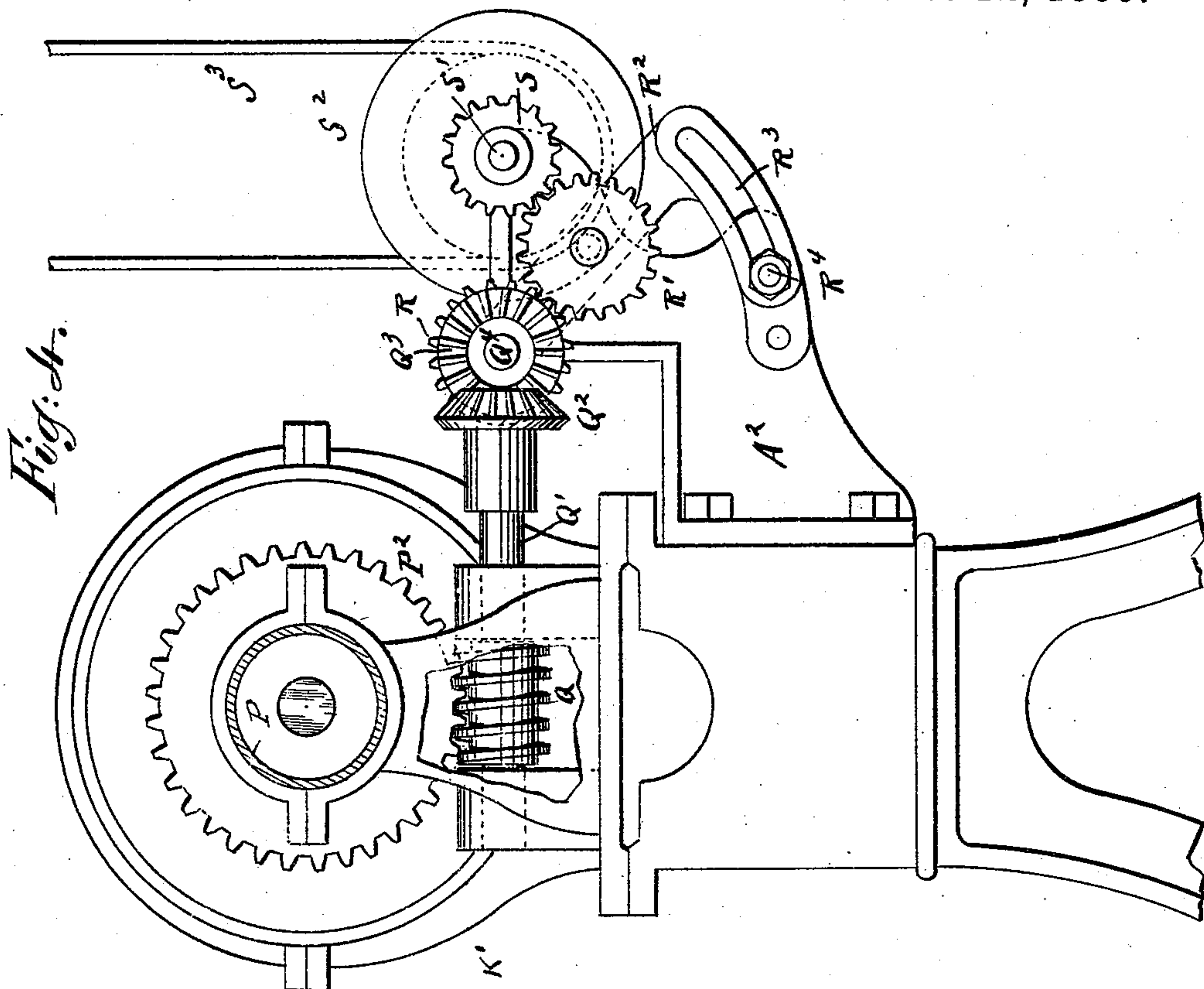
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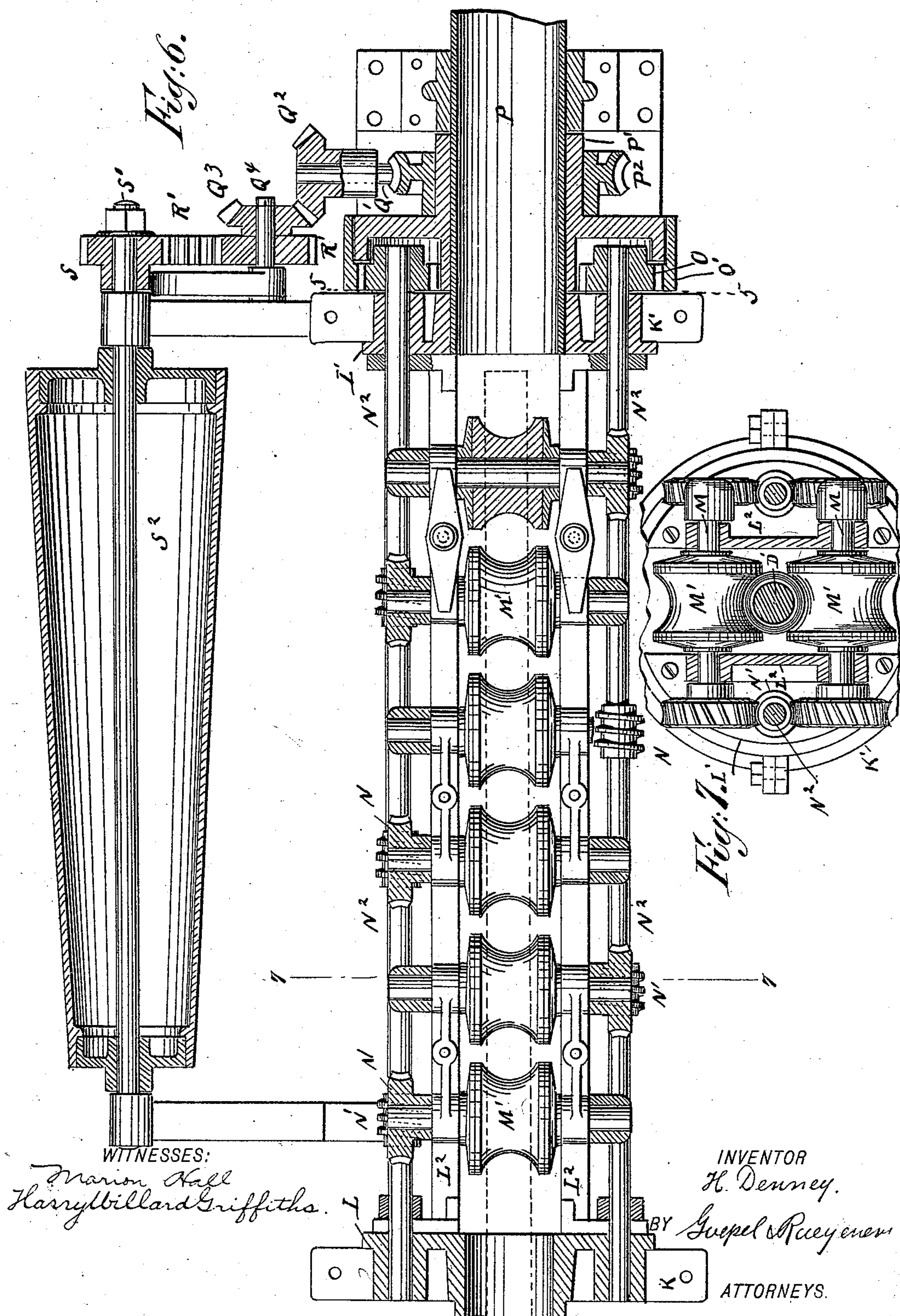
5 Sheets—Sheet 4.

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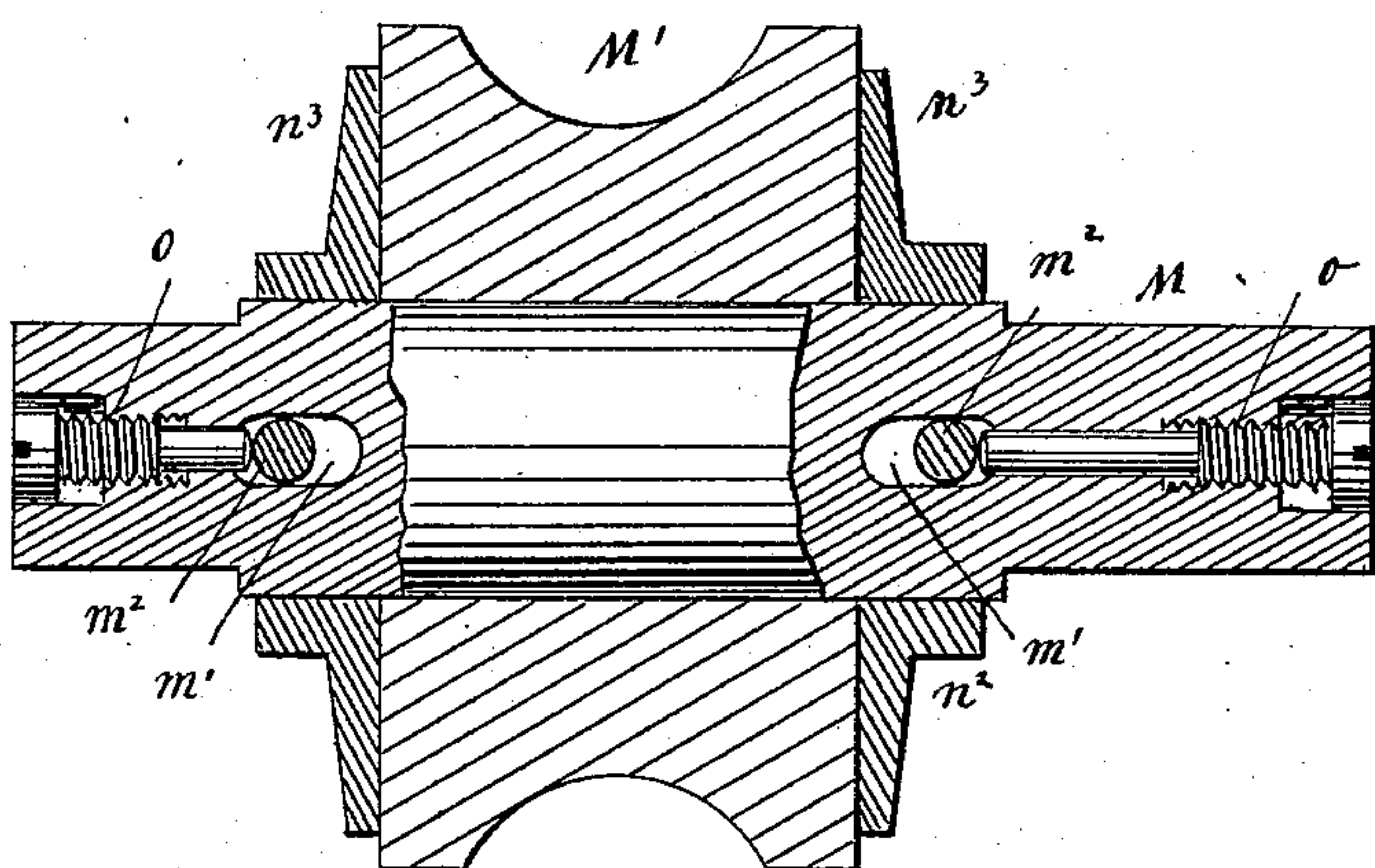
H. DENNEY.

MACHINE FOR MAKING PAPER TUBES.

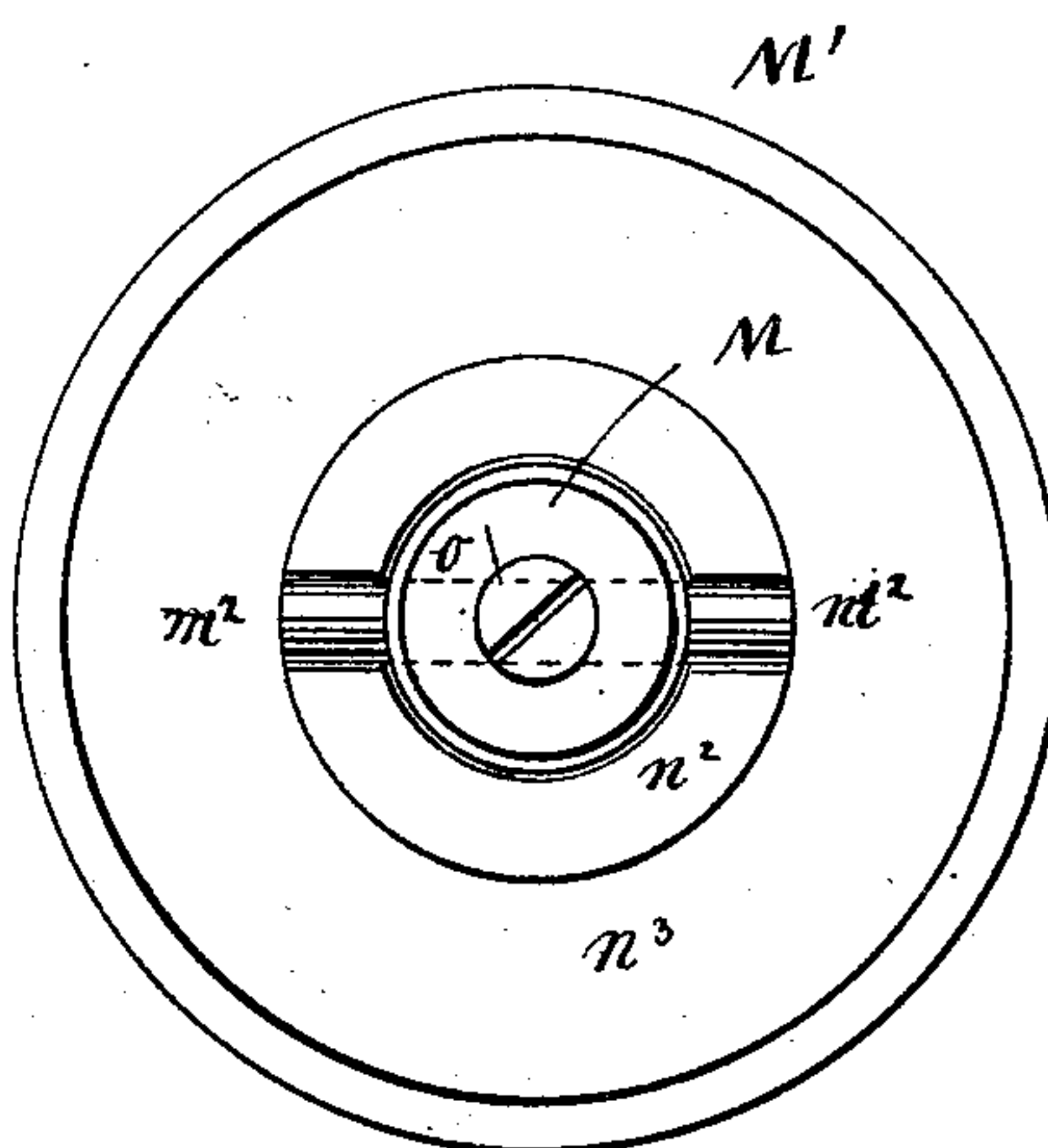
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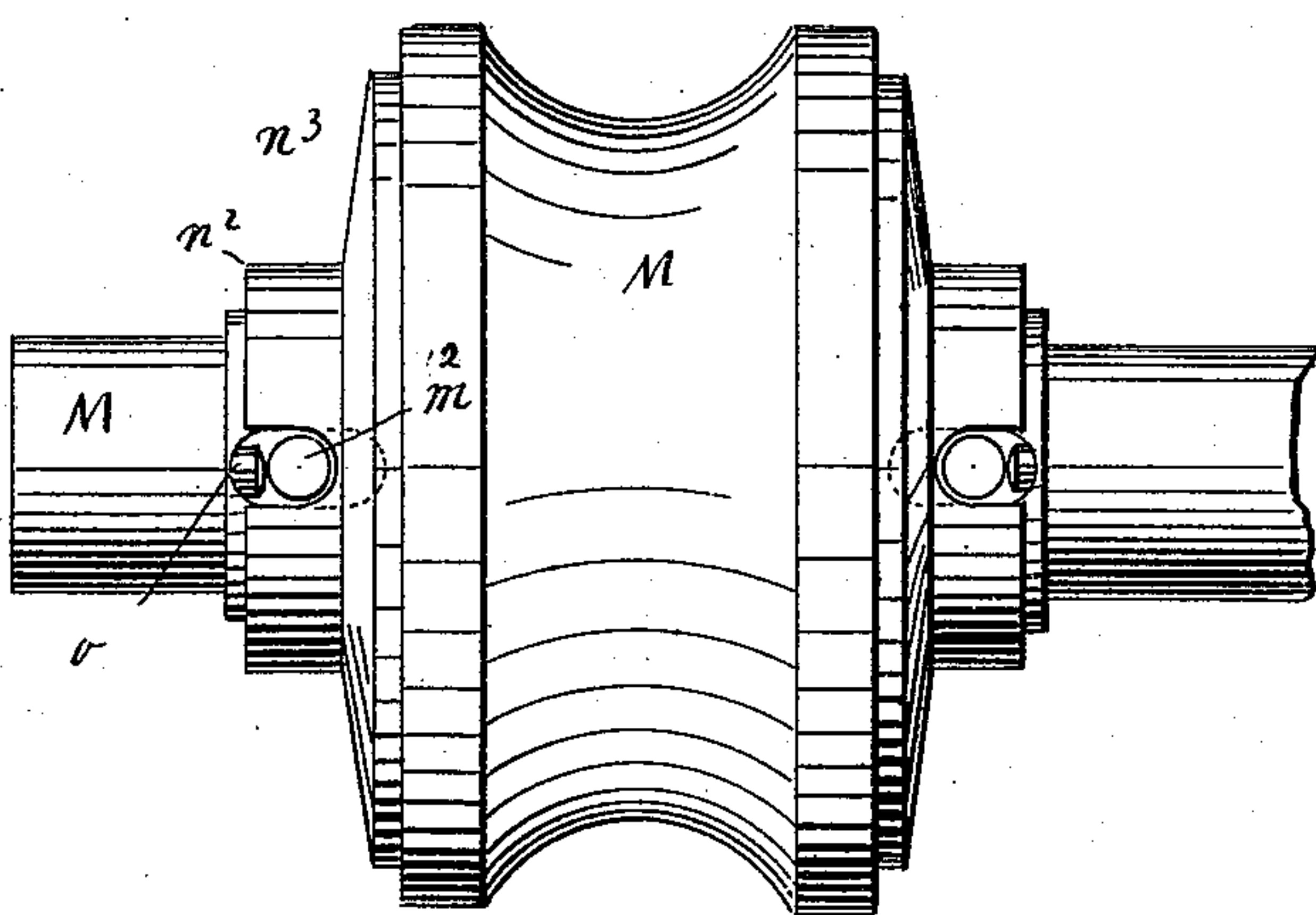
*Fig. 8.*



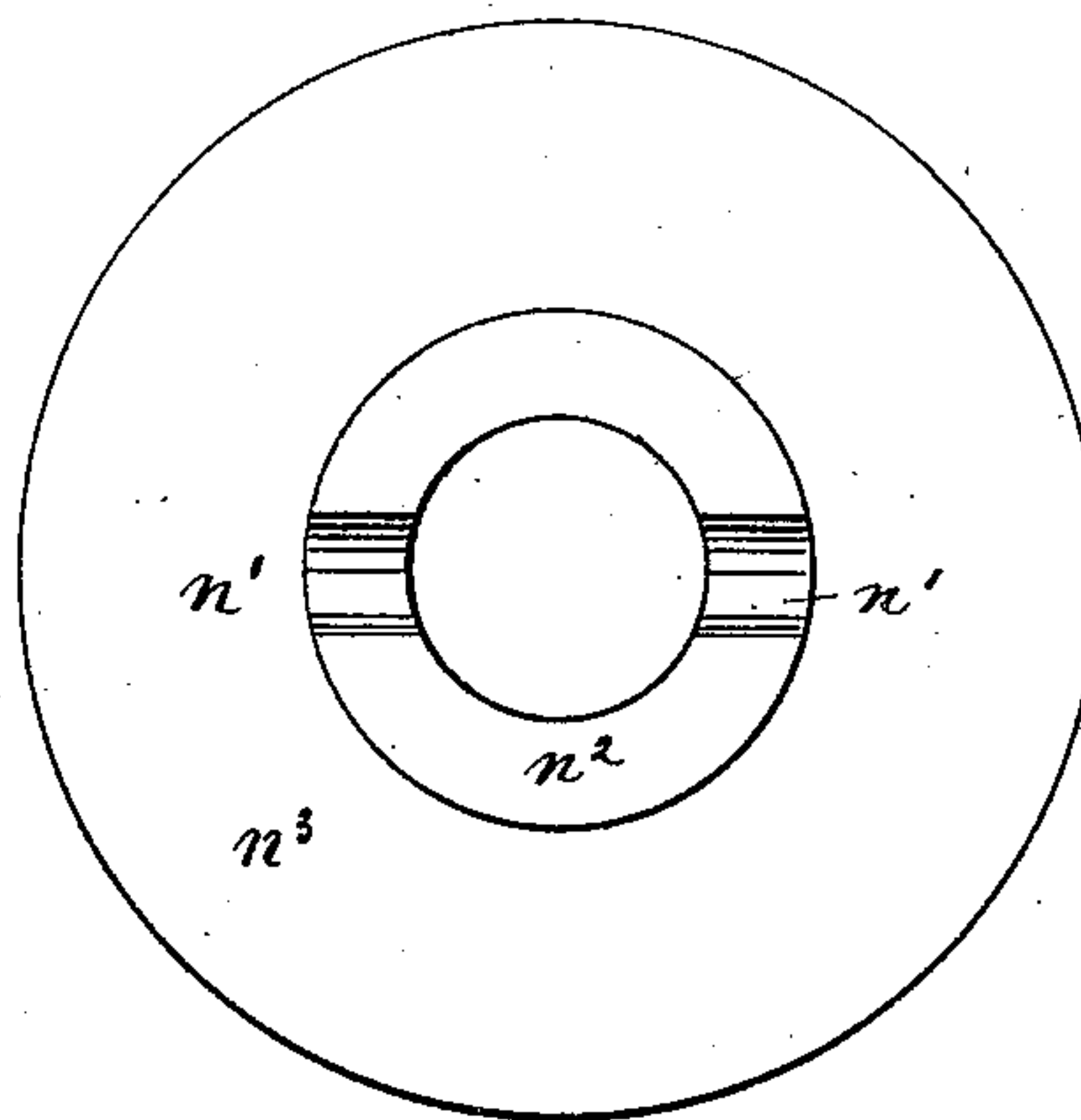
*Fig. 9.*



*Fig. 10.*



*Fig. 11.*



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# UNITED STATES PATENT OFFICE.

HARMER DENNEY, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED STATES MAILING TUBE COMPANY, OF CHICAGO, ILLINOIS.

## MACHINE FOR MAKING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 549,667, dated November 12, 1895.

Application filed December 7, 1892. Serial No. 454,326. (No model.)

*To all whom it may concern:*

Be it known that I, HARMER DENNEY, a citizen of the United States, and a resident of the city, county, and State of New York, have  
5 invented certain new and useful Improvements in Machines for Making Paper Tubes, of which the following is a specification.

This invention relates to improvements in machines for making paper tubes; and the  
10 object of my invention is to provide a machine of this kind which is simple in construction, strong, and durable, and in which the speed of the different parts of the machine can be so regulated that even when the  
15 paper is not of uniform width the same will be laid in such a manner as to form an absolutely close and tight joint in the tube produced.

The invention consists of a machine for  
20 making paper tubes, constructed with a rotary mandrel, means for conducting the tapering strip upon said mandrel, a rotary sleeve through which the strip passes, and a rotary frame provided with feed-rollers, between  
25 which feed-rollers the tubes pass after having passed through the rotary sleeve, which mandrel, sleeve, and rotary frame are rotated by independent power-transmitting devices.

The invention also consists in the construction and arrangement of numerous parts and details, as will be fully described and set forth hereinafter, and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is  
35 a plan view of my improved machine for making paper tubes. Fig. 2 is an end view of the reel, parts being broken out. Fig. 3 is a vertical longitudinal sectional view on the line 3 3 of Fig. 1. Fig. 4 is an end view of  
40 the machine, parts being broken out and others in section. Fig. 5 is a vertical transverse sectional view on the line 5 5, Fig. 6.

Fig. 6 is an enlarged detail sectional plan view through the feed-rollers and mechanism  
45 for operating the same. Fig. 7 is a vertical transverse sectional view on the line 7 7, Fig. 6. Fig. 8 is an enlarged detail longitudinal sectional view of one of the rubber pressure and feed rollers and its shaft. Fig.  
50 9 is an end view of the same. Fig. 10 is a

longitudinal side view of the same, and Fig. 11 is a face view of the end plate for the roller.

Similar letters of reference indicate corresponding parts.

On the two standards A' A' of the machine-frame A a tubular shaft B is mounted to turn, and on one end of the same is fixed a combined reel and belt-pulley C, over which a  
55 driving-belt C' passes from a pulley C<sup>3</sup> on a counter-shaft C<sup>2</sup>. The block D is fastened in one end of said shaft, and on said block a mandrel D' is fixed, which is located centrally in said tubular shaft B and rotates with the  
60 same.

A coil of paper *a* is wound on part of the tubular shaft B, projecting into the pulley or reel C, and the paper strip *a'* passes from the coil over pulleys E and *e*, mounted on the inner side of the rim of the pulley C, and from  
65 there passes over a pulley E', mounted between the ends of two arms E<sup>2</sup>, projecting from the block D in the direction of the length of the tubular shaft B, and from said pulley E' the strip *a'* passes through an opening E<sup>3</sup> in the block D to the mandrel D', upon  
70 which it is wound so as to form a spiral core. A sleeve F is formed on the upper end of the standard F' on the machine-frame A, the central axis of which sleeve is in line with  
75 the central axis of the tubular shaft B. Within said sleeve F a sleeve G is arranged, which is provided at its outer end with a belt-pulley G', over which a driving-belt G<sup>2</sup> passes, that  
80 also passes over a pulley G<sup>3</sup> on the counter-shaft C<sup>2</sup>.

At one side of the machine-frame a reel I is arranged, from which a strip of paper *b* is guided at an inclination upon the core *d*,  
85 formed by the paper strip *a'* on the mandrel, and at the other side of the machine a similar reel I' is arranged, from which a strip of paper *b'* also passes to the core *d*, said strip *b'* passing through a paste-pot J, having a suitable doctor or scraper J'  
90

On the two standards K K' of the machine-frame, arranged at that end of the frame opposite the one to which the reel or pulley C is located, two disks L L' are mounted to rotate, which disks are united by bars L<sup>2</sup>, in  
100



which bearings are formed for a series of shafts M, said shafts being provided alternately at opposite ends with the worm-wheels N, engaging worms N' on two shafts N<sup>2</sup>, arranged parallel with said bars L<sup>2</sup> and having their ends mounted to rotate in the disks L L'. Each shaft N<sup>2</sup> carries at one end a pinion O, which engages the circular rack O', having a hub P', mounted loosely on the sleeve P, one end of which is fixed centrally in the disk L'. On the hub P' a worm-wheel P<sup>2</sup> is fixed, which engages a worm Q on a horizontal shaft Q', arranged transversely to the length of the machine-frame and suitably journaled in bearings on the top of said machine-frame, which shaft Q' carries at its end a bevel cog-wheel Q<sup>2</sup>, engaging the bevel cog-wheel Q<sup>3</sup>, which is fixed on the same shaft Q<sup>4</sup> with a cog-wheel R, the shaft Q<sup>4</sup> of said united bevel cog-wheels Q<sup>3</sup> and R being mounted in a bracket A<sup>2</sup> on the side of the machine-frame. The cog-wheel R engages a cog-wheel R', mounted to turn on an L-shaped arm R<sup>2</sup>, that is mounted to swing on the shaft Q<sup>4</sup> of the bevel cog-wheel Q<sup>3</sup> and cog-wheel R, which L-shaped arm has a segmental slot R<sup>3</sup>, through which a bolt R<sup>4</sup> passes from the bracket A<sup>2</sup>. The cog-wheel R' engages a pinion S on the end of the shaft S' of a tapering drum S<sup>2</sup>, over which a driving-belt S<sup>3</sup> passes, that also passes over a tapering drum S<sup>4</sup>, fixed on the counter-shaft C<sup>2</sup>. The pinion S is interchangeable and can be replaced by a smaller or larger wheel, for a purpose that will be set forth hereinafter, and to permit of interchanging said cog-wheel the arm R<sup>2</sup>, on which the cog-wheel R' is mounted is made adjustable, so as to adapt it for the various sizes of wheels.

Between the bars L<sup>2</sup> a soft-rubber roller M' is mounted on each short transverse shaft M, the rim of each roller having a concave annular groove. As said rollers must be made interchangeable, so as to adapt the machine for tubes of various diameters, the same are constructed as shown in Figs. 8 to 11. The shaft M is provided with two transverse slots m', through which pins m<sup>2</sup> are passed, the ends of which rest in the notches n' of the central necks n<sup>2</sup> of the end plates n<sup>3</sup>, which are mounted loosely upon the shafts M and rest against the side faces of the rollers M'. Screws o are screwed into threaded apertures extending from the ends of the shafts M to the slots m', the inner ends of said screws o bearing against the transverse pins m<sup>2</sup>. Said screws press the transverse pins m<sup>2</sup> against the necks n<sup>2</sup> of the disks n<sup>3</sup> and thus press said disks n<sup>3</sup> against the sides of the rubber rollers M', thereby holding said rollers in the proper place on the shafts M.

Whenever a roller is to be removed, the screws o are loosened, so as to permit of removing the pins m<sup>2</sup>, and then the end disks n<sup>3</sup> and the roller M' are removed and a new roller is placed upon the shaft with the end

disks n<sup>3</sup>, the pins m<sup>2</sup> are replaced, and the screws o drawn up so as to press said pins m<sup>2</sup> against the end disks and said disks against the sides of the rubber roller. In this way the machine can easily be adjustable for tubes of various diameters. Said rollers M' must be interchanged to suit the various sizes of the tubes, and to facilitate this interchanging the shafts of the rollers are held in place by detachable bearing-blocks T, (see Fig. 1,) which are held in place by bow-springs T', fastened by screws T<sup>2</sup> to the bars L<sup>2</sup>, each bow-spring resting on two adjacent bearing-blocks. The mandrel D' passes between the two sets of rollers M'. A belt-pulley W is fixed on the sleeve P, and over the same a belt W' passes, that also passes over a pulley W<sup>2</sup> on the counter-shaft C<sup>2</sup>.

The operation is as follows: The paper strip a' is drawn from the reel upon the mandrel and is wound upon the same spirally by hand until the coils of the spiral have been passed through the rotating sleeve G, the belt and pulleys of which are so arranged that the speed of said sleeve is different from that of the mandrel. This rotating sleeve holds the paper coil snugly on the mandrel and prevents unwinding of the same. Immediately beyond the sleeve G the two paper strips b b' are wound upon the core on the mandrel, the strip b', which is provided with paste on both sides, being wound on first, and the strip b is wound directly upon the strip b'. The completed tube now passes on the mandrel in between the rubber feed-rollers M' and the rotating frame formed by the disks L L' and the bars L<sup>2</sup>, and thereby the several layers of paper forming the tube are pressed together by the grooved rubber feed-rollers M' and at the same time the tube is drawn forward. The speed of rotation of said rotating frame on its longitudinal axis must be different from the speed of rotation of the mandrel and its pulley, so as to form the spirals. As said frame rotates, the pinions O on the shafts N<sup>2</sup> are rotated as they are engaged with the circular rack O'. The said circular rack is rotated around the cylinder P by means of the worm-wheels and gearing described and the belt S<sup>2</sup> from the shaft C<sup>2</sup>. Accordingly as said circular rack O' is rotated with greater or less speed, or in the same direction or the reverse direction of said pinions O, the speed of rotation of the shafts N<sup>2</sup>, and consequently the speed of rotation of the shafts M of the rollers M', varies. The paper strips are not always of the same width and thickness, and in order to cause the edges of said paper strips to lie snugly and closely against each other, so as to form close and tight joints, it is necessary to regulate and govern the speed of rotation of the feed-rollers M' accordingly. The operator of the machine can easily accomplish this by varying the speed of rotation of the circular rack O' around the cylinder P. The said feed-rollers M' press the



layers of paper firmly against each other and firmly against the mandrel D', which, as shown in dotted lines in Fig. 3, passes in between the two layers or sets of rollers M'.

5 The mandrel D' rotates in the same direction as the frame formed by the two disks L L' and the bars L<sup>2</sup> uniting them, but, as stated before, the speed of rotation of said frame is different from the speed of rotation of the  
10 mandrel. The rubber feed-rollers M' do not only press the strips of paper against each other and against the mandrel, but at the same time they move the tube forward in the direction of its length by drawing it off the  
15 mandrel, which travels, as has been previously stated, at a rotary speed different from the speed of rotation of the frame formed by the disks L L' and the bars L<sup>2</sup> uniting them, both said frame and the mandrel rotating on  
20 the same longitudinal axis. As the mandrel runs in between the rubber feed-rollers it permits of exerting considerable pressure by said rollers on the tube without crushing the latter, and thus a friction can be obtained be-  
25 tween the feed-rollers and the tube to draw the tube off the mandrel and move it in the direction of its length uniformly.

The variation of speed that can be accomplished by shifting the belt S<sup>3</sup> on the two  
30 pulleys S<sup>2</sup> and S<sup>4</sup> has certain limitations, and sometimes it is necessary to adjust the machine beyond these limitations, and in that case the pinion S is removed from the shaft S' and is replaced by a wheel of greater or  
35 less diameter.

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

1. In a machine for making paper tubes, the combination with a rotary tubular shaft,  
40 of a mandrel held concentrically in the same, a paper-holding reel on said tubular shaft, the plane of rotation of said reel being at right-angles to the longitudinal axis of the  
45 tubular shaft, and means for drawing the paper from said reel forward upon the mandrel and winding it upon said mandrel, substantially as set forth.

2. In a machine for making paper tubes, the combination with a rotary tubular shaft,  
50 of a mandrel mounted centrally in the same to rotate therewith, a reel mounted on the end of the tubular shaft, guide-rollers for a paper strip at the circumference of the reel, a guide-roller mounted on a projecting arm  
55 of the reel and means for drawing the paper unwound from the reel upon the mandrel and drawing the paper lengthwise on the mandrel and also winding it on said mandrel,  
60 substantially as set forth.

3. In a machine for making paper tubes, the combination with a rotary tubular shaft, of a reel fixed on one end of the same, the  
65 plane of the reel being at right-angles to the axis of the tubular shaft, a mandrel in said tubular shaft mounted to rotate therewith,

means for guiding the paper from the reel upon the mandrel, means for winding the paper on the mandrel, and devices for guiding additional paper strips upon the strip on  
70 the mandrel, substantially as set forth.

4. In a machine for making paper tubes, the combination with a mandrel and means for guiding a strip of paper upon said mandrel, means for supplying strips of paper to  
75 be wound upon the strip guided upon the mandrel, a rotary frame having a speed different from that of the mandrel, a rotative circular rack at one end of said frame, longitudinal shafts in said rotary frame rotating  
80 at less speed than the frame, pinions on the ends of said shafts engaging said rotative circular rack, a series of feed rollers in the frame and gearing for rotating said feed rollers from the above mentioned shafts in the  
85 frame, substantially as set forth.

5. In a machine for making paper tubes, the combination with a mandrel, of means for guiding a strip of paper upon the same, means for supplying strips of paper to be  
90 wound on the strip on the mandrel, a rotating frame having a speed different from that of the mandrel, a series of feed rollers on said frame, bearing blocks for the shafts of said feed rollers and springs held between  
95 the bearing blocks, each spring resting on two adjacent bearing blocks, substantially as herein shown and described.

6. In a machine for making paper tubes, the combination with a rotary tubular shaft,  
100 of a mandrel in the same, means for guiding paper upon the mandrel, a rotary frame, a series of feed-rollers mounted in said frame to rotate with the frame and to rotate on their own axes, and means for rotating said rotary frame  
105 at a speed varying from the speed of the mandrel, which means for rotating the frame are independent of the means for rotating the mandrel, substantially as set forth.

7. In a machine for making paper tubes, the combination with a rotating mandrel, of  
110 means for guiding a strip of paper upon the mandrel, a rotating sleeve through which the mandrel passes and a rotating frame carrying a series of feed rollers mounted to rotate with-  
115 in the frame on their own axes and means for rotating said sleeve and said frame at speeds differing from that of the mandrel, substantially as set forth.

8. In a machine for making paper tubes, the combination with a tubular shaft, of means  
120 for guiding a strip of paper on the mandrel, a mandrel held in the same, a rotating sleeve at one end of said tubular shaft and in line with the center of the same, and a rotating  
125 frame carrying feed rollers, which rollers are mounted to rotate on their own axes and means for rotating said sleeve and frame at speeds differing from that of the mandrel, substantially as set forth.  
130

9. In a machine for making paper tubes, the combination with a mandrel, of means for



guiding a strip of paper on the mandrel, a rotating sleeve and a rotating tube-feeding device, each driven by an independent power-transmitting device at speeds differing from  
5 that of the mandrel, substantially as set forth.

10 10. In a machine for making paper tubes, the combination with a rotating mandrel, means for guiding paper on the same, a rotating frame, means for rotating the same at a speed differing from that of the mandrel, rollers in said frame, means for rotating said  
15 rollers in the rotating frame on their own axes, and means for varying the speed of rotation of said feed rollers, substantially as set forth.

20 11. In a machine for making paper tubes, the combination with a rotating mandrel, of means for feeding paper to the same, a rotating frame, means for rotating the same at a speed differing from that of the mandrel, rotative feed rollers in said frame, and means  
for varying the speed of rotation of said ro-

tary feed rollers independent of the speed of the rotative frame, substantially as set forth.

25 12. In a machine for making paper tubes, the combination with standards, of disks mounted to rotate in the same, bars connecting the disks, feed rollers mounted between the bars, worms on the ends of the feed roller shafts, worm-shafts mounted in said disks parallel to the bars connecting the disks, pinions  
30 on the ends of said shafts, a rotative circular rack engaging the pinions, a sleeve on one of the disks, a worm-wheel mounted on the hub of the circular rack and gearing for transmitting motion to said worm-wheel, substantially  
35 as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

HARMER DENNEY.

Witnesses:

OSCAR F. GUNZ,  
CHARLES SCHROEDER.