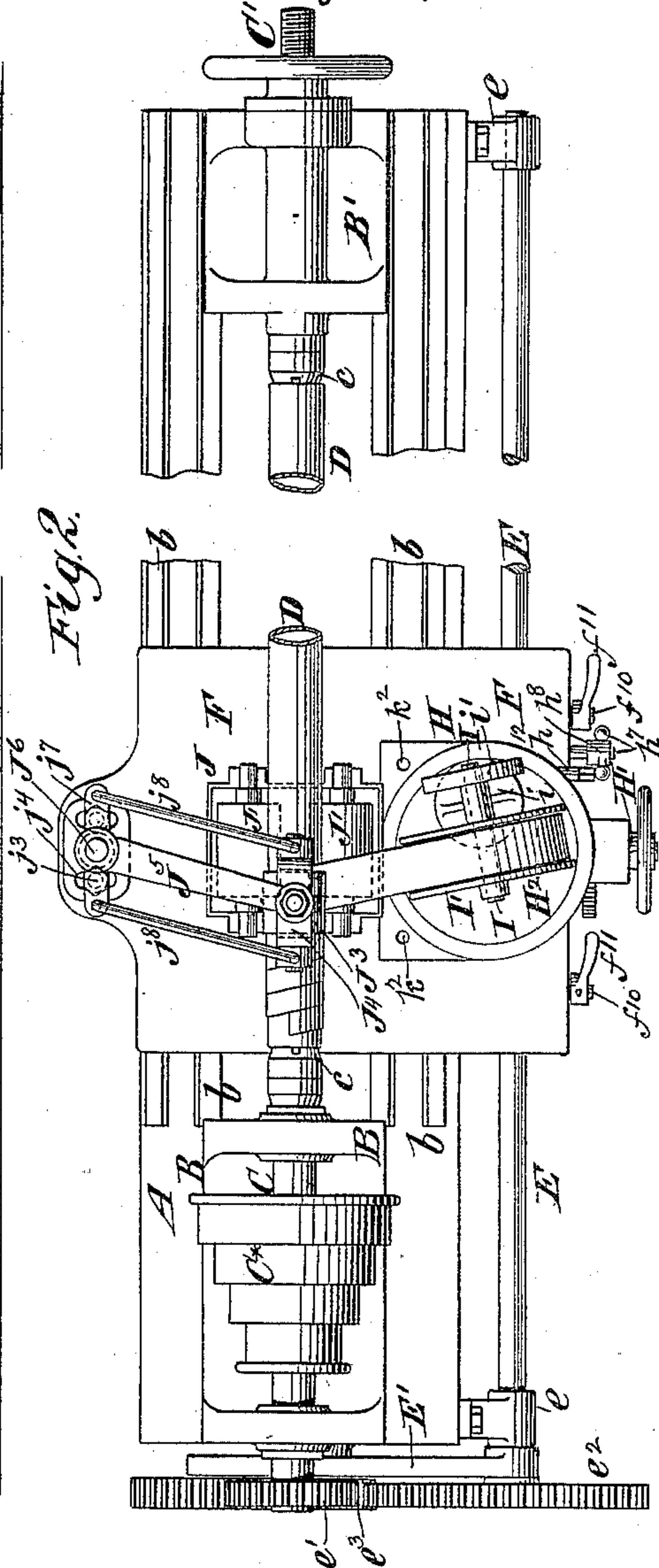


2 Sheets—Sheet 1.

Patented May 13, 1890.



Inventor:  
Edwin D. McCracken  
by his attys  
Brown & Hall.

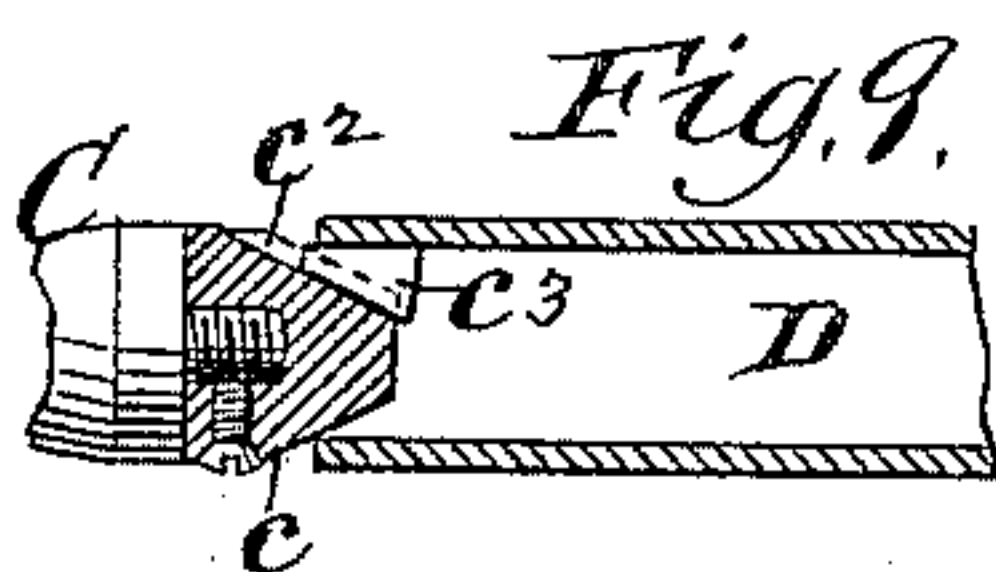
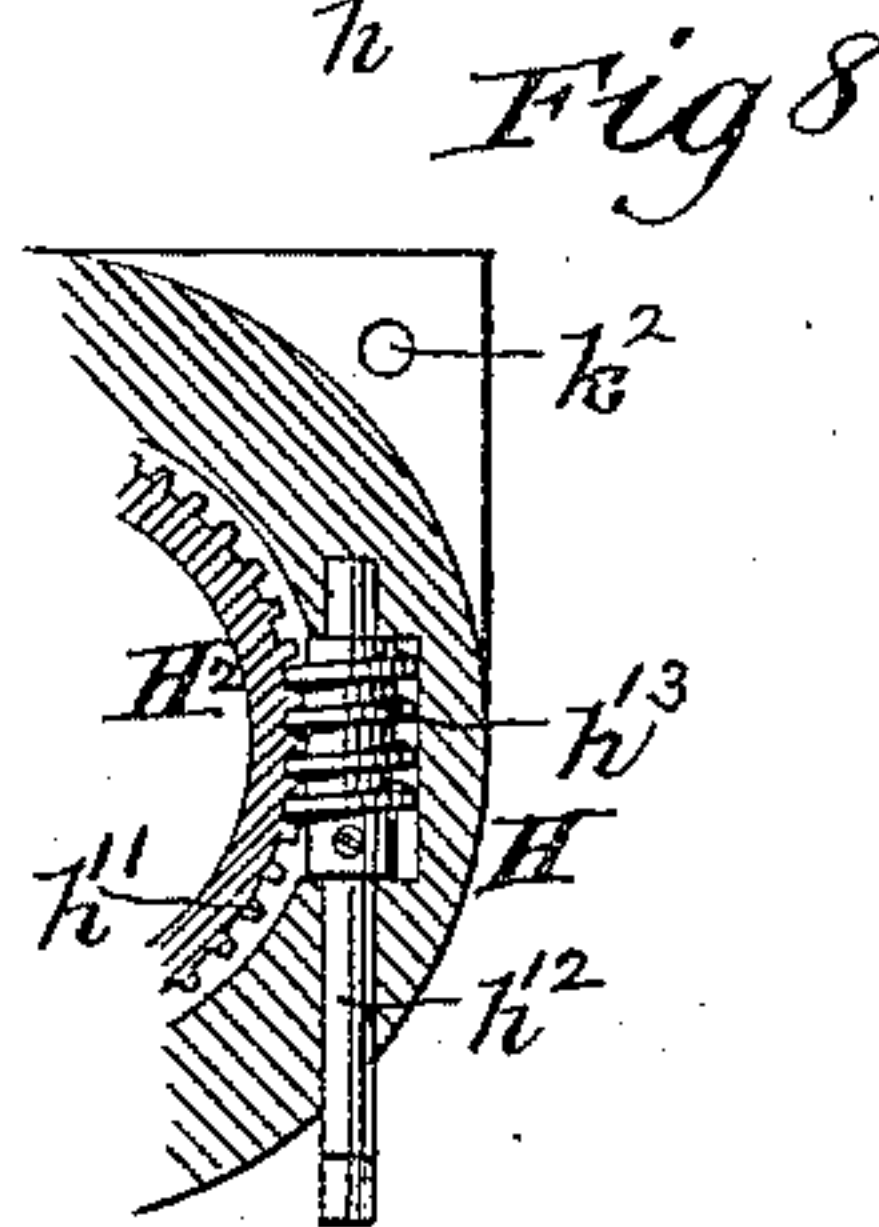
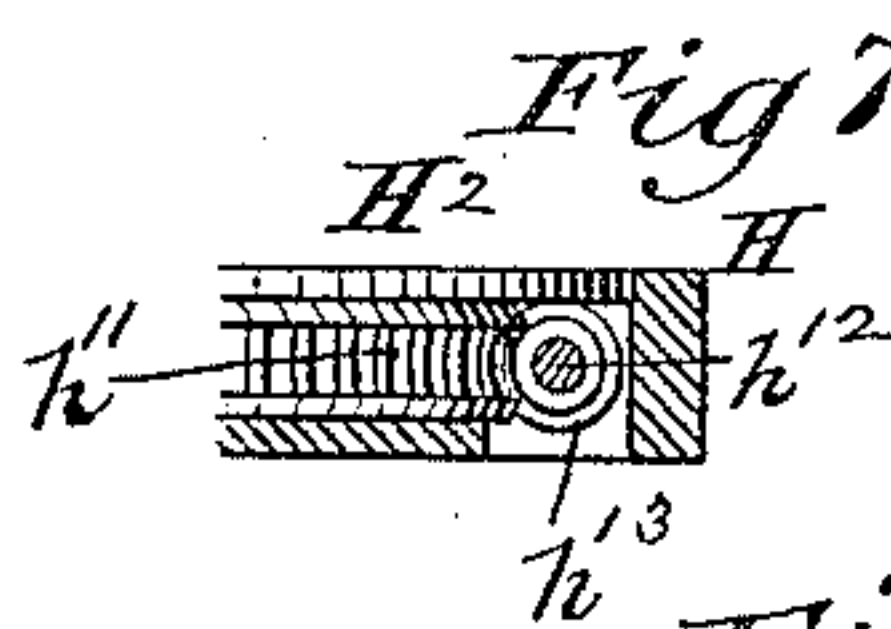
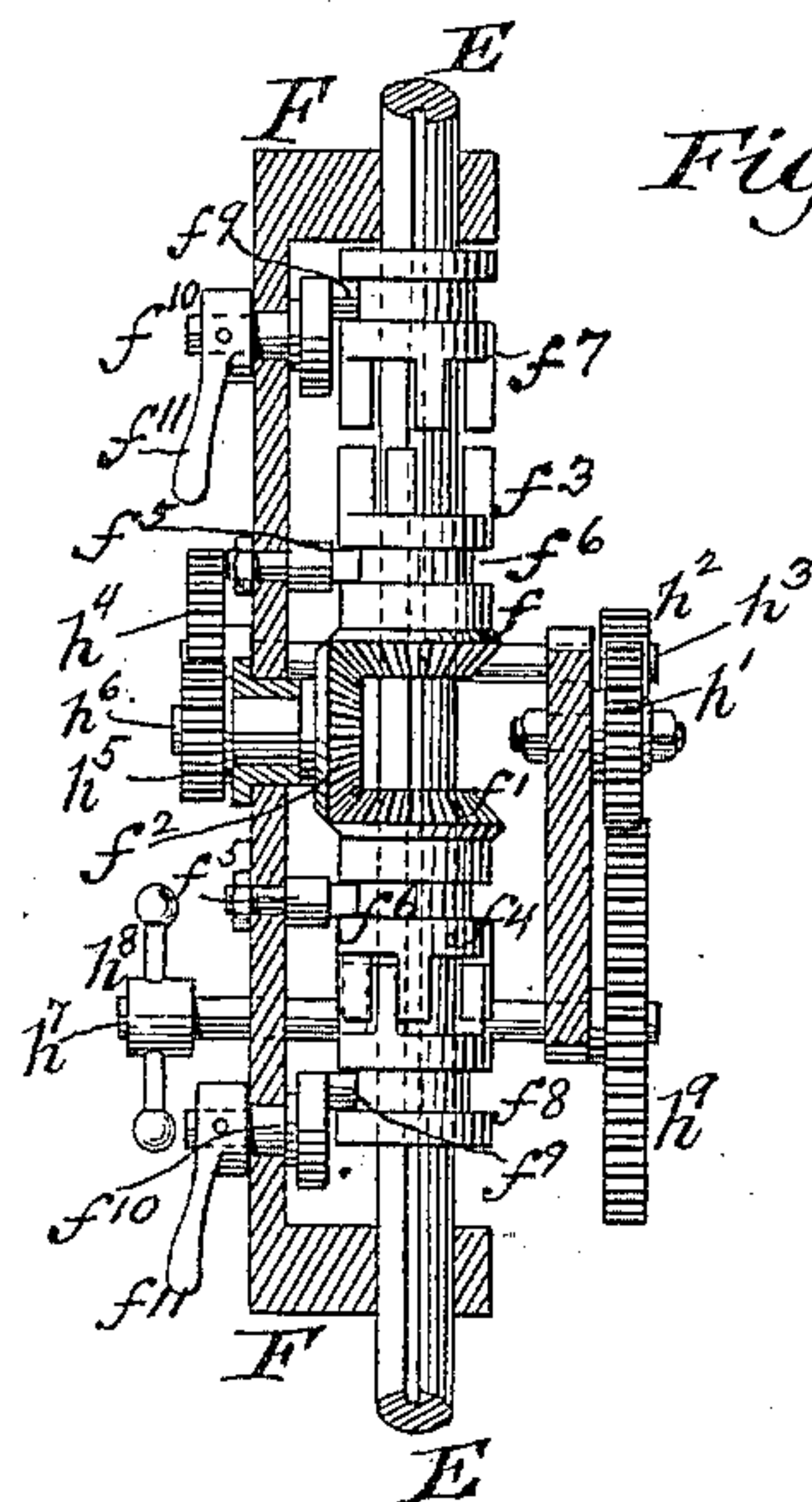
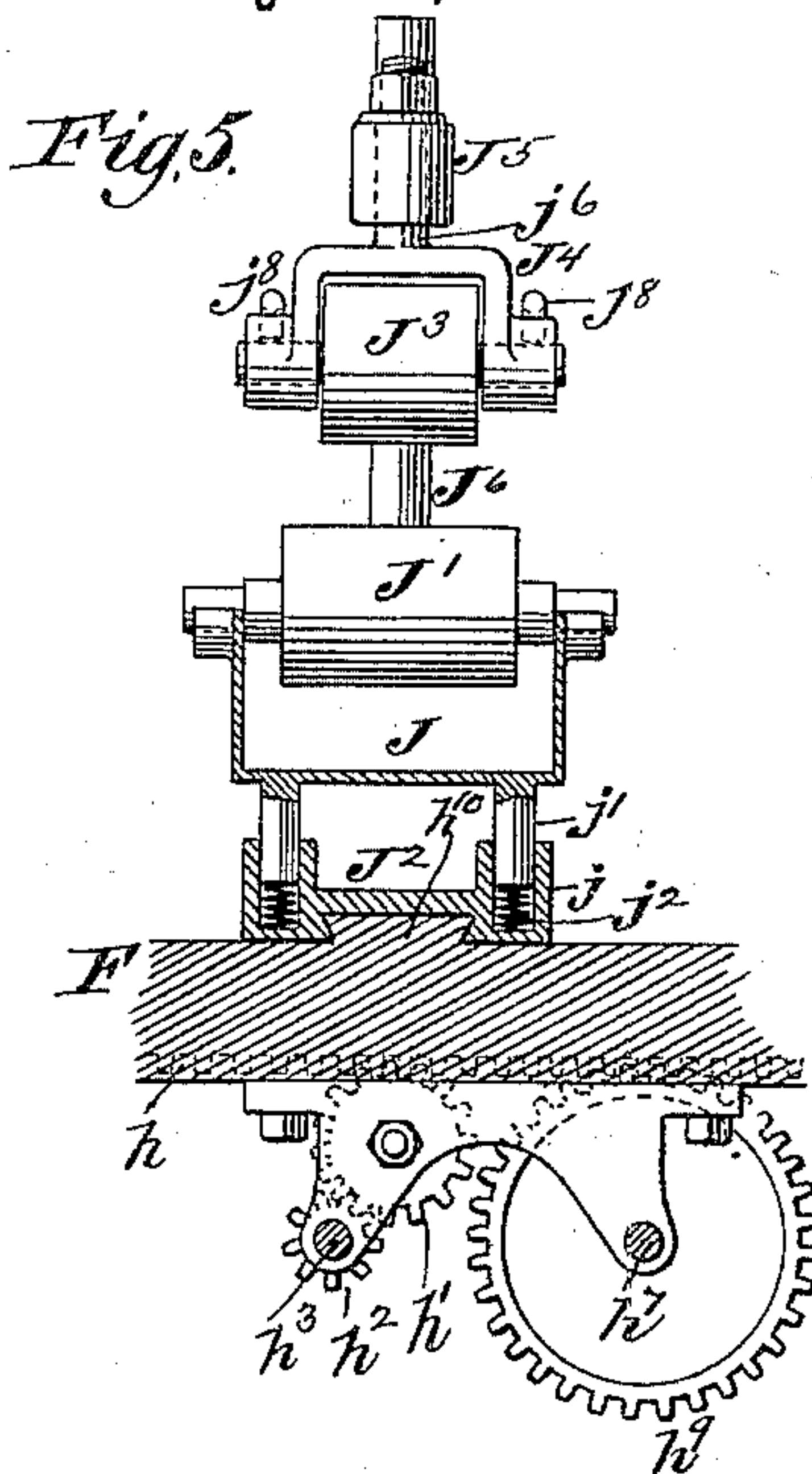
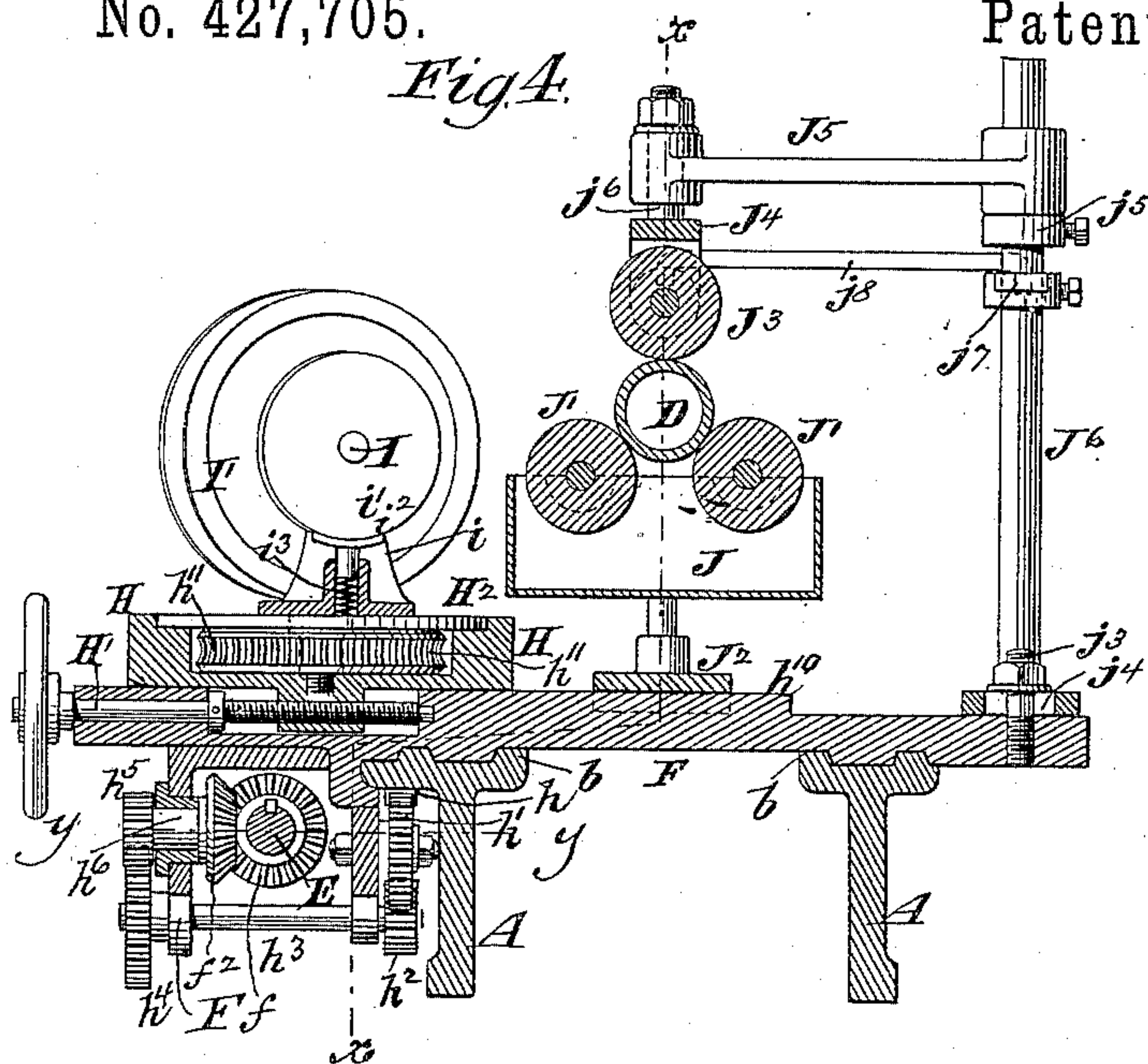
(No Model.)

2 Sheets—Sheet 2.

E. D. McCracken.  
MACHINE FOR MAKING PAPER TUBES.

No. 427,705.

Patented May 13, 1890.



Witnesses:

O. Sundgren  
Emil Heiter

Inventor:

Eduin D. McCracken  
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Brown Hall



# UNITED STATES PATENT OFFICE.

EDWIN D. McCRACKEN, OF ALPINE, NEW JERSEY, ASSIGNOR OF ONE-HALF  
TO FRANCIS M. MILLER, OF CORTLAND, NEW YORK.

## MACHINE FOR MAKING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 427,705, dated May 13, 1890.

Application filed June 1, 1887. Renewed September 9, 1889. Serial No. 323,349. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN D. McCRACKEN, of Alpine, in the county of Bergen and State of New Jersey, have invented a new and useful Improvement in Machines for Making Paper Tubes, of which the following is a specification.

My invention relates to a machine which in some respects resembles an ordinary lathe, in that it is provided with head and tail spindles for supporting and driving a mandrel, and by which thin paper from a reel and in a strip of considerable width may be wound spirally and continuously from end to end of the mandrel to form a tube of proper thickness, paste or other adhesive substance being employed to produce adhesion between the overlapping and superposed spiral convolutions.

I employ in connection with head and tail spindles for supporting a rotating mandrel, a rotary feed-shaft and a main sliding carriage operated thereby and caused to travel along shears or ways similar to those of a lathe.

Upon the main sliding carriage I support a rotary carriage or turn-table and a paper reel or drum, which is mounted to rotate in a substantially vertical plane on the rotary carriage or turn-table, and has its diametrical and axial center substantially in line with the center of the rotary carriage or turn-table.

When the reel is thus arranged relatively to the rotary carriage, the carriage and reel may be readily adjusted to give the paper a direction oblique to the mandrel, either in one direction or the other, from a central line, and thus bind it spirally upon the mandrel from either end alternately toward the other end. Although the rotary carriage or turn-table may be considered as supported upon the main sliding carriage, it is directly mounted upon a carriage which is fitted to slide on the main carriage and transversely to its line of movement and to the length of the mandrel, and the rotary carriage or turn-table may be formed with a circle of worm-teeth, with which engages a tangential worm or screw for shifting it.

I also employ a paste-applying roll or rolls, which is or are pressed by springs against the paper tube on the mandrel during its forma-

tion, and preferably the paste-box, in which the rolls are journaled, is guided in a saddle fitted upon the main sliding carriage and is supported in said saddle by springs. I here use the term "paste-box and paste-applying roll" in a generic sense, thereby meaning to include a box and roll for applying any adhesive substance.

I also employ a pressure-roll, which bears upon the top of the tube during its formation and produces the firm union of the spiral convolutions by means of the adhesive substance and presses and consolidates the paper. This roll is preferably journaled in a yoke, which is adapted to turn and also to rise in a horizontal arm, which is fulcrumed upon a post at the back of the machine and is capable of swinging horizontally, so as to bring the pressure-roll to any desired position lengthwise of the mandrel, and I also employ parallel connections on opposite sides of this arm and extending to opposite ends of the roll, so that during the swinging movement of the arm the roll will always be maintained parallel with the mandrel.

I also employ a post having a disk-cutter mounted upon it and provide a socket on each side of the upper sliding carriage for receiving the post and to enable it to be used for cutting off first one end and then the other of the paper tube.

The head and tail spindles may be provided with suitable centers for supporting the mandrel, and the center upon the head-spindle may have a longitudinal groove, with which engages a rib secured to one side of the hollow mandrel, and through which rib and groove the mandrel is driven positively by the head-spindle.

For imparting motion to the main sliding carriage, I prefer to employ an ordinary feed-shaft, which is geared to the head-spindle, so as to rotate at any suitable speed, and this feed-shaft has mounted upon it, within the sliding carriage, reverse bevel-wheels having clutch members formed integral therewith, and the feed-shaft also has upon it movable clutch members having groove and spline or feather connections with the shaft. Both the reverse bevel-wheels are in constant gear with a third wheel, which in turn and through suit-



able gearing transmits motion in one direction or the other to a wheel which gears with a rack on the under side of the bed, and by the engagement of this wheel with the rack the sliding carriage is moved in one direction or the other at a very quick speed as compared to the feed of a lathe.

The invention consists in novel combinations of parts, which are hereinabove briefly referred to and hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation, and Fig. 2 a plan, of a machine embodying my invention, a portion of the length of the machine between the head and tail sockets being broken away to reduce the size of the drawing. Fig. 3 is an end view of the machine, including the gearing whereby the feed-shaft is operated. Fig. 4 is a transverse section of the machine, upon a plane extending through the main sliding carriage. Fig. 5 is an elevation and partial section of the pressure-roll and the paste-roll and paste-box, including a saddle supporting the paste-box and applied to the main sliding carriage, and a sectional view of a portion of the gearing in the main sliding carriage upon about the plane indicated by the dotted line *xx*, Fig. 4. Fig. 6 is a horizontal section upon about the plane indicated by the dotted line *yy*, Fig. 4, of the main carriage and the appurtenances or gearing connected therewith. Fig. 7 is a vertical section, and Fig. 8 a horizontal section, showing a portion of the rotary carriage or turn-table and the transversely-sliding carriage which supports it. Fig. 9 is a detail view illustrating the center, which is upon the head-spindle, and the means employed for imparting motion therefrom to the mandrel; and Fig. 10 is an elevation of a cutter operating upon the paper tube for cutting off its end, and which is supported from the transversely-sliding carriage on which is the turn-table or rotary carriage.

Similar letters of reference designate corresponding parts in all the figures.

*A* designates the bed, and *b* the tracks, ways, or shears, such as are ordinarily provided upon a lathe. At one end of the bed is mounted a head-stock *B*, in which is journaled a head-spindle or live-spindle *C*, having a cone-pulley *C*<sup>2</sup>, and on the opposite end of the bed is fixed a tail-stock *B'*, in which is journaled the usual tail-spindle *C'*.

*D* designates a mandrel, which usually consists of a tube of metal fitted upon the centers *c c'* and the live center *c*, or the center upon the head-spindle *C* may have a longitudinal groove *c*<sup>2</sup>, which receives a rib or tongue *c*<sup>3</sup>, secured to one side of the mandrel. Through this groove and rib or tongue the live-spindle *C* transmits rotary motion to the mandrel *D*.

At the front of the machine extends a feed-shaft *E*, which is journaled in suitable bearings *e*, and through a suitable train of gears the live-spindle *C* transmits motion to this feed-shaft. In this example of the invention

the train of gears comprises a pinion or wheel *e'* upon the live-spindle *C* and wheel *e*<sup>2</sup> upon the feed-shaft, and the intermediate wheel *e*<sup>3</sup>, which engages with both the wheels *e'* *e*<sup>2</sup> and is journaled upon a stud secured in the lever *E'*, fulcrumed upon the feed-shaft *E*. The lever is provided with a slot *e*<sup>4</sup>, in which the stud *e*<sup>5</sup>, on which the wheel *e*<sup>3</sup> is journaled, is adjustable, and is likewise provided with an arc-shaped slot *e*<sup>6</sup>, through which passes a clamping-bolt *e*<sup>7</sup>, and by which the lever *E'* may be adjusted and held at any desired angle to the horizontal. The two slots *e*<sup>6</sup> *e*<sup>4</sup> provide for introducing a larger or smaller wheel in place of the wheel *e*<sup>3</sup>, and therefore provide for imparting a slower or quicker motion to the feed-shaft *E*.

The machine comprises a main sliding carriage *F*, which, as best shown in Fig. 4, is supported to slide freely upon the tracks or ways *b*, and which is moved to and fro along the mandrel *D* by mechanism set in motion by the feed-shaft *E*.

The mechanism for operating the carriage is best shown in Fig. 6.

On the shaft *E* are fitted reverse bevel-gears *f f'*, both of which engage with the bevel-wheel *f*<sup>2</sup>, and which also comprise clutch members *f*<sup>3</sup> *f*<sup>4</sup>. The bevel-gears *f f'* are held in proper position to engage with the wheel *f*<sup>2</sup> by studs *f*<sup>5</sup>, secured in the carriage *F* and engaging suitable grooves *f*<sup>6</sup> in the gears and clutch members. On opposite sides of the gears and clutch members *f f'* are fitted sliding clutch members *f*<sup>7</sup> *f*<sup>8</sup>, which have a groove and spline or feather engagement with the shaft *E*, so as to receive positive rotary motion therefrom and so as to permit their sliding along the shaft. The sliding clutch members *f*<sup>7</sup> *f*<sup>8</sup> may be operated by cams or eccentrics, which consist of pins *f*<sup>9</sup>, set eccentrically in disks, which are upon short shafts or studs *f*<sup>10</sup>, as best shown in Fig. 6, and these short shafts or studs *f*<sup>10</sup> are provided at the front of the carriage with handles *f*<sup>11</sup>.

As shown in Fig. 6, the sliding clutch member *f*<sup>7</sup> is adjusted into engagement with a companion clutch member *f*<sup>3</sup>, which forms a part of the gear *f*, and thereby the gear *f* is rotated and transmits its motion to the gear *f*<sup>2</sup>, and at the same time the movable clutch member *f*<sup>8</sup> is slid out of engagement with the clutch member *f*<sup>4</sup>, and the wheel *f'* and clutch member *f*<sup>4</sup> are free to rotate idly by their engagement with the wheel *f*<sup>2</sup>.

Upon the under side of the bed is a longitudinal rack *h*, and *h'* designates a spur wheel or pinion, which is mounted upon a stud in the carriage and engages with this rack. Gearing with the wheel or pinion *h'* is a second wheel or pinion *h*<sup>2</sup>, which is upon the short shaft *h*<sup>3</sup>, supported in suitable bearings in the carriage, and at the outer end of this shaft is a wheel *h*<sup>4</sup>, which is geared with the pinion *h*<sup>5</sup> on the same short shaft *h*<sup>6</sup> to which the bevel-wheel *f*<sup>2</sup> is attached.

From the above description it will be un-



derstood that the wheel  $f^2$  will be rotated in one direction or the other, according to whichever of the wheels  $f f'$  transmits motion to it, inasmuch as they engage with its opposite sides, and by the rotation of the wheel  $f^2$  the train of gears  $h^5 h^4 h^2 h'$  will be rotated, and by the engagement of the wheel  $h'$  with the rack  $h$  the carriage will be moved at the desired speed in one direction or the other along the tracks or ways  $b$ .

I have also represented on the carriage F a short shaft or spindle  $h^7$ , provided on the front of the carriage with a handle  $h^8$  and provided on the inner end with a wheel  $h^9$ , which engages with the rack  $h$ , and by this handle  $h^8$  and wheel  $h^9$  the carriage may be moved rapidly along the tracks or ways when both the movable clutch members  $f^7 f^8$  are adjusted to the position of the clutch member  $f^7$  in Fig. 6.

H designates a carriage, which is mounted directly upon the main carriage F, and by means of the screw  $H'$ , provided with the hand-wheel at the front of the machine, may be slid or shifted upon the carriage F in a direction transverse to the length of the mandrel D, along a gibbed way or tongue  $h^{10}$ , upon the main carriage. The transverse adjustment of the carriage H provides for varying the distance from the paper-reel I' to the mandrel D, as may be desired when spirally winding paper upon mandrels D considerably larger than that here shown. The rotary adjustment of the carriage  $H^2$  and the sliding adjustment of the carriage H also combine to afford provision for laying the paper spirally upon the mandrel D at exactly the desired angle.

$H^2$  designates a rotary carriage or turn-table, which is mounted in the transverse carriage H, and which is constructed with a circle of worm-teeth  $h^{11}$ , and  $h^{12}$  designates a tangential shaft or key, on which is a worm  $h^{13}$ , engaging with this circle of gear-teeth. The projection on the carriage  $H^2$ , on which are formed the worm-teeth  $h^{11}$ , is received in a cavity in the transverse carriage H, and by turning the worm-shaft  $h^{12}$  the carriage or turn-table  $H^2$  may be rotated to the extent desired. The carriage  $H^2$ , although supported directly and rotatable on the transverse carriage H, may be regarded as supported from the main sliding carriage F.

On the rotary carriage or turn-table H is a standard  $i$ , supporting a suitable shaft I, to which is fixed a paper reel or drum I', and the shaft I and standard  $i$  are so arranged that the diametrical and axial center of the drum I' is directly in line with the center of the turn-table  $H^2$ , and as the turn-table is rotated the angle at which the strip of paper is delivered from the reel I' upon the mandrel is varied, and the strip of paper may be delivered at an angle on either side of a plane directly transverse to the mandrel by shifting the rotary carriage or turn-table  $H^2$  to the desired position.

On the shaft I, I have also represented a brake wheel or disk  $i'$ , on which acts a spring-actuated brake-shoe  $i^2$ , movable vertically by the action of the spring  $i^3$  in the standard  $i$ , so as to retard the rotation of the reel I' and offer a sufficient resistance to the unwinding of the paper to produce the smooth-laying under tension of the paper upon the mandrel D.

To secure the firm adhesion of the spiral convolutions of paper, I employ a paste-box J, which contains paste or other adhesive material, and in which are journaled a paste roller or rollers J'. In this example of the invention, two rollers bearing upon the paper tube which is being formed and arranged on opposite sides of the center of the tube are employed, and I may employ springs for maintaining the roller or rollers, pressed against the paper tube, which is wound on the mandrel D. In the present example of the invention a saddle  $J^2$  is fitted to the dove-tailed projection  $h^{10}$  at the top of the carriage F, and contains sockets  $j$ , which receive downwardly-projecting stems  $j'$  on the paste-trough J, and these sockets contain springs  $j^2$ , which bear upon the stems and thereby hold the roller or rollers J' against the paper tube by pressure transmitted through the paste-box J.

To consolidate the paper and produce the firm union of its several convolutions by means of the adhesive substance, I employ a pressure-roller  $J^3$ , which is in this example of my invention journaled in the yoke  $J^4$ , suspended from a horizontal arm  $J^5$ , which is mounted upon a post  $J^6$  at the back of the machine. As represented, the post is secured in place upon the sliding carriage F by bolts  $j^3$ , which pass through slots  $j^4$  and provide for the adjustment of the post toward and from the mandrel D. The arm  $J^5$ , although it is maintained in vertical position and prevented from falling on the post  $J^6$ , is free to turn thereon and is supported vertically by a collar  $j^5$ , and the roller-yoke  $J^4$  has a stem  $j^6$ , which is adapted to turn and rise in the end of the arm  $J^5$ . Consequently it will be seen that the pressure-roller  $J^3$  bears upon the paper tube with a force due to its weight and to the weight of its yoke  $J^4$ , and is free to rise slightly and still maintain a uniform pressure as the paper-tube increases in size due to the winding of the strip upon it. I have here represented upon the post  $J^6$  a cross-piece  $j^7$ , from opposite ends of which parallel connections  $j^8$  extend to and engage with the roller  $J^3$  or with the opposite ends of the yoke  $J^4$ , and which serve to maintain the roller  $J^3$  in position parallel with and above the mandrel D, notwithstanding the angle to which the arm  $J^5$  is adjusted.

After the tube has been formed upon the mandrel it is desirable to cut off its ends truly, and to do this I employ a rotary or disk knife  $k$ , which is mounted in a standard  $k'$ , and I provide the transversely-sliding carriage H



with sockets  $k^2$  at opposite sides, as best shown in Fig. 2, into either of which the post  $k'$  may be inserted in order that provision may be afforded for cutting off one end of the tube and then the other. After the tube is thus completed and cut off at the ends the mandrel D may be removed from it by any desired method.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with head and tail spindles for supporting and rotating a mandrel, of a rotary feed-shaft and a sliding carriage operated thereby, a rotary carriage or turn-table mounted on the sliding carriage, and a paper reel or drum mounted to rotate in a substantially vertical plane on the rotary carriage or turn-table and having its diametrical and axial center substantially in line with the center of the rotary carriage or turn-table, substantially as herein set forth.

2. The combination, with the spindles for supporting and rotating a mandrel and a feed-shaft and sliding carriage moved thereby along the ways of the machine, of the second carriage mounted to slide on the first in a direction transverse to the mandrel, the rotary carriage mounted on the transversely-sliding carriage, and a worm or screw for shifting it, and a paper-reel mounted on the rotary carriage and rotating in a substantially vertical plane, substantially as herein set forth.

3. The combination, with the spindle for supporting and driving a mandrel, of a carriage sliding lengthwise of the ways, and a rotary carriage supported by the sliding carriage, a paper-reel on the rotary carriage, a paste-box, and a paste-applying roller rotating by contact with the paper tube on the mandrel, and springs forming a yielding support for said roller and maintaining it pressed against the tube, notwithstanding variations in the size of the latter, substantially as herein set forth.

4. The combination, with the spindles for supporting and rotating a mandrel, of a carriage sliding lengthwise of the ways and a rotary carriage supported on the sliding carriage, a paper-reel on the rotary carriage, a saddle adjustable on the sliding carriage in a direction transverse to its line of movement, and a paste-box guided and supported by springs in said saddle and provided with a paste-applying roller or rollers bearing on the paper tube, substantially as herein set forth.

5. The combination, with spindles for supporting and rotating a mandrel and a sliding carriage, of a rotary carriage or turn-table supported on the sliding carriage and a pa-

per-reel on the rotary carriage or turn-table, a post on the sliding carriage, a horizontally-swinging arm on said post, and a roller-yoke and pressure-roller supported by said swinging arm and to bear on the paper tube, substantially as herein set forth.

6. The combination, with the spindles C C' and the sliding carriage F, of the rotary carriage H<sup>2</sup> and the paper-reel supported thereon, the post J<sup>6</sup> on the sliding carriage, the arm J<sup>5</sup> and its support  $j^5$  on the post, the roller J<sup>3</sup> and the roller-yoke J<sup>4</sup>, having an upright stem fitted to both turn and rise in said arm, substantially as herein set forth.

7. The combination, with the spindles for supporting and rotating a mandrel, the main sliding carriage and the rotary carriage and reel supported on the said sliding carriage, of a paste-applying roller bearing on the paper tube, the post J<sup>6</sup>, with its swinging arm J<sup>5</sup>, the roller J<sup>3</sup>, and the roller-yoke J<sup>4</sup>, fitted to turn and rise in said arm, and the parallel connections  $j^3$ , on opposite sides of said arm, for maintaining the roller J<sup>3</sup> parallel with the mandrel, substantially as herein set forth.

8. The combination, with the spindles for supporting and rotating a mandrel and the main sliding carriage, of an upper carriage sliding transversely to the mandrel on the main carriage, a rotary carriage or turn-table on the upper sliding carriage, a paper-reel on the rotary carriage, a post having a disk-cutter, and a socket on each side of the upper sliding carriage for receiving the post and to provide for cutting off first one end and then the other of the paper tube, substantially as herein set forth.

9. The combination, with the main spindle C and its head or cutter  $c$ , having a longitudinal groove  $c^2$ , of the tubular mandrel D, having secured on its inner side a rib or tongue  $c^3$  for engaging said groove, substantially as herein set forth.

10. The combination, with the spindles for supporting and rotating a mandrel and a bed provided with ways and a rack, of the carriage F, the feed-shaft E, and the reversed bevel-gears and clutch members  $f f'$ , the movable clutch members  $f^7 f^8$ , having a spline-and-groove connection with said shaft, and handles for sliding them on the shaft, and the bevel-gear  $f^2$ , engaging both the reversed gears and geared with a wheel which engages the said rack, substantially as herein set forth.

EDWIN D. MCCrackEN.

Witnesses:

C. HALL,  
FREDK. HAYNES.