

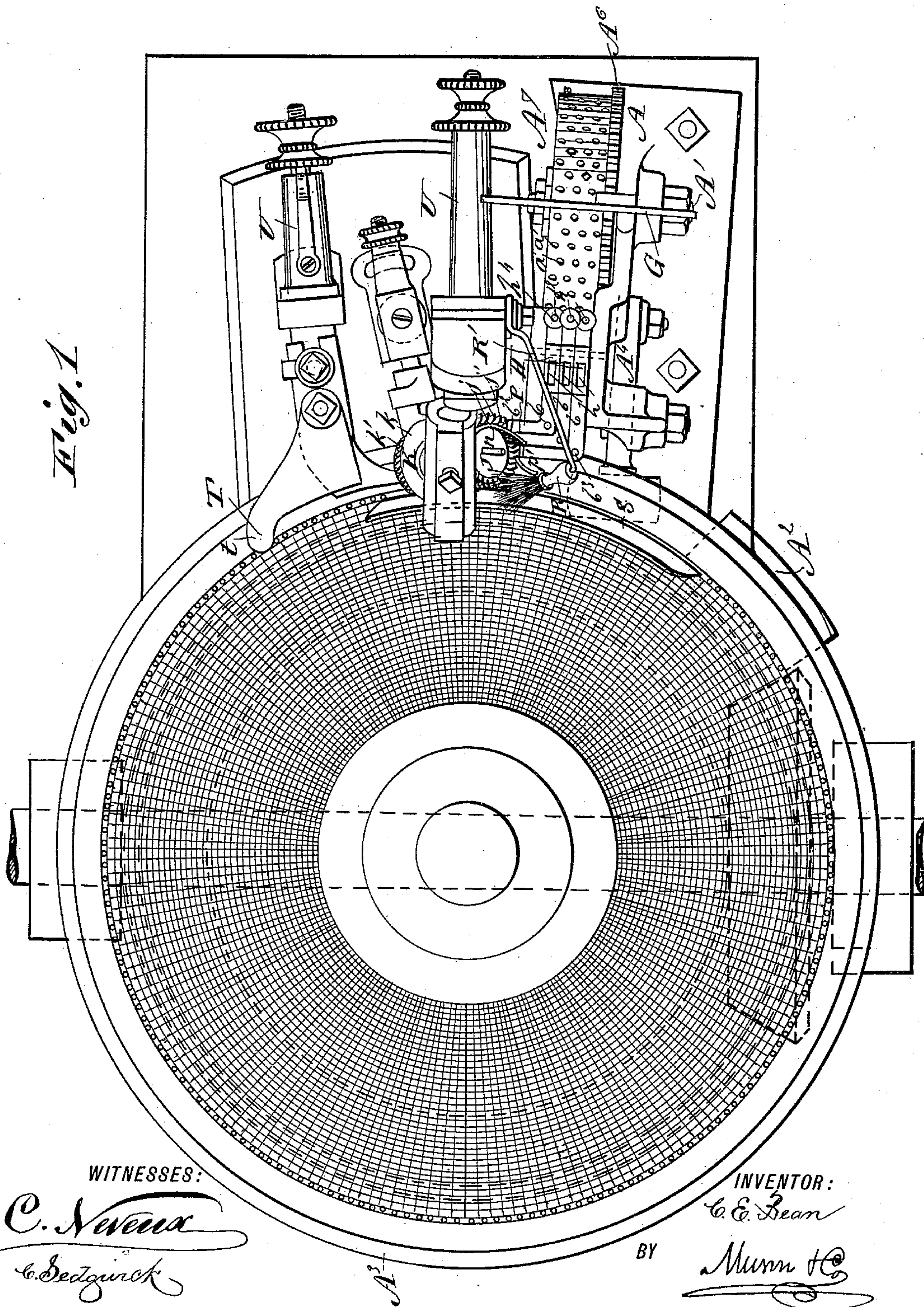
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8 Sheets—Sheet 1.

C. E. BEAN.  
CIRCULAR KNITTING MACHINE.

No. 407,917.

Patented July 30, 1889.



WITNESSES:

*C. Neveu*  
*C. Sedgwick*

INVENTOR:

*C. E. Bean*

BY

*Munn & Co*

ATTORNEYS.



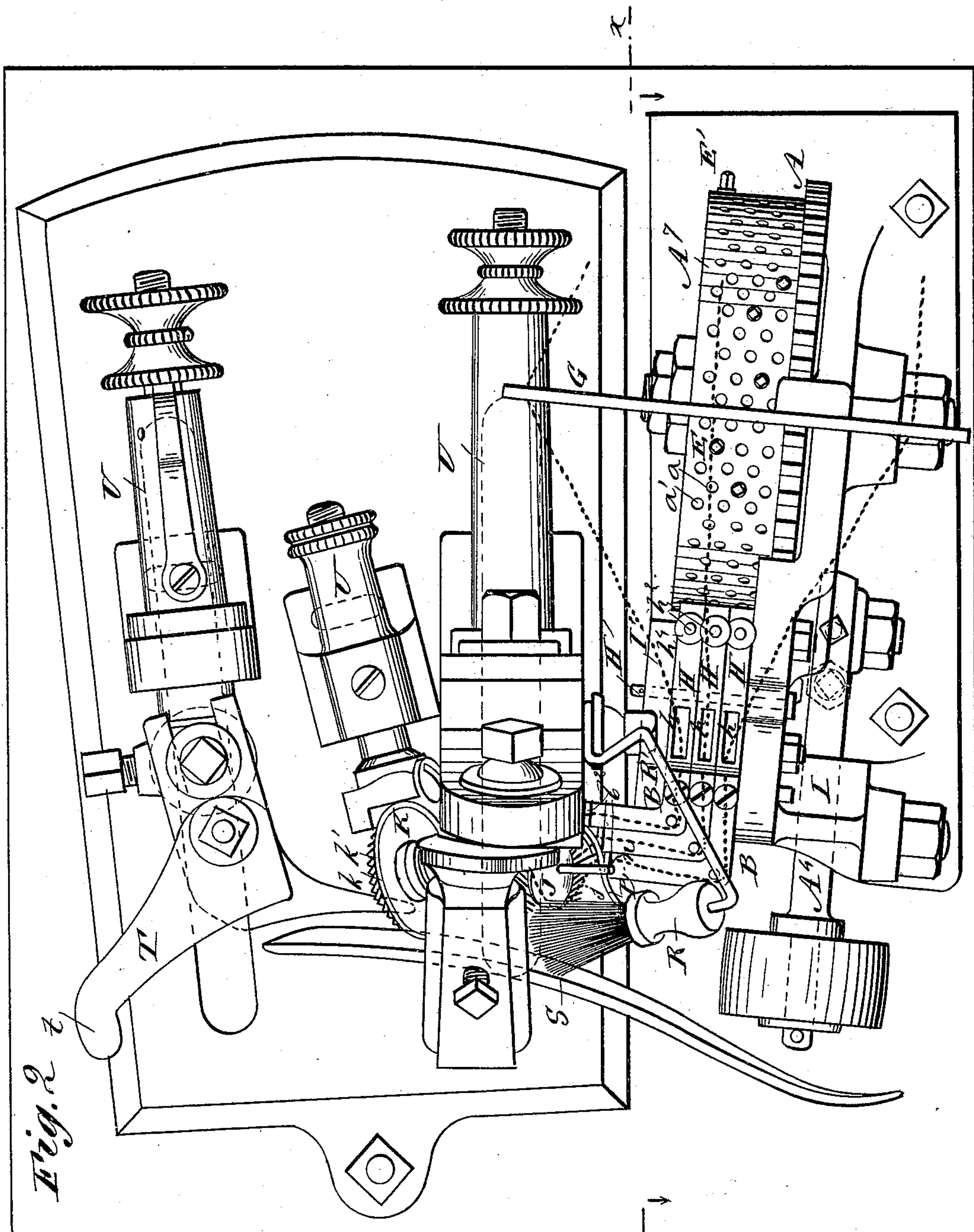
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WITNESSES:  
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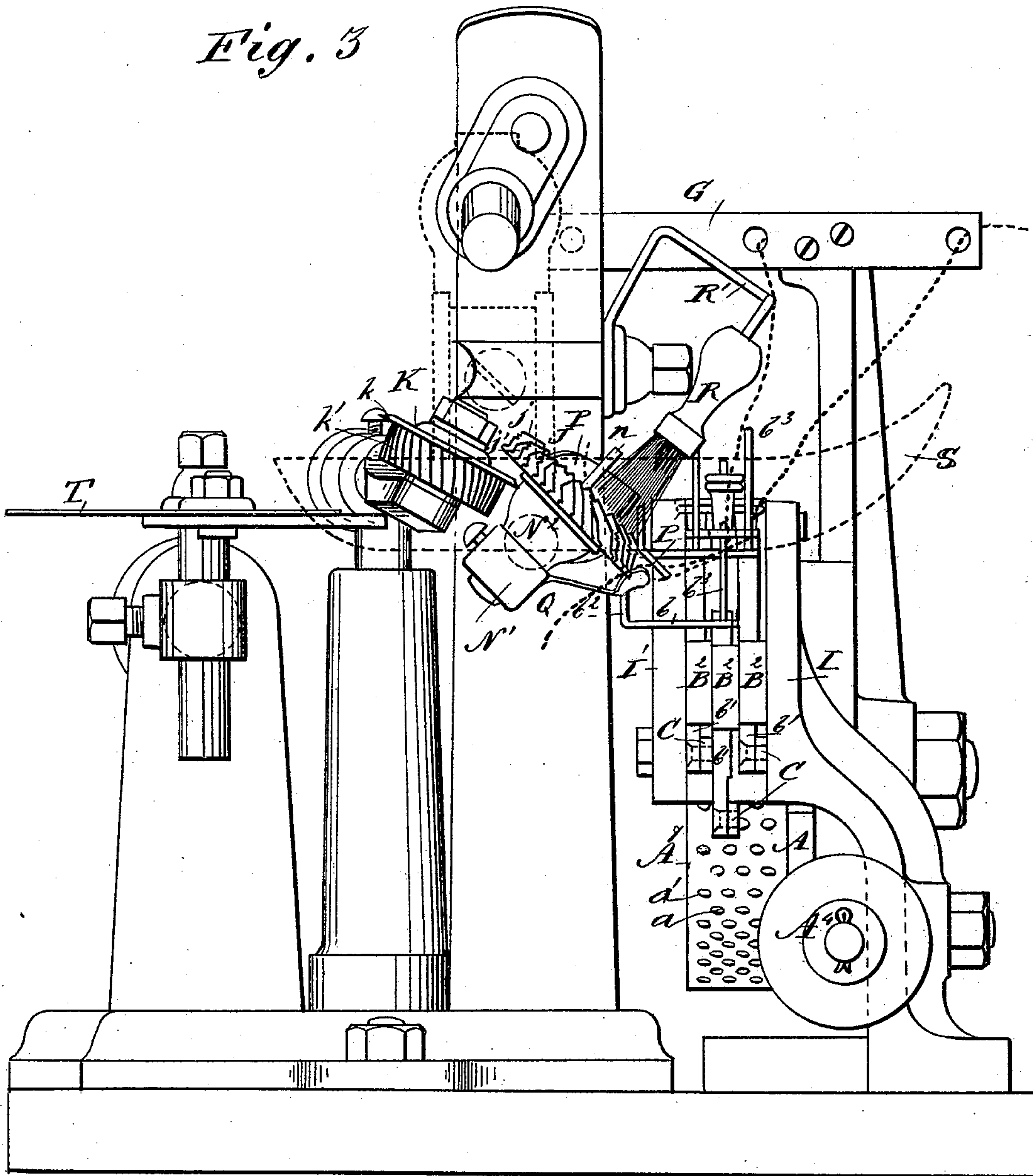
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*Fig. 3*



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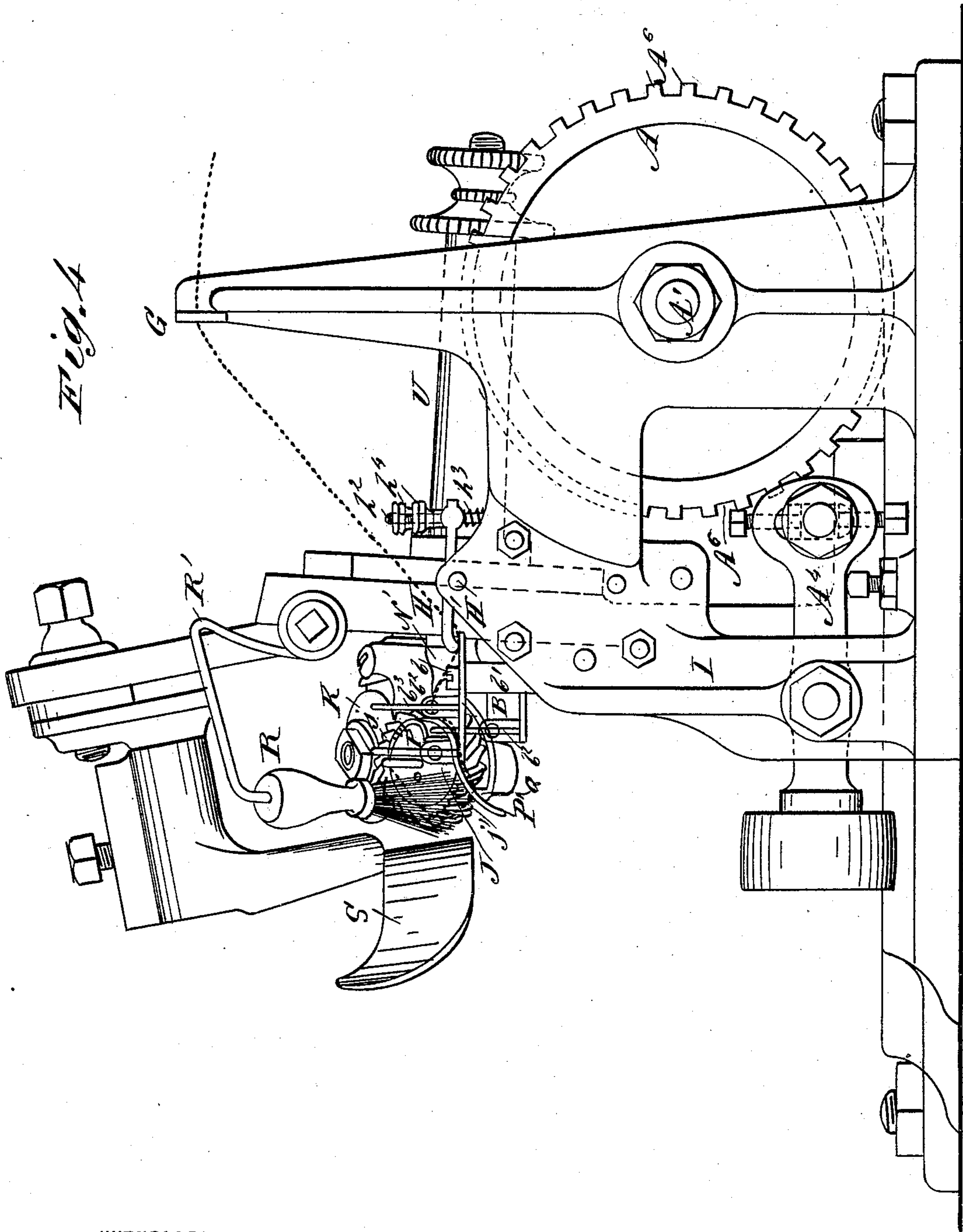
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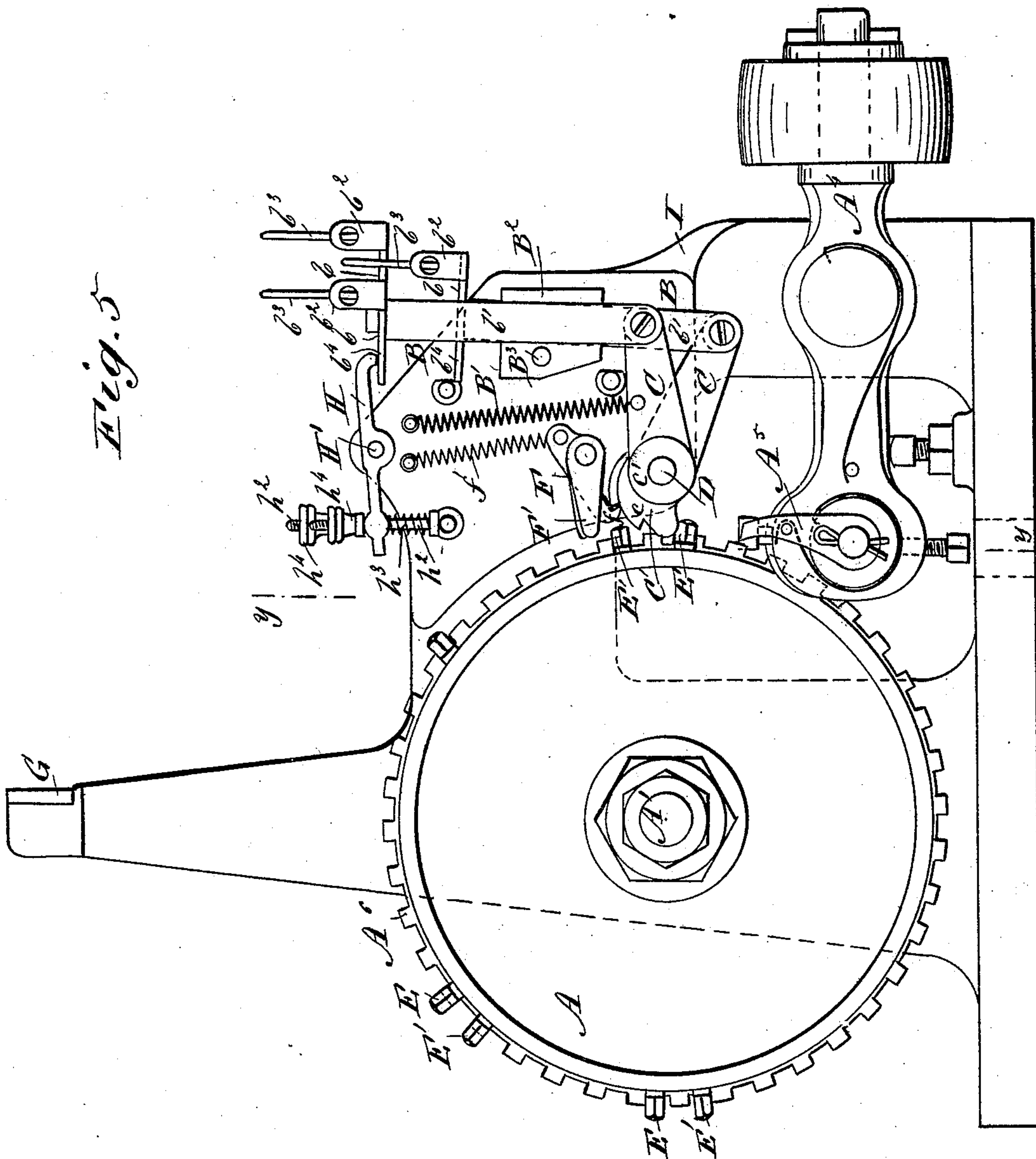
(No Model.)

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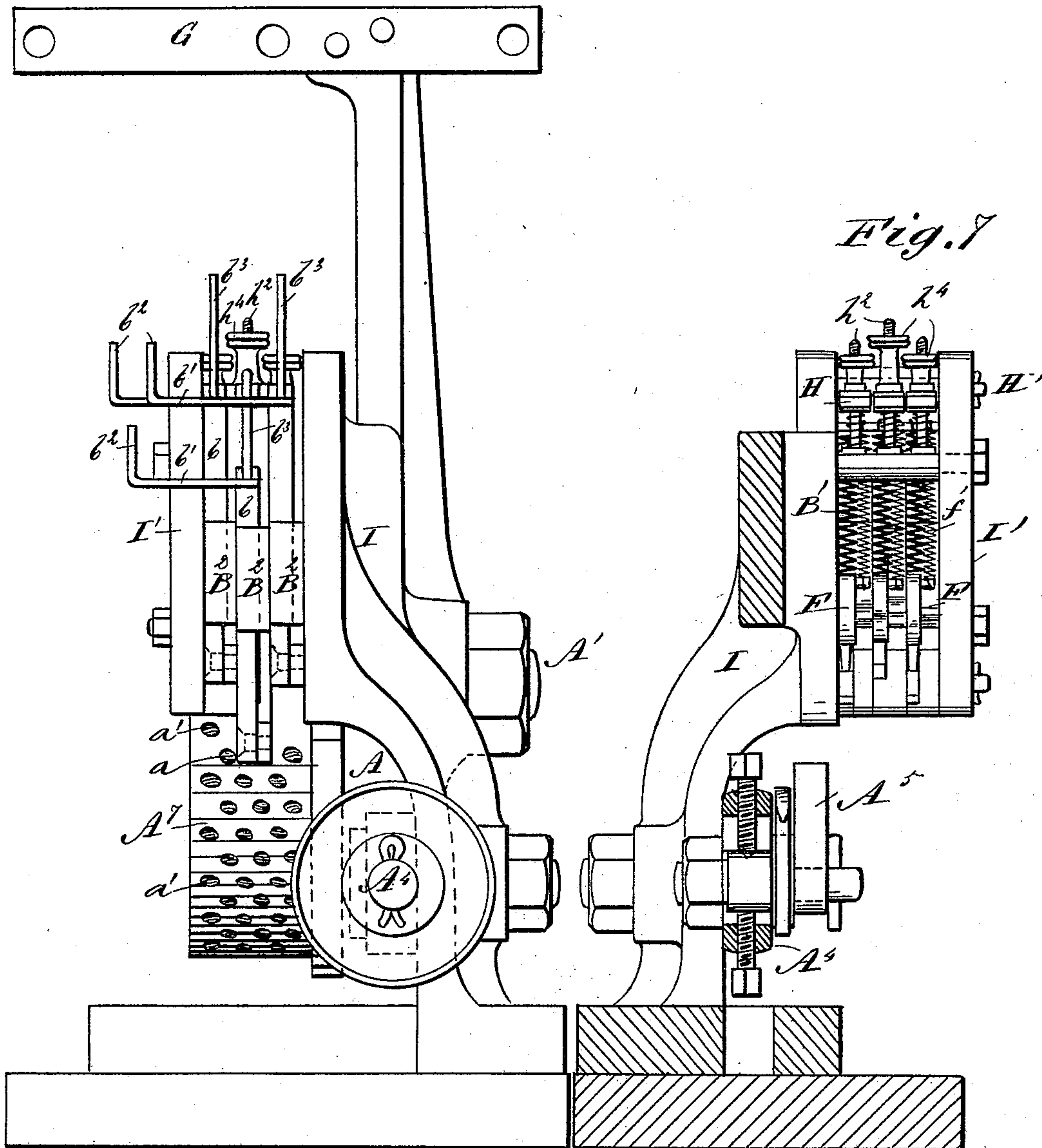
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C. E. BEAN.  
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*Fig. 6*



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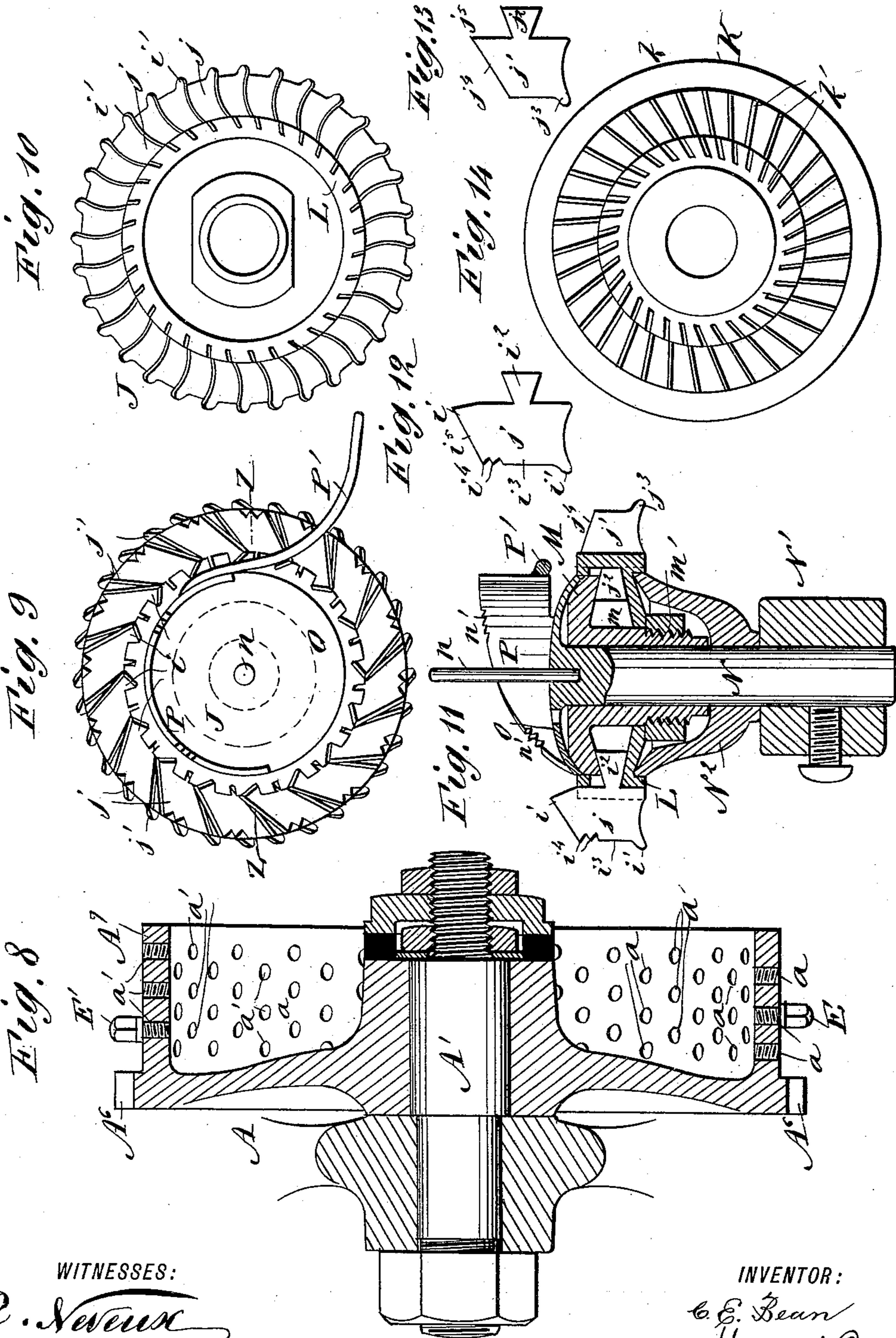
(No Model.)

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C. E. BEAN.  
CIRCULAR KNITTING MACHINE.

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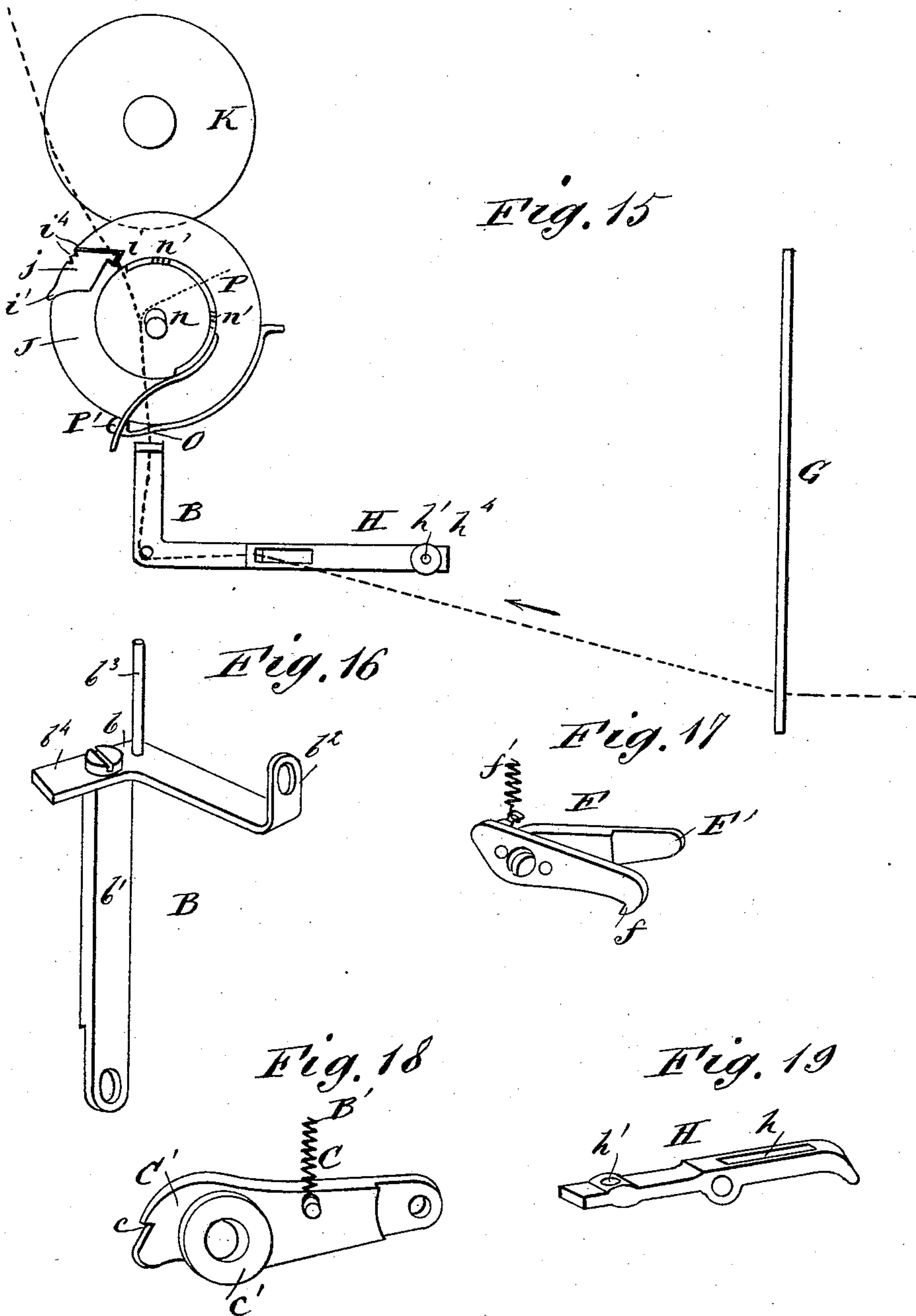
(No Model.)

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C. E. BEAN.  
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# UNITED STATES PATENT OFFICE.

CHARLES E. BEAN, OF SCRANTON, PENNSYLVANIA, ASSIGNOR OF ONE-HALF  
TO THE LACKAWANNA MILLS, OF SAME PLACE.

## CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 407,917, dated July 30, 1889.

Application filed January 14, 1889. Serial No. 296,308. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. BEAN, of Scranton, in the county of Lackawanna and State of Pennsylvania, have invented a new and Improved Circular-Knitting Machine, of which the following is a full, clear, and exact description.

My invention relates to mechanism to be applied to knitting-machines for controlling a plurality of threads or yarns of different colors, and constructed to automatically supply the different yarns to the needles in a manner to form any desired pattern, in stripes or other patterns, in the knitted web.

The invention consists, principally, of the construction of and means for operating the movable guides for the thread or yarn; of the construction of the stitch-wheel for carrying the yarn into the needles and against the cutter-wheel when the yarn-guide is elevated; of the combination, with the stitch-wheel, of a separate cutter-wheel turned by the needles, and of the construction of the pattern-wheel carrying the pattern-pins, combined with the yarn-guides and the means for locking and releasing them.

The invention also consists in the construction, arrangement, and combination of parts, all as hereinafter described and claimed.

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

Figure 1 is a plan view of my invention, showing its application to an ordinary circular-knitting machine. Fig. 2 is an enlarged plan view. Fig. 3 is a front elevation with the work-presser shown in dotted lines. Fig. 4 is a side elevation. Fig. 5 is a section on line *xx* of Fig. 2. Fig. 6 is a rear elevation of the parts shown in Fig. 5. Fig. 7 is a section on line *yy* of Fig. 5. Fig. 8 is a sectional elevation of the pattern-wheel. Fig. 9 is an enlarged plan view of the stitch-wheel. Fig. 10 is a bottom view of the same. Fig. 11 is a sectional elevation of the stitch-wheel and its support, taken on line *zz* of Fig. 9. Figs. 12 and 13 show, respectively, the forms of the main and intermediate blades or plates of the stitch-wheel. Fig. 14 is a bottom view

of the cutter. Fig. 15 is a diagram view showing the course of the yarn through stationary guide G, tension-plate H, and movable guide B, and across the stitch-wheel and against the cutter. Fig. 16 is an enlarged perspective view of one of the movable guides. Fig. 17 is a perspective view of one of the triggers for locking the guide-lever C. Fig. 18 is a perspective view of one of the tension-levers, and Fig. 19 is a perspective view of one of the tension-plates.

A represents the pattern-wheel, and B B the yarn-guides attached at their lower ends to levers C C, pivoted on a bolt or rod D. (See Fig. 5.) The pattern-wheel A is journaled on the axle A' and is given an intermittent rotary motion by means of a cam A<sup>2</sup> on the needle-cylinder A<sup>3</sup> acting through lever A<sup>4</sup>, pawl A<sup>5</sup>, and ratchet A<sup>6</sup> at the edge of said wheel A. The flange A<sup>7</sup> of the pattern-wheel is perforated with transverse series of holes *a* and *a'*, to receive, respectively, the pattern-pins E, for depressing the yarn-guides, and the pins E', for tripping the triggers F (see Fig. 5) for releasing the yarn-guides. The holes of each series *a* are arranged intermediate of the holes in each of the series *a'*, to bring pins E and E' out of line with each other and in line, respectively, with the extensions C' of the levers C and the projections F' of the triggers F.

The yarn-guides B are each made substantially as shown in Fig. 16, the principal features being an eye for the yarn and a surface to serve as a grasp or tension for the yarn at the time of cutting. In this instance I employ an angle-plate *b*, attached to the upper end of a bar *b'*, the latter acting as a connecting-rod to lever C. The plate *b* is bent at right angles at the center and is bent upward to form the lip *b*<sup>2</sup>, which is perforated for the passage of the yarn. At the angle is secured the vertical pin *b*<sup>3</sup>, around which the yarn passes from the main stationary yarn guide or plate G (see Fig. 3) to the lip *b*<sup>2</sup>. The outer end *b*<sup>4</sup> of the plate *b* forms the tension-surface to grasp the yarn between it and the tension-finger H (see Fig. 19) when the guide B is thrown upward by the spring B', as shown at the front in Fig. 5. The yarn-guides B



may be variously held in place during their up-and-down movement, caused by levers C and springs B'; but I prefer to place the bars *b'* thereof in grooves made in the blocks B<sup>2</sup>, which rock on pivots B<sup>3</sup>, so that while they hold the guides to a rigid action they at the same time permit them to answer to the arc described by the ends of the levers C. The said blocks and yarn-guides are held between the upright piece I of the main frame and the cheek-plate I', bolted thereto, as shown in Fig. 3.

The extension C' of each lever C is formed with a notch *c* to receive the catch *f* of the trigger F, and said extension reaches into the path of the pattern-pins E in the pattern-wheel A, so that any pattern-pin placed in the pattern-wheel in range of either of the levers C, in passing said extensions C', will turn the lever on bolt D and draw down the guide B, attached thereto, and also cause the lever to be locked by its trigger F. Each lever C is formed with a collar *c'* to form spaces or clearances between the extensions C' for the pins E' to pass the levers. Over each space or clearance is held the arm F' of the trigger F, so that said pins E', after passing the lever C, strike said arms and lift the triggers and release the levers C, permitting them to be suddenly drawn upward by springs B'. The hook *f* of each trigger is held in constant contact with the extension C' of the levers by a spring *f'*. (Shown clearly in Figs. 5 and 17.)

The tension-plates H are pivoted on the rod H', and are slotted at *h* for the passage of the yarn. The rear end of each tension-plate is apertured at *h'* to fit upon a vertical pin *h*<sup>2</sup>, on which, under the rear end of the plate, is placed a coiled spring *h*<sup>3</sup> to act on the plate. The upper end of the vertical rod *h*<sup>2</sup> is provided with a nut *h*<sup>4</sup>, for adjusting the plate, so that a greater or less pressure will be exerted on the yarn by plates H, as circumstances require.

The yarn, as above intimated, first passes through the apertures of the main fixed guide-plate G, thence through the slots *h* of the tension-plates, thence around pins *b*<sup>3</sup>, and thence through the eye *b*<sup>2</sup> in the plate *b*, the ends of the yarn normally resting upon the inclined stitch-wheel J, as shown in dotted lines in Fig. 15. This wheel is revolved by the needles of the knitting-machine in the usual manner, and is provided with diagonally-arranged plates *j* and *j'*, of peculiar construction, as hereinafter described.

K is the cutter-wheel, having a circular blade *k* and diagonal plates *k'*, between which the needles of the machine enter and revolve the wheel. This wheel is slightly inclined and it reaches somewhat under the plates *j j'* of the wheel J, as shown clearly in Fig. 3, so that when either of the yarns has been knit in the fabric to form the required width of stripe, and is elevated by the tripping of its guide B, the stitch-wheel J, by means of plates

*j*, will carry it upward over the top of the stitch-wheel and draw it in contact with the revolving cutter *k*, as illustrated in Fig. 15, which quickly severs it. The wheel J therefore serves the double purpose of entering the yarn to the needles, and also that of carrying the yarn out of the needles and holding it in contact with the revolving cutter. This latter purpose is effected by points *i i'* upon its upper face. I prefer to form these points as a part of the plates *j*, as shown clearly in Figs. 10, 11, and 12. Each plate *j* is made in substantially the form shown in Fig. 12—viz., with the said point *i* at the upper inner corner, point *i'* at the lower outer corner, the dovetailed or keystone-shaped projection *i*<sup>2</sup> at the inner edge, by which it is clamped in the wheel, the straight edge *i*<sup>3</sup>, and notches *i*<sup>4</sup>. The upper edge *i*<sup>5</sup> of the plate is inclined from the front to the top of the point *i*, as shown clearly in Fig. 12.

The intermediate plates *j'* are each of substantially the form shown in Fig. 13—that is, formed with the projection *j*<sup>2</sup> for clamping them in the wheel and the point *j*<sup>3</sup> at the lower corner. The upper edge *j*<sup>4</sup> is inclined, and its point *j*<sup>5</sup> is flush with the upper edge of the slotted ring L. This ring is placed on a boss *m* of the upper clamp-ring M, and on the lower end of this boss is placed the nut *m'*, which, when screwed up, clamps the ring M and the plate L firmly upon the projections *i*<sup>2</sup> *j*<sup>2</sup> of plates *j j'*, holding them as in a vise. Through the plate M and boss *m* is passed the axle N for the stitch-wheel, which is held by a set-screw in the horizontal arm N'. The upper end of the axle N is formed with a disk or flange O, which prevents the stitch-wheel from upward movement on the axle. The lower surface of the stitch-wheel rests on a cup N<sup>2</sup>, placed on the axle. In the center of the axle N is fitted rigidly the pin *n*, and upon the upper surface of the said flange O is secured rigidly the curved and sloping flange P, formed by preference with some teeth *n'* to retain the yarn. To the lower edge of this flange is attached the curved finger or rod P' to guide the ends of the yarn, as hereinafter described.

Q is a finger or guide (see Fig. 3) held near the lower edge of the stitch-wheel J and over which the yarn passes, and which serves to hold the yarn close to said wheel; and to prevent the ends of the yarn from tangling and from falling below the lower edge of the stitch-wheel I employ a brush R, held by an arm R' in slight contact with the upper surface of the stitch-wheel.

S is the ordinary work-presser held within the circle of needles, and T is an outer plate formed with a curved projection *t*, which serves to hold down the work upon the outside after it passes the inner work-presser S, and it serves also to turn down the ends of the yarn after being severed, so that they will not be knitted in with the next row of stitches.



In operation, the pattern-pins E and E' will be set in the pattern-wheel to produce striped or other patterns of work of any desired design. The machine will then be threaded as above described, the end of the yarn first to be knit in the fabric passing between the finger Q (Fig. 4) and the stitch-wheel. The ends of the other yarns will terminate on the top of the stitch-wheel J, as indicated in dotted lines at the right in Fig. 15. Thus threaded, the pattern-wheel will be turned by hand until the guide B, holding the first yarn to be used, is forced down. Then the machine will be started in operation. The pattern-wheel will be turned one notch for each revolution of the cam-cylinder. The knitting with the first yarn will proceed until the second pattern-pin E comes in contact with its lever C, forcing it forward and downward, thus lowering the next guide B and its yarn to the needles. At the same time a pin E' will strike the arm F' of the trigger F and release the first depressed lever C and guide B, which will be instantly elevated by the spring B'. This upward movement of the guide lifts the yarn it carries out of the knitting-needles and up against the curved finger P'. The notches  $i^4$  of the plates  $j$  will now act to work the yarn up over the top of the stitch-wheel J, as shown in Fig. 15, where it will be caught by one or the other of the points  $i$  and carried against the revolving circular knife  $k$ , which severs the yarn. The end of the yarn will swing up around the pin  $n$  and on the upper edge of the plate P, which holds it out of contact with the plates of the stitch-wheel. The brush R prevents the ends from dropping down of their own accord. This operation is repeated with the downward and simultaneous upward movement of the guides B; and although I have shown only three guides B and the pattern-wheel formed to receive only three sets of pattern-pins, adapting the machine for three yarns, it is obvious that the machine could be constructed to receive any number of yarns that might be desired.

The supports for the stitch-wheel, the cutter, and the plate T are horizontal shafts held in tubes U, attached to suitable parts of the main frame, and are of ordinary construction and need no detailed description.

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

1. The pattern-wheel and two sets of projections placed therein out of line with each other, the levers C, having extensions C', and the yarn-guides B, attached to the said levers, in combination with the triggers F, adapted to lock the levers C and to be disengaged from said levers by the projections in the pattern-wheel, substantially as described.

2. The combination, with the guides B and means for moving them vertically, and the stitch-wheel J, having points  $i$ , of the finger or rod P', reaching to a lower level than the

lower edge of the stitch-wheel, and the cutter K, arranged beyond the stitch-wheel, substantially as described.

3. The pattern-wheel A and pins E E', the levers C, notched at  $c$  and held in range of the pins E, and the triggers F, arranged to engage notch  $c$  and held in range of the pins E', in combination with the yarn-guides B, attached to levers C, tension-plates H, stitch-wheel J, having points  $i$ , and rotating cutter K, all arranged to operate substantially as described.

4. The guide-depressing levers and the notched extension thereof, and the spacing-pieces  $c'$ , in combination with the triggers, formed with a catch  $f$  and having an offset arm standing above the spacing-pieces between the said levers, and the pattern-wheel provided with pins to simultaneously operate the said levers and the said triggers, substantially as described.

5. The guide B, formed with the upright bar  $b'$  and bent plate  $b$ , having apertured lip  $b^2$  and upwardly-projecting pin  $b^3$ , substantially as described.

6. The guide-block B<sup>2</sup>, pivoted on the pin B<sup>3</sup>, in combination with the guide B, having vertical bar  $b'$ , the lever C, and the pattern-wheel and pattern-pins, substantially as described.

7. The guide B, composed of the vertical bar  $b'$ , angle-plate  $b$ , having apertured lip  $b^2$ , and the pin  $b^3$ , in combination with the pivoted tension-plate H, overhanging the end of the angle-plate  $b$ , substantially as described.

8. The tension-plate H, pivoted on the rod H', in combination with the vertical rod  $h^2$ , spring  $h^3$ , nut  $h^4$ , and the vertically-movable guides B, substantially as described.

9. The tension-plate H, pivoted at H', and having slot  $h$ , in combination with the guide B and means for moving it vertically, substantially as described.

10. The stitch-wheel J, having inclined plates  $j$  formed with the teeth  $i^4$  at the upper outer corner, substantially as described.

11. The stitch-wheel J, having plates  $j$  formed with the point  $i$  at the upper inner corner, the point  $i'$  at the lower outer corner, and the teeth  $i^4$  at the upper outer corner, substantially as described.

12. The plate  $j$ , formed with the projection  $i^2$  at the inner edge, the point  $i$  at the upper inner corner, the point  $i'$  at the lower outer corner, and the teeth  $i^4$  at the upper outer corner, substantially as described.

13. The stitch-wheel J, having the inclined plates  $j$  and intermediate inclined plates  $j'$ , the latter formed with upper inclined edge  $j^4$  and point  $j^3$  at the lower outer corner, the plates  $j$  being formed with opposite points  $i i'$ , substantially as described.

14. The axle N, provided with the plate O, having the flange P secured thereto, in combination with the stitch-wheel placed on said axle, substantially as described.

15. The axle N, having pin  $n$  and plate O,

provided with the flange P and finger P', in combination with the stitch-wheel placed on said axle, substantially as described.

16. The cutter-wheel K, having a cutting  
5 edge or blade and provided with a series of circularly-arranged inclined plates k', substantially as described.

17. The cutter-wheel having the circular

blade k and the circularly-arranged plates k', in combination with the knitting-cylinder 10 and its needles, substantially as described.

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Witnesses:

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