

No. 757,423.

PATENTED APR. 12, 1904.

J. P. SWIFT.
BRAIDING MACHINE.
APPLICATION FILED JUNE 4, 1902.

NO MODEL.

4 SHEETS—SHEET 1.

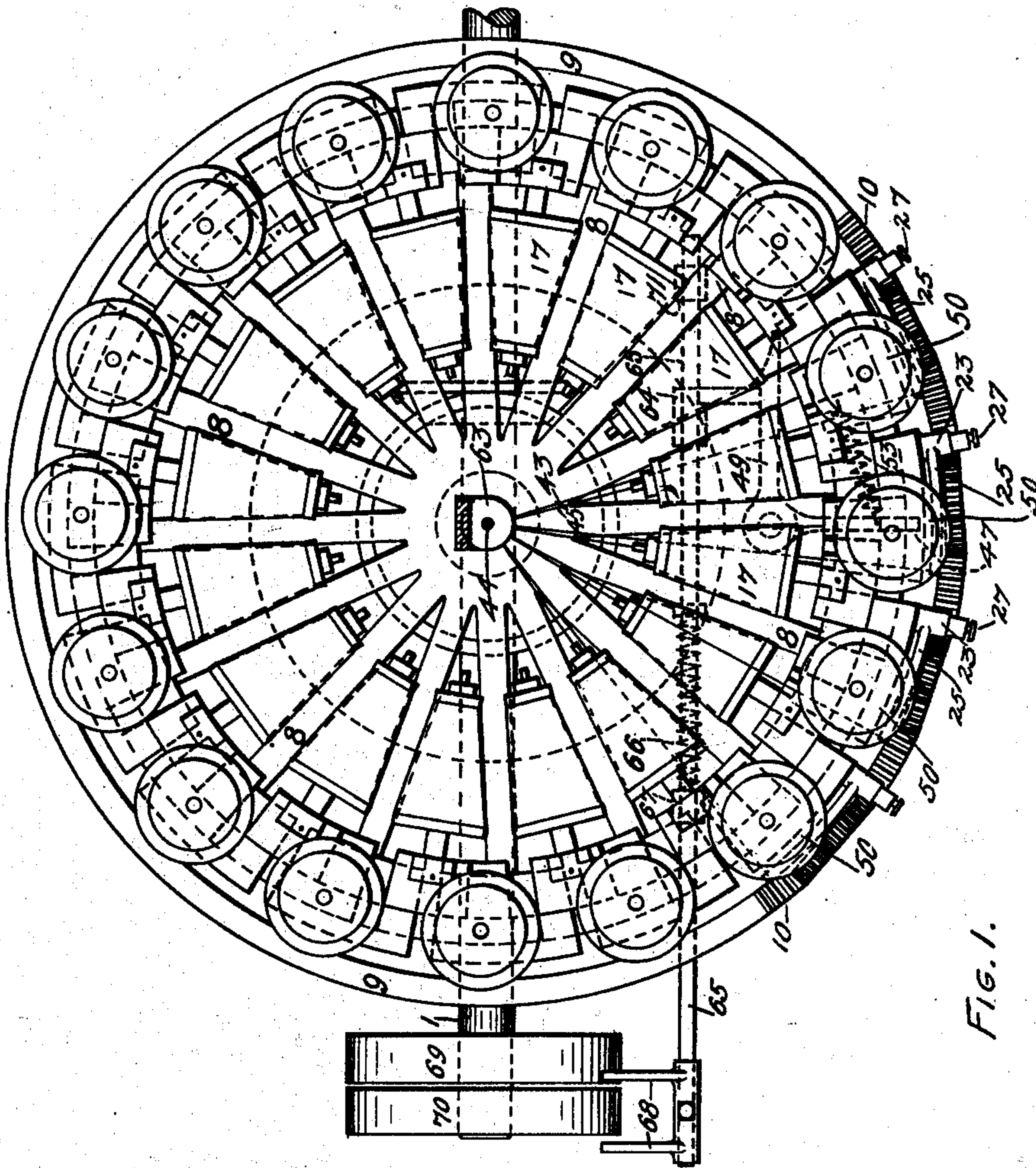


FIG. 1.

WITNESSES

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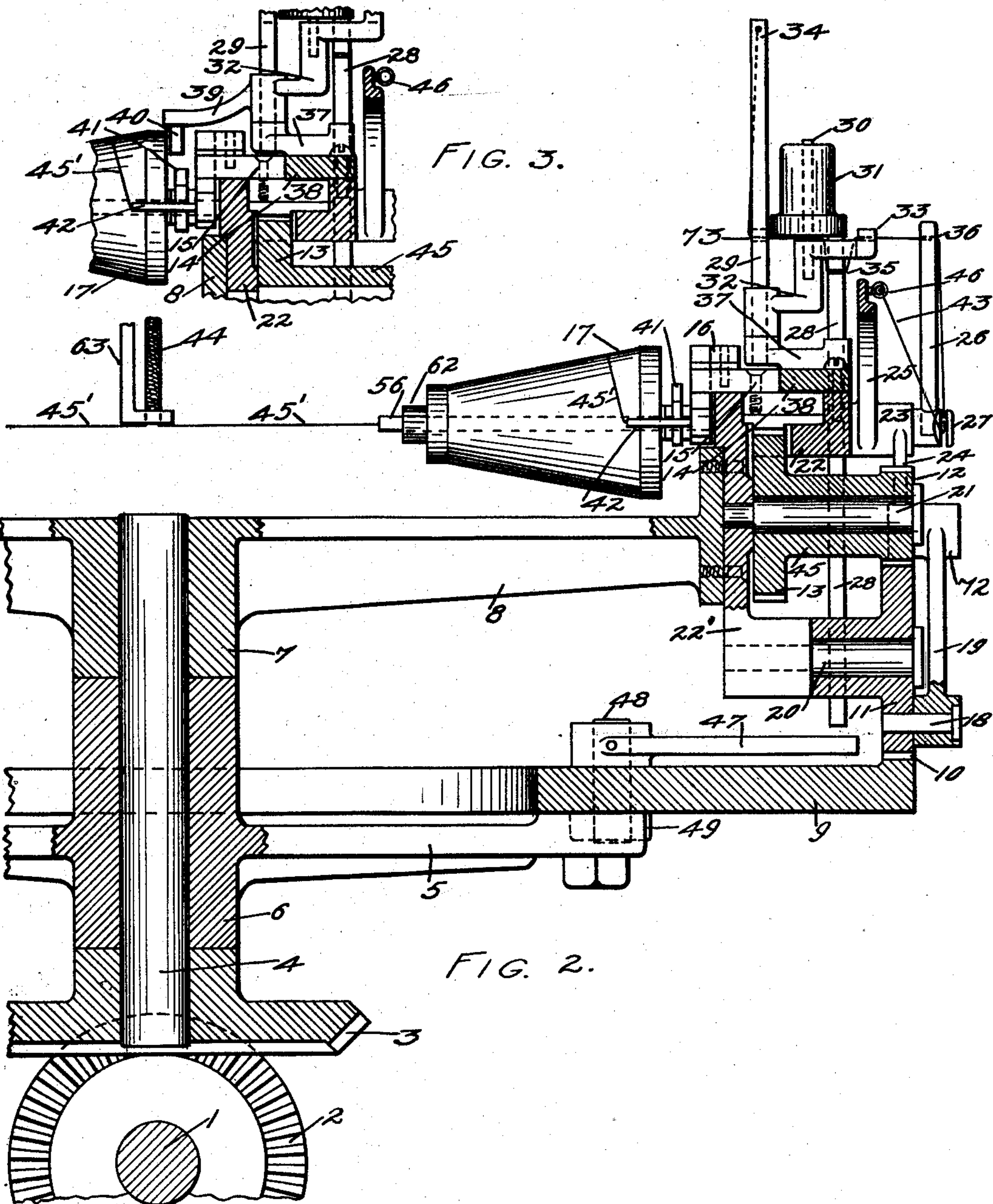
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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

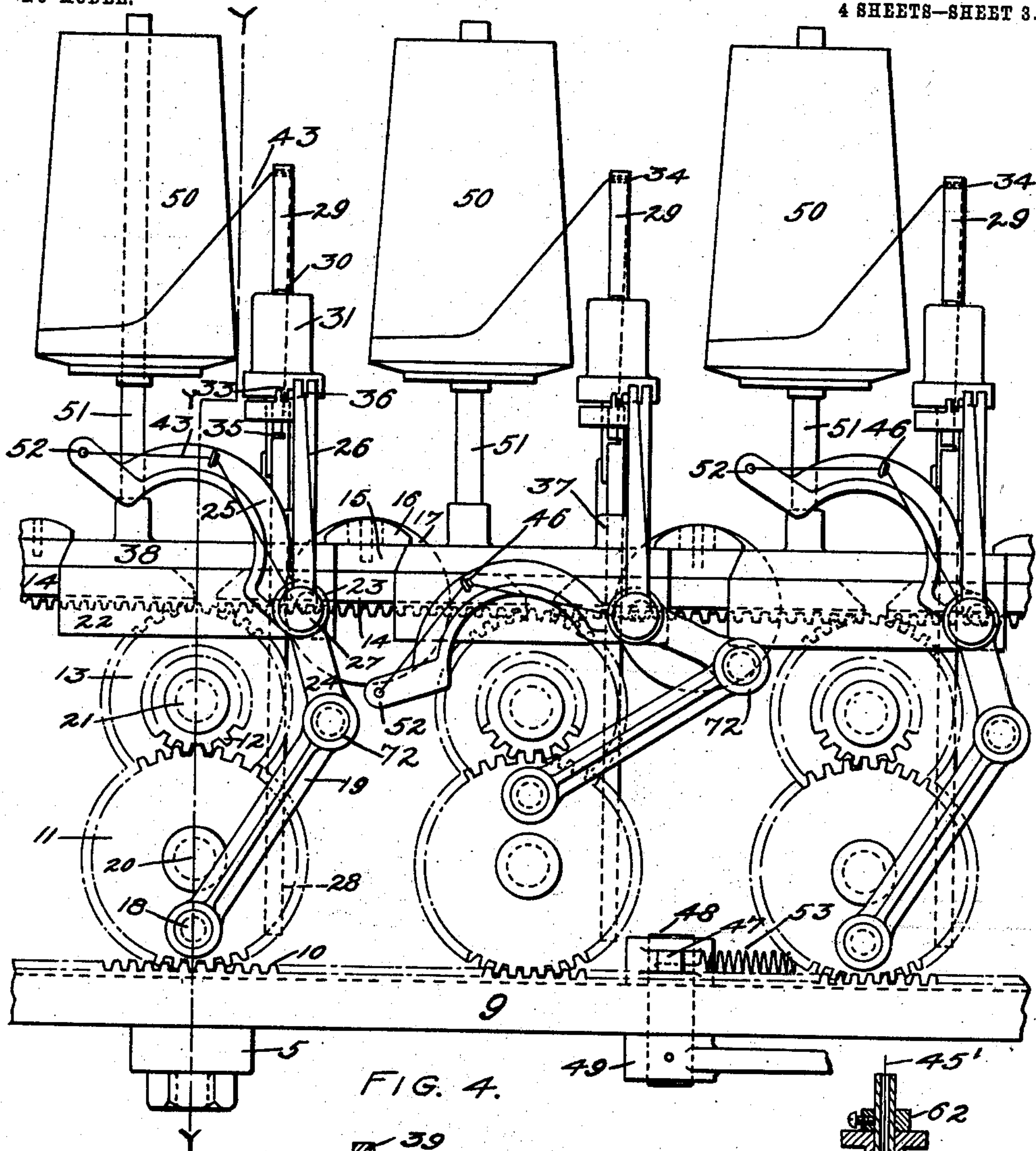


FIG. 4.

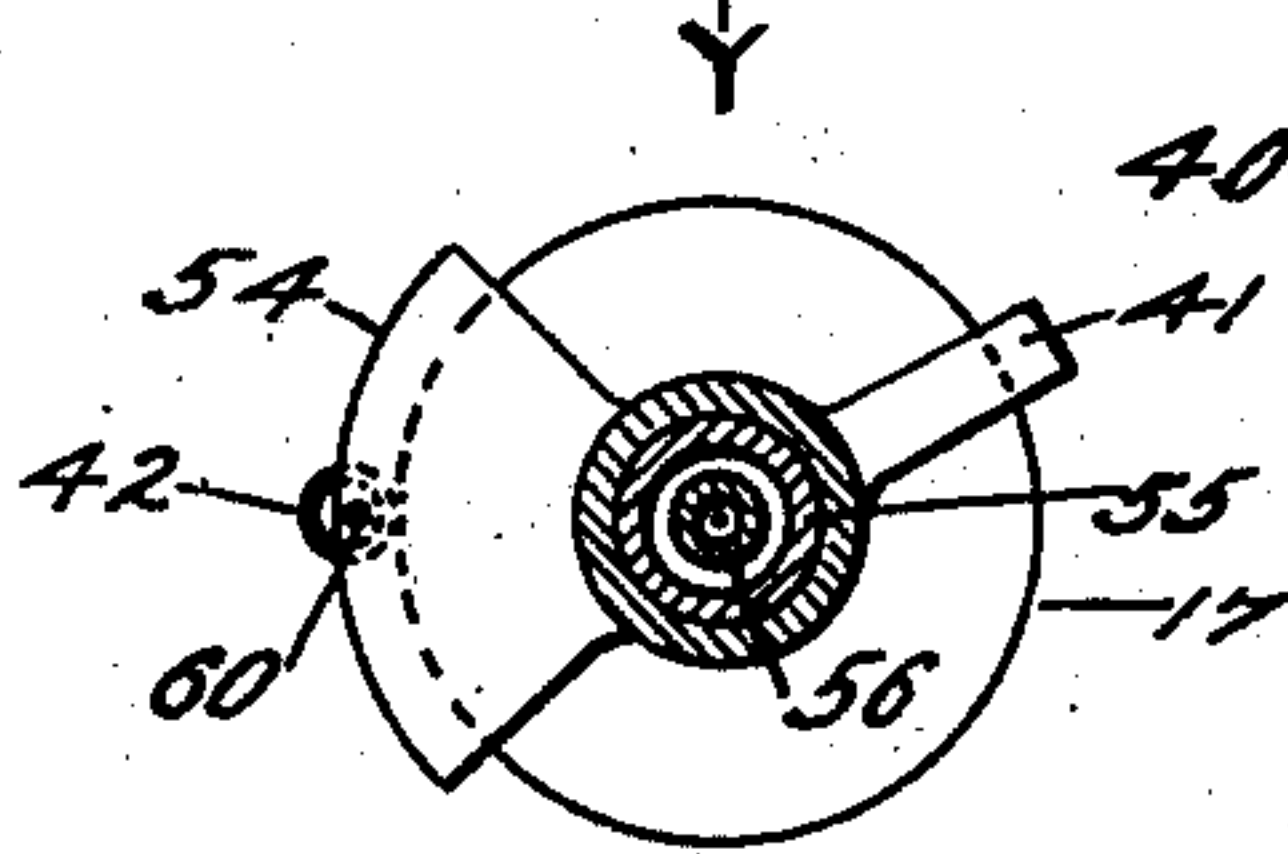


FIG. 7.

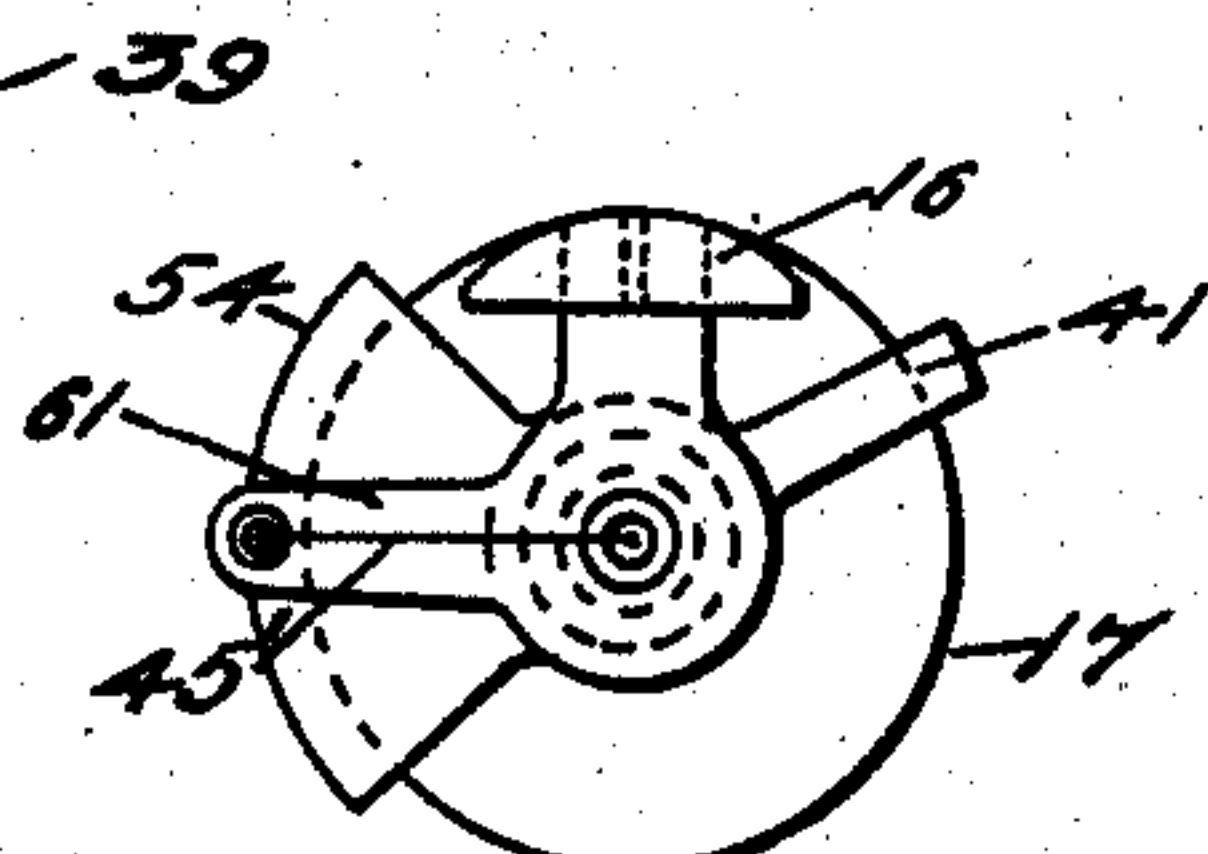


FIG. 6.

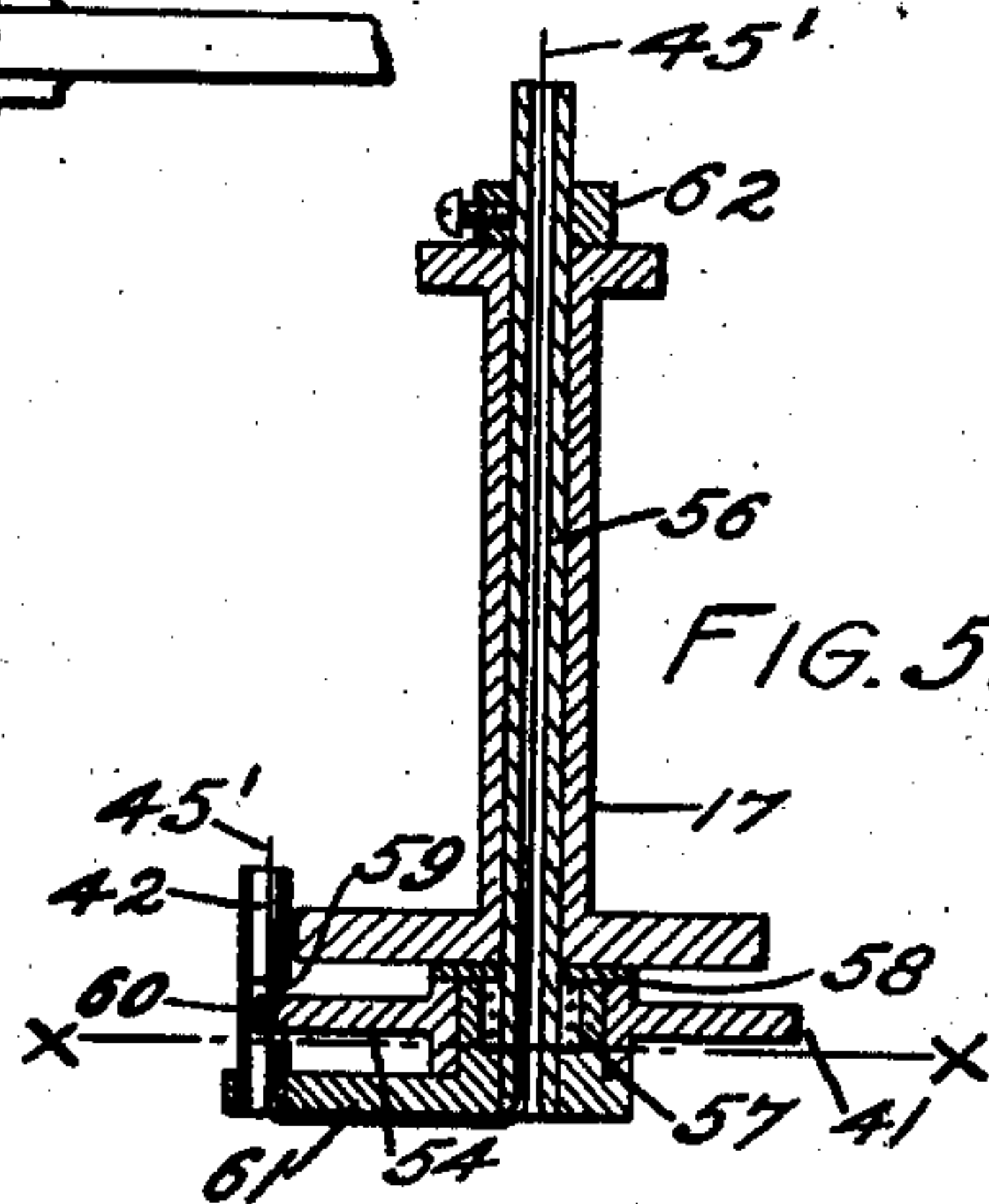


FIG. 5.

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4 SHEETS—SHEET 4.

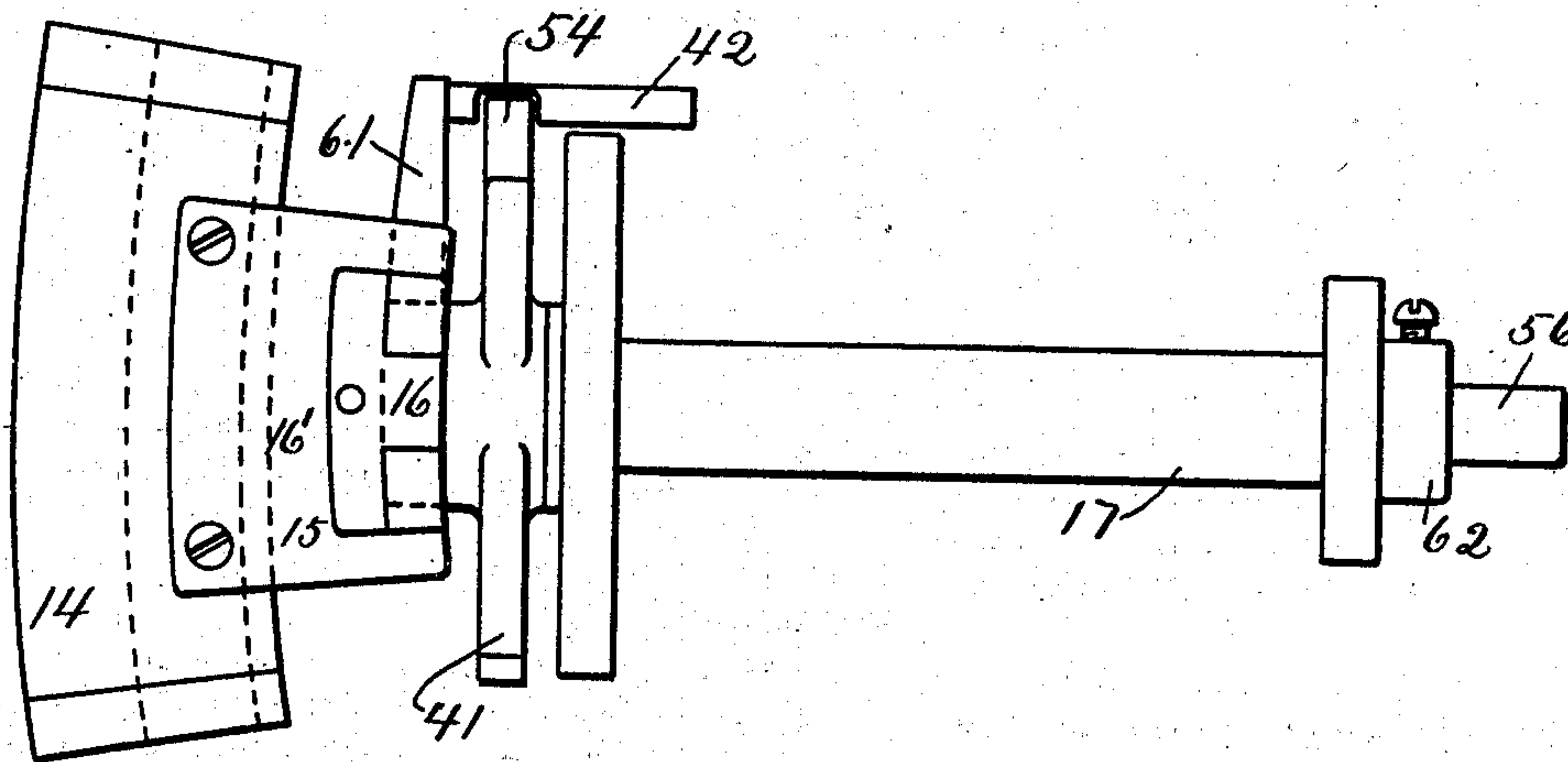


FIG. 8

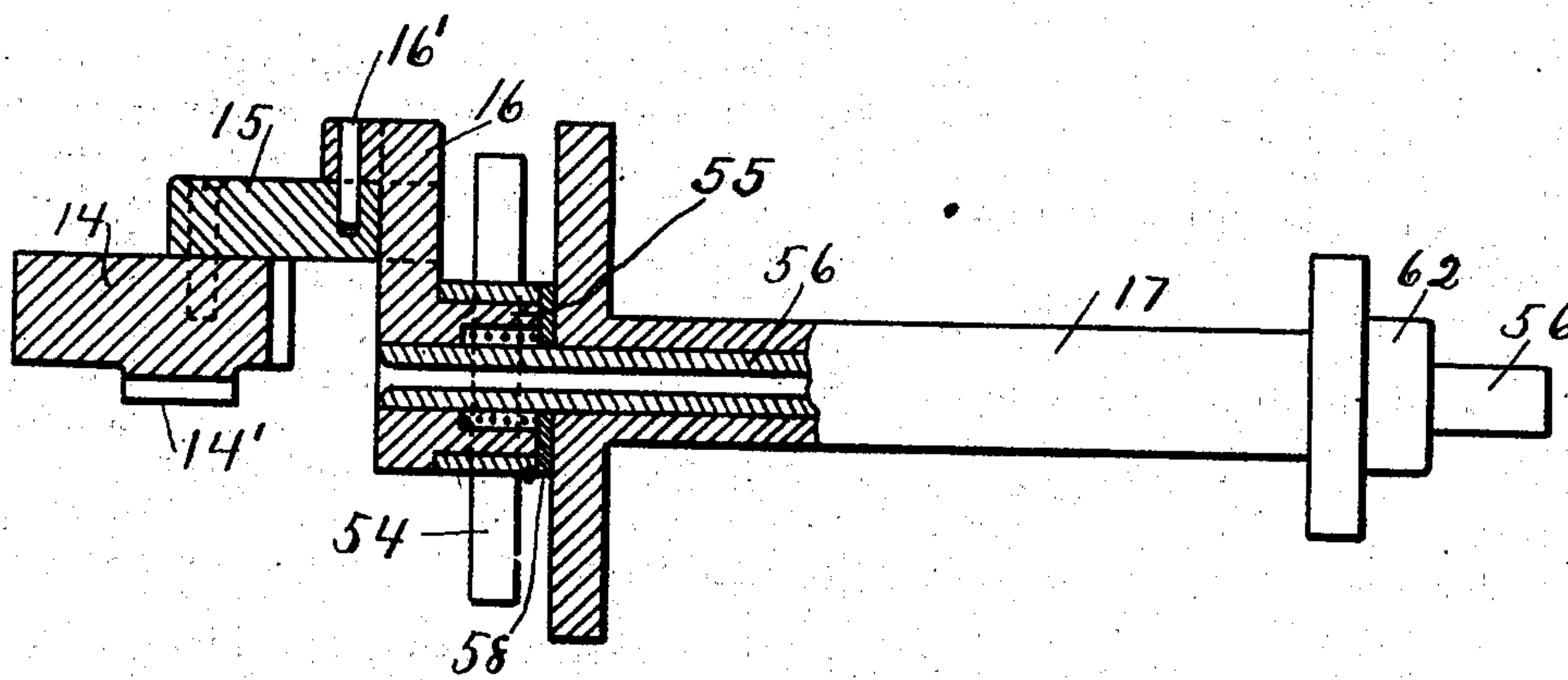


FIG. 9

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UNITED STATES PATENT OFFICE.

JOHN P. SWIFT, OF PAWTUCKET, RHODE ISLAND, ASSIGNOR OF THREE-FOURTHS TO ADAM SUTCLIFFE, OF PAWTUCKET, RHODE ISLAND.

BRAIDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 757,423, dated April 12, 1904.

Application filed June 4, 1902. Serial No. 110,135. (No model.)

To all whom it may concern:

Be it known that I, JOHN P. SWIFT, a citizen of the United States of America, and a resident of Pawtucket, county of Providence, and State of Rhode Island, have invented certain new and useful Improvements in Braiding-Machines, of which the following is a specification.

My invention relates to improvements in braiding-machines in which the thread is carried by an inner and outer series of bobbins, both series moving in a circular course, but in opposite directions, the interlacing of the thread in my device being accomplished by the operation of a series of crank-actuated arms which carry the thread of the outer series of bobbins over and under that of the inner series at predetermined intervals; and the object of my invention is to provide a braiding-machine in which cam movements and reciprocating action are either eliminated or greatly simplified.

I also aim to secure by my invention an automatic stopping device which will stop the machine in case of the breaking of a thread from either series of bobbins.

My invention consists, essentially, of a fixed circular bed, with a suitable support therefor, a revolving spider, the outer ends of which constitute together a segmental trackway, a series of bobbin-carriers adapted to move therein, a second and outer series of bobbins mounted upon said segments, and a plurality of crank-actuated arms operating to pass the thread from said second series of bobbins over and under the thread of the inner series of bobbin-carrier-supported bobbins at predetermined intervals.

The construction of my invention is disclosed by the accompanying drawings, in which—

Figure 1 is a plan view looking down upon the spider; Fig. 2, a vertical section on the line shown by *y y* in Fig. 4 looking toward the right; Fig. 3, a detail of the stopping mechanism; Fig. 4, an elevation of a part of the bed and segmental trackway, showing the outer series of bobbins and the crank-actuated arms; Fig. 5, a sectional view of one of the

interior bobbins; Figs. 6 and 7, details of the stopping mechanism, Fig. 7 being a section through *X X* of Fig. 5; and Figs. 8 and 9, details of the bobbin-hub and bobbin-carrier, Fig. 9 being a vertical section through the center line of Fig. 8.

The same numerals designate the same parts throughout.

In Fig. 2 the numeral 9 represents the circular bed of the machine, having its center removed. The bed 9 is supported at suitable intervals by legs. (Not shown in the drawings.) To 9, by means of bolts, are fixed the arms 5, which are integral with the sleeve 6, in which revolves the upright shaft 4. The outer edge of 9 is flanged and cut with gear-teeth, as shown at 10.

In Fig. 1, 1 is the driving-shaft; 70 and 69, the fast and loose pulleys, respectively; 68, the belt-shipper, and 65 the shipping-rod.

8 in Fig. 2 is the spider, having the hub 7. Attached to the outer end of each arm 8 by screws or some equivalent means is the member 22, which constitutes one segment of the trackway and also supports the gearing intermediate the bobbin-carriers and the bed 9. The shaft 1 communicates motion to the spider 8 8 by means of bevel-gears beneath the bed of the machine and shown at 2 and 3 in Fig. 2.

17 17 represent the inner bobbins revolving upon spindles and located just above the arms of the spider. This series of bobbins has the spindles placed horizontally. The outer series of bobbins is shown at 50 and is mounted upon the segments fixed upon the extremities of the spider-arms. Cone-shaped bobbins are preferably used with my machine, although it is applicable to spools or bobbins of a cylindrical or other shape.

4 in Fig. 2 is the vertical shaft upon which is fixed the spider 8 8, and 44 represents the braid.

45' is the thread passing from the inner series of bobbins, and 43 that from the outer series of bobbins, meeting to form the finished braid 44 at the center.

24 25 are the crank-actuated arms. (Seen best in Fig. 4.) These arms are pivoted upon

studs 27 and actuated by connecting-rods attached to the gears 11 by the studs 18. (Shown in Fig. 4.) The outer extremity of the stud 27 is grooved to form a guide for the thread 43 from the outer series of bobbins.

In Fig. 2, 17 shows an elevation of one of the inner series of bobbins. This is mounted upon the support 16, which fits into the bobbin-carrier 14 15, said bobbin-carrier consisting, essentially, of the member 15 and the member 14, suitably fastened together by screws and sliding in the trackway formed, as shown, at the outer extremity of the spider by the segmental members 22, having the cap 38. An elevation of these bobbin-carriers is shown in Fig. 4 at 14 15, while Figs. 8 and 9 give an enlarged plan and vertical section thereof, respectively. The hub proper of the inner bobbins is provided with a projection 16, comprising a shank or arm having a flanged upper portion. The shank fits into a vertical slot in the member 15, and at the same time a pin 16', integral with the flanged upper portion of 16, fits with a sliding connection into a suitable hold or seat in the upper part of the member 15. The bobbin-carriers have upon the bottom of the member 14 a segmental rack 14' engaging the pinion 13. (Shown in Figs. 2 and 9 in cross-section, a front view of which is seen in Fig. 4.) This pinion is mounted so as to revolve upon the stud 21, which is fixed at its inner end to the member 22 at the outer end of the arm 8. (Seen best in Fig. 2.) The pinion 13 is provided with the hub 45, integral with which is the toothed pinion 12. This pinion engages with the gear 11, revolving upon the stud 20, said stud itself being fixed upon the lower part of the segment, as shown at 22' in Fig. 2. This latter gear 11 engages the gear 10 upon the bed 9. As the arms 8 of the spider are revolved the gear 11 is caused to revolve also, which in turn gives revolution to the pinion 12 and the gear 13, thus moving the bobbin-carrier 14 15 in the opposite direction to that of the spider, the sizes of the intermediate gears being such that the speed of the bobbin-carrier is just equal to that of the spider, but in the opposite direction. The length of the member 14 of the bobbin-carrier is a little less than the distance between the centers of two adjacent pinions 13, being just enough for one pinion 13 to engage the member 14 just before an adjacent pinion 13 releases it, and the distance between adjacent bobbin-carriers is such that 13 engages one bobbin-carrier at or about the same moment that it releases the preceding one.

Upon the gear 11 is the connecting-rod 19, attached to said gear by the stud 18. This connecting-rod has a joint 72 connecting it with the member 25 by means of the shorter member 24, the two members forming together one solid integral arm joined at the hub 23 and oscillating upon the stud 27, which stud is fixed to the outer face of the segment 22. Fig. 4 shows the adjacent crank-actuated

arms at very nearly the extremities of their travel upwardly and downwardly, respectively. The relative positions of the arm 24 25 and the bobbin-carriers 14 15 and the distance between adjacent bobbin-carriers are such that the end 52 of the arm 24 25 carries the thread from the outer series of bobbins down between adjacent segments while the space is open, said end 52, with the thread, remaining below the segment 22 long enough for one or more bobbin-carriers, as desired, with its or their inner bobbin or bobbins, to pass over it, coming up again when the space is clear and remaining above the segment 22 long enough for the desired number of bobbin-carriers, with their inner bobbins, to pass under it, thus forming the braid. The course of the thread from the outer series of bobbins is shown in Figs. 2 and 4. As it leaves the bobbin 50, Fig. 4, the thread passes through an eye 34 at the upper end of an upright rod 29, which rod is fixed to a projection 37, integral with the upper part of the cap 38 of the trackway. Thence the thread passes down the side of said rod and out again through a second eye 73. (Seen in Fig. 2.) Supported by the upright rod 29 is a bracket 32, having at its upper part a flat seat for the thread and bearing the spindle 30, on which is loosely slipped the weight 31, which is retained in place by the spindle 30 and its own weight. The thread passes under the weight 31 and is held against the seat by said weight, whence it passes through a lateral slot 35 in a rod 28, which rod slides loosely through a perforation in the segmental trackway. The thread passes from said slot through a vertical slot 33 of said bracket 32, thence through a vertical slot 36 in the member 26, which is supported by and integral with the stud 27. The head of this stud 27 is slotted or grooved, as shown in Fig. 2, and through this groove the thread passes, thence to an eyelet 46 and through the extremity of the arm 24 25, as shown at 52 in Fig. 4, to the braid at the center. The rod 28 is normally suspended when the machine is going by the thread passing through the slot 35, as described, and the weight of this rod 28 furnishes the necessary tension to the thread and keeps the same uniform. The rod 28 is placed beneath the weight 31, and the draft on the thread raises 28 until it lifts 31, thus releasing the necessary supply.

The automatic stopping device is shown best in Figs. 2 and 3, with certain details shown in Figs. 5, 6, and 7. As already stated, the rod 28 is while the machine is in motion suspended entirely by the tension of the thread which passes through the lateral slot 35. Should a thread from any one of the outer series of bobbins break, the rod 28 would be immediately released and would fall by gravity, so that its lower end could rest upon the bed 9 of the machine. At a certain point in this bed is attached a partially-revoluble shaft

or stud 48, having fixed thereon above the bed a tripping dog 47 and below the bed a latch-bar 49. (Seen in plan in Fig. 1 in dotted lines.) This latch-bar engages an arm projecting from a collar 64, fixed upon the shipper-rod 65, as shown in Fig. 1, said latch-bar holding the shipper-rod by means of the spring 53, so that the belt of the shipper 68 will remain upon the fast pulley 70 while the machine is in operation. In case, however, of the breaking of a thread the rod 28 is immediately released and falls by its own weight until it strikes the top of the bed. As the machine revolves this rod is carried along until the dog 47 is reached. The rod then engages the dog 47, trips the latch-bar 49, and the spiral spring 66, suitably fastened at one end to a bearing 67, attached to the bed and having its other end retained by a collar upon the shipper-rod; throws said shipper-rod from the tight to the loose pulley, thus stopping the machine. The shipper-rod 65 is held to the bed by the bearings 67 and 71, Fig. 1.

The above-described device is used for stopping the machine upon the breaking of a thread of the outer series of bobbins. The stopping device connected with the inner series of bobbins is shown in Figs. 5, 6, and 7 and also in Fig. 3, Fig. 7 being a section through *xx* of Fig. 5. Upon the support 16, on which each of the interior series of bobbins is mounted, is a projecting arm 61, on which is fixed the tube 42, parallel with the spindle supporting the bobbin. (Seen best in Fig. 5.) This tube 42 has a part of its lateral wall removed, making the recess 59. Upon the spindle 56 of the bobbin 17 and immediately below the base thereof is a disk 54 in the form of a sector of a circle, Fig. 6. This disk is revolvably mounted upon the hub 55 of the spindle 56, that carries the bobbin, and is separated from the bobbin by the washer 58. Within the hub 55 is an annular space containing a spiral spring. (Shown by the dotted lines 57 in Fig. 5.) This spring being compressed by the washer 58 operates by friction to prevent the too free rotation of the bobbin. Integral with the disk 54 and forming a part thereof is the arm 41, projecting beyond the center of the bobbin upon the opposite side thereof from the disk 54, the disk being heavier than the arm 41. The thread 45', passing from the bobbin, goes through the tube 42 and also through a perforation 60, Fig. 5, near the circumference of the disk 54. Thence the thread passes to the center of the bobbin and out through the spindle 56, which is tubular in form, to the braid 44. The bobbin 17 is retained upon the spindle by the collar 62, attached by a set-screw to the spindle. Fig. 6 is an elevation of one of the interior bobbins looked at from without the machine and represents the normal position of the disk 54, with its arm 41 as supported by the thread while the machine is running. This disk is

retained in this position by the thread passing through the perforation 60; but if the thread should break the disk and arm 41 being in unstable equilibrium the disk 54 immediately drops, and the arm 41 correspondingly rises.

One or more of the brackets 32, supported by the rod 29, previously described, is made revoluble on said rod. This revoluble bracket is shown in detail in Fig. 3 and has projecting downwardly therefrom the arm 39, with a pin 40. When the disk 54 with its arm 41 are in their normal position during the operation of the machine, the bobbin 17, with its carrier and all other connections, passes below the pin 40 without touching the same; but in case of the breaking of the thread 45' the disk 54 being released immediately drops, the arm 41 rises correspondingly, and the length of 41 is such that it engages the pin 40 of the arm 39 and causes the same to make a partial revolution upon the upright rod 29. This partial revolution of the bracket 32, with its slots 33, withdraws the thread from the slot 35 in the rod 28, which rod then drops, as in the case of the breaking of a thread in the outer series of bobbins, engaging the dog 47 and its connected mechanism and stopping the machine in the same manner as above described.

It will be seen from an inspection of my device that a great number of variations are possible in the style of braid manufactured. For instance, it is not necessary that the thread from any given outer bobbin should pass alternately over and under the adjacent threads from the inner series. The sizes of the parts may be changed, so that each exterior thread shall pass over and under two or more interior threads or over one and under two or more, or vice versa. The braid may be further varied by the removal of a part of the bobbins from the outer series or of a part of the bobbins from the inner series. Again, the crank-actuated arms may be so adjusted as to all rise together and all fall together or so that any number of the arms may rise and fall simultaneously, thus producing what I believe to be entirely new and novel styles or designs of braid.

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

1. In a braiding-machine the combination of a stationary circular bed having a toothed rim; a series of gears 11 in mesh with said rim and revoluble both upon their own axes and also around said bed; a series of bobbin-carriers; a gear 13 in mesh with said bobbin-carriers, and integral with 13 a pinion 12 in mesh with the gears 11; an inner series of bobbins mounted on said bobbin-carriers; an outer series of bobbins; a plurality of thread-guiding members, and means for rotating said bobbin-carriers in one direction and said outer series of bobbins and said thread-guiding members

in an opposite direction; substantially as described for the purpose specified.

2. In a braiding-machine, a stationary circular bed having a toothed rim; a spider revolvably mounted above said bed; a trackway formed by recesses within the extremities of said spider; a series of bobbin-carriers sliding in said trackway; an inner series of bobbins borne by said bobbin-carriers; an outer series of bobbins mounted upon the extremities of said spider; a plurality of movable thread-guiding arms also mounted upon said extremities, and operating to guide the thread from said outer series of bobbins across the path of said inner series of bobbins at predetermined intervals; and means for simultaneously revolving in opposite directions said thread-guiding members and said bobbin-carriers, substantially as described.

3. In a braiding-machine a revoluble segmental trackway; a series of thread-supplying devices mounted thereon; a plurality of thread-guiding members therefor; a series of connecting-rods actuating said members; a series of gears operating said connecting-rods and engaging a stationary rack common to them all, the whole in combination with said stationary rack; the relative position of said thread-guiding members being so adjustable as to present the thread guided by said members in a variable relation to a second set of thread-supplying devices, so as to form braid of different styles, substantially as described.

4. In a braiding-machine the combination of a stationary circular bed having a toothed rim; a series of gears 11 in mesh with said rim, and rotatable both upon their own axes and also around said bed; a spider supporting said gears and revolvably mounted above said bed; a segmental circular trackway concentric with said rim, and formed by recesses within the extremities of said spider; a series of bobbin-carriers moving in said trackway; a set of gearing intermediate said bobbin-carriers and the gears 11 and operating to drive said bobbin-carriers in said trackway; a plurality of movable thread-guiding members mounted upon the extremities of said spider; and a series of connecting-rods 19 operated by said gears 11, the relative arrangement of parts being such that said bobbin-carriers and said thread-guiding members revolve in opposite directions by means of the revolution of said spider, substantially as described for the purpose specified.

5. In a braiding-machine a circular bed having a toothed rim; a revoluble segmental trackway suitably mounted on said bed; an outer series of bobbins supported upon the segments of said trackway; a plurality of thread-guiding members also supported upon said segments; a series of bobbin-carriers moving in said trackway but in an opposite direction thereto, each of said bobbin-carriers having a segmental rack upon the bottom thereof; an

inner series of bobbins supported by said bobbin-carriers; a series of gears and pinions mounted upon the segments of said trackway and intermediate the toothed rim of said bed and said bobbin-carriers, and a series of connecting-rods connecting said gears with said thread-guiding members and operating to pass the thread from said outer series of bobbins over and under the thread from any desired number of bobbins of said inner series, substantially as described.

6. In a braiding-machine, a tension device consisting of a seat crossed by the thread; a weight resting thereon; a movable rod normally suspended underneath said weight by a loop of said thread when said machine is in operation, in such a manner that the draft upon the thread raises said rod until it engages and lifts said weight from the thread, thus releasing the desired amount of thread, substantially as described.

7. In a braiding-machine of the type mentioned, an automatic stopping device consisting of an unbalanced disk revolubly mounted on the hub of each of the inner series of bobbins and having an arm radially projecting therefrom; a vertical rod supported by the thread from a bobbin of the outer series, by means of a lateral slot therein; an upright rod 29; a two-armed bracket revolubly mounted thereon; one arm of said bracket being slotted to receive the thread aforesaid after the same passes from said vertical rod, the other arm of said bracket projecting downwardly toward the radially-projecting arm of the unbalanced disk aforesaid, and adapted to engage said arm when said disk is released by the breaking of a thread from a bobbin of said inner series; a spring-actuated shipper-rod; a latch-bar engaging said shipper-rod; a dog operating the said latch-bar; the relation between said parts being such that the breaking of a thread from a bobbin of said outer series at once releases said vertical rod causing the same to drop and engage said dog and stop the machine by means of said dog, latch-bar and shipper-rod, while the breaking of the thread from a bobbin of said inner series releases said vertical rod in like manner, by the consequent engagement of the radial arm of the aforesaid disk with the downwardly-projecting arm of the bracket aforesaid, all substantially as described for the purpose specified.

8. In a braiding-machine the combination of the following instrumentalities: a segmental member 22; a bobbin-carrier composed of an upper member 15 adapted to hold a bobbin, and a lower member 14 fixed upon said member 15 and sliding easily in said segmental member 22, the lower surface of 14 forming a rack; a gear 13 and integral therewith a pinion 12, said gear 13 being in mesh with the rack upon the member 14; a gear 11 in mesh with said pinion 12; a thread-guiding

arm 24 25; a connecting-rod 19 connecting
said arm with the gear 11; the whole forming
one of a series, each gear 11 of which is in
mesh with a stationary circular rack 10, com-
5 mon to said series; the whole in combination
with said rack 10; substantially as described
for the purpose specified.

Signed at Pawtucket this 31st day of May,
1902.

JOHN P. SWIFT.

Witnesses:

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