No. 862,436. PATENTED AUG. 6, 1907.

V. BEAUREGARD.

BRAIDING MACHINE.

APPLICATION FILED MAR. 19, 1906.

5 SHEETS—SHEET 1.

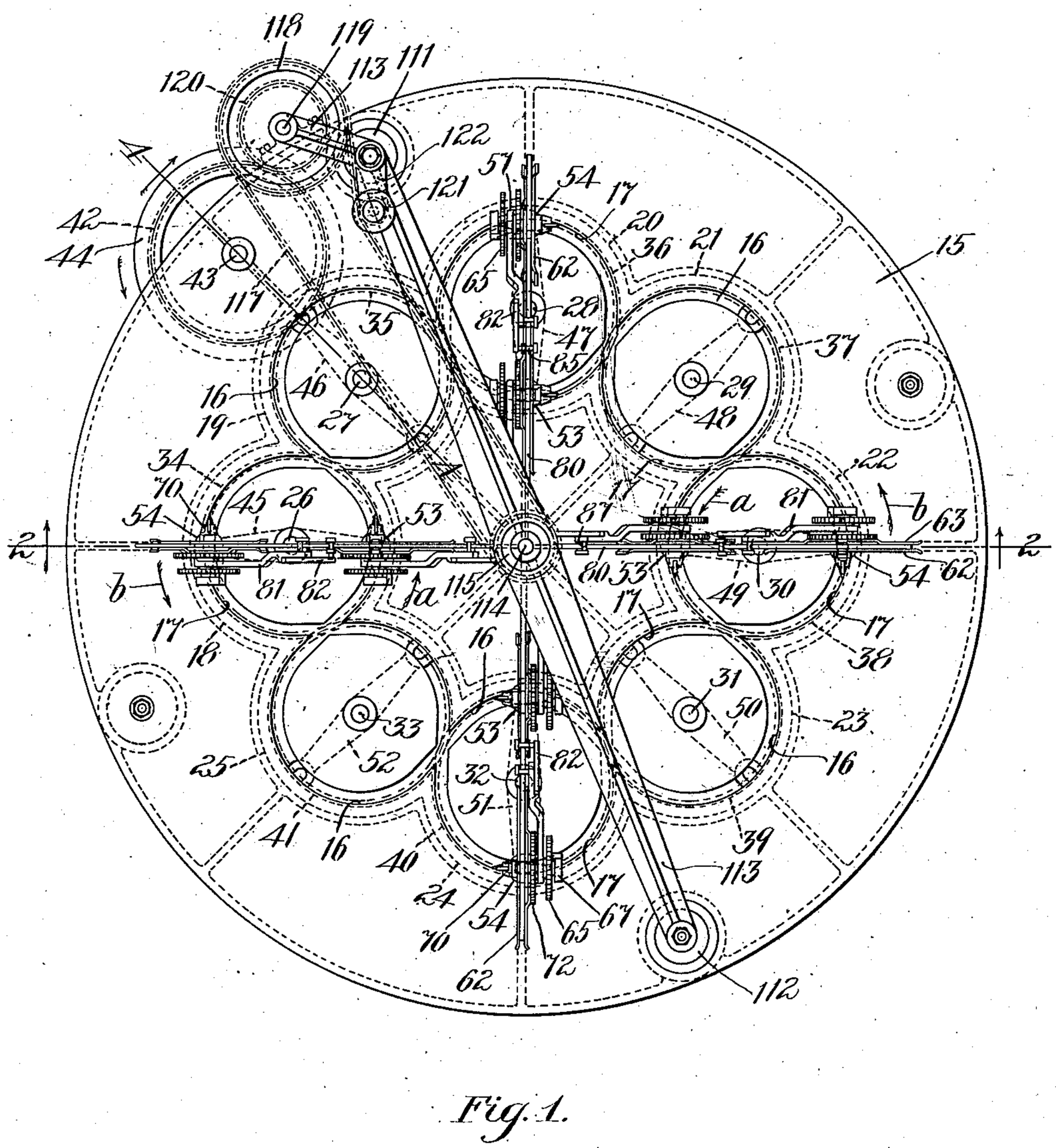

Fig. 1.

Witnesses:
Everett N. Curtis
K. M. Sullivan

Inventor:
Victor Beauregard
by Chas. F. Perkins Attorney

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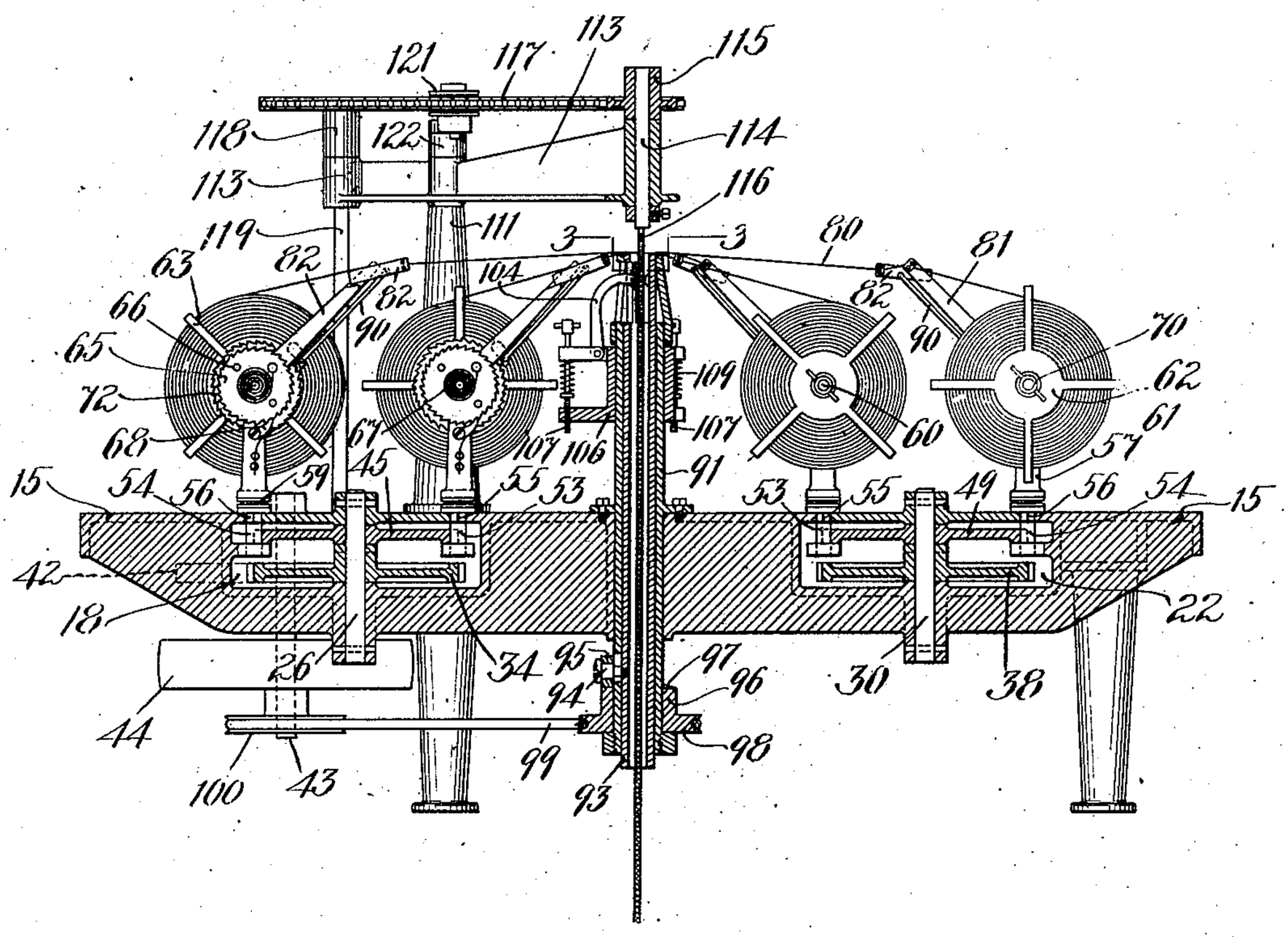

Fig. 2.

Witnesses:
Everett N. Curtis.
K. M. Sullivan.

Inventor
Victor Beauregard
by Chas. F. Perkins Attorney

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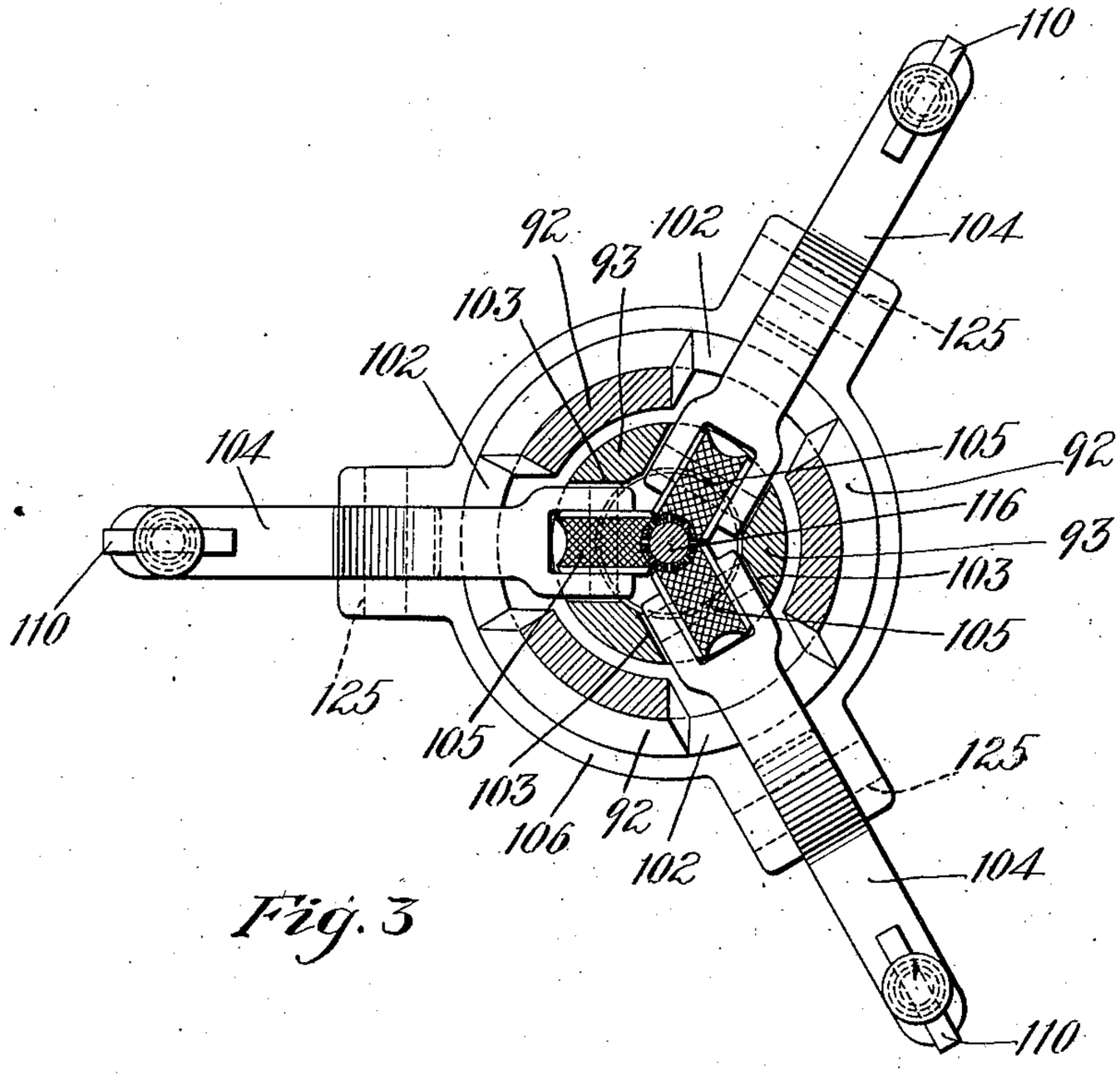

Fig. 3

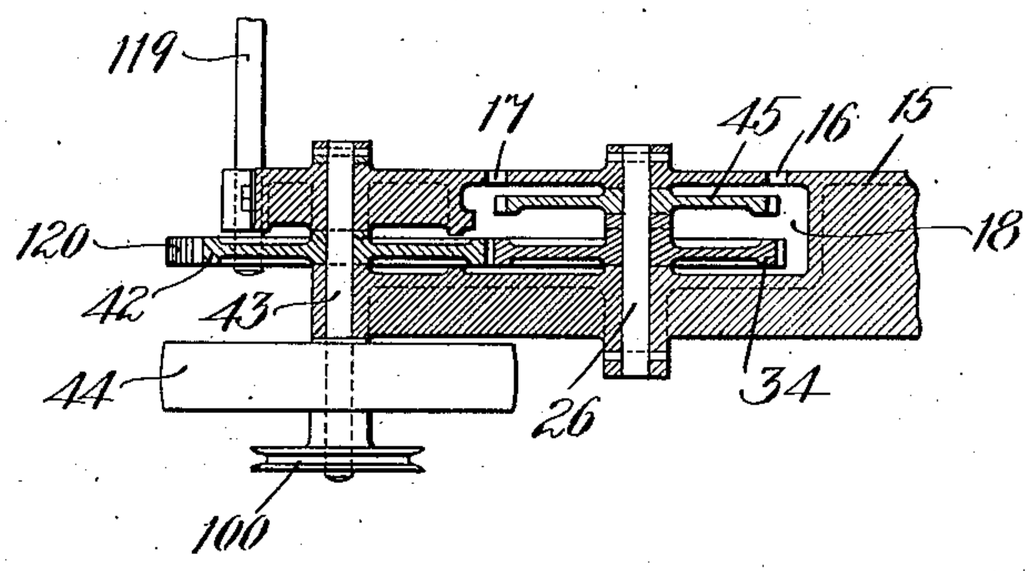

Fig. 4.

Witnesses:
Everett N. Curtis
K. M. Sullivan

Inventor
Victor Beauregard
by Chas. F. Perkins Attorney

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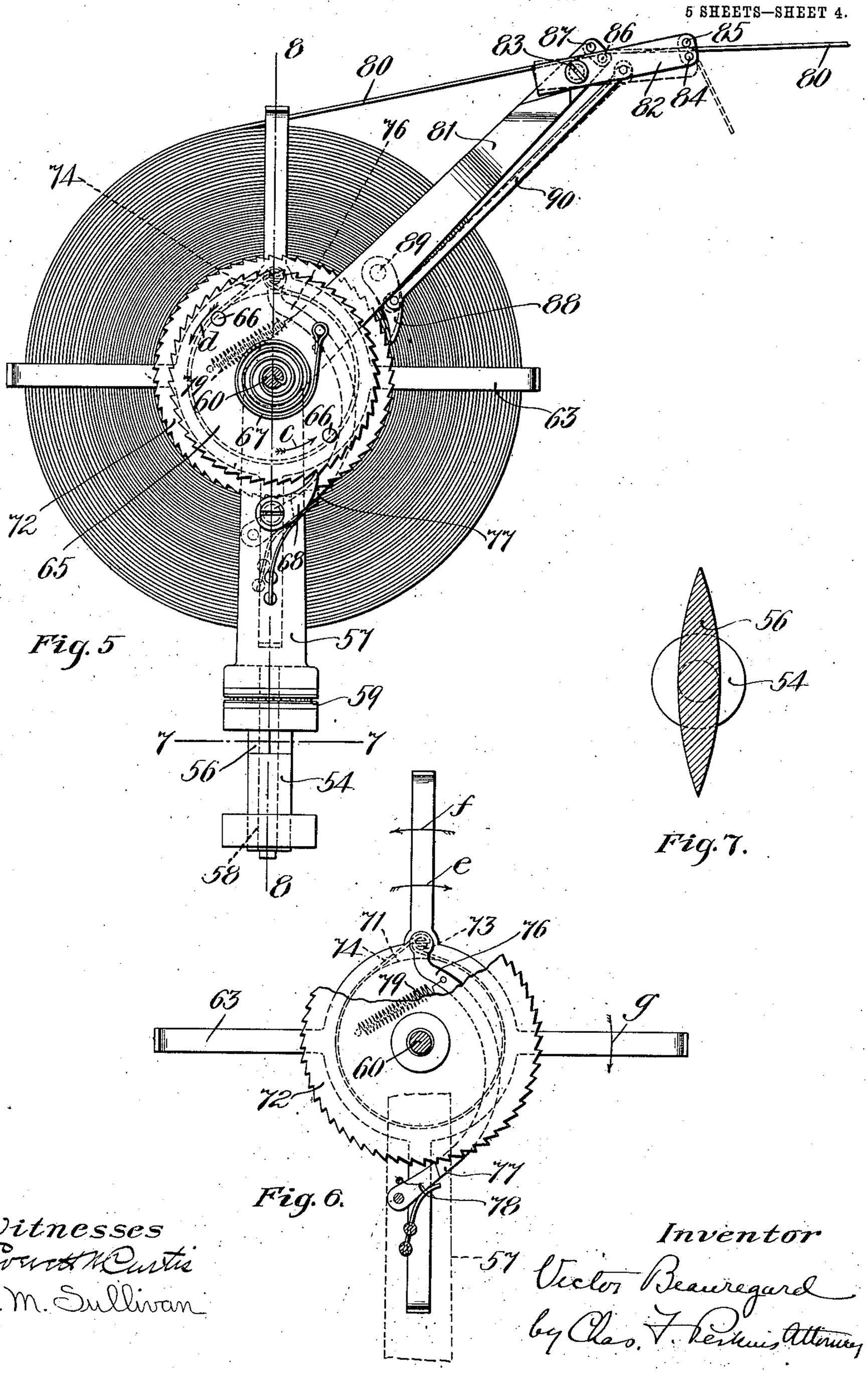

Fig. 5

Fig. 7.

Fig. 6.

Witnesses
Everett K. Curtis
K. M. Sullivan

Inventor
Victor Beauregard
by Chas. F. Perkins Attorney

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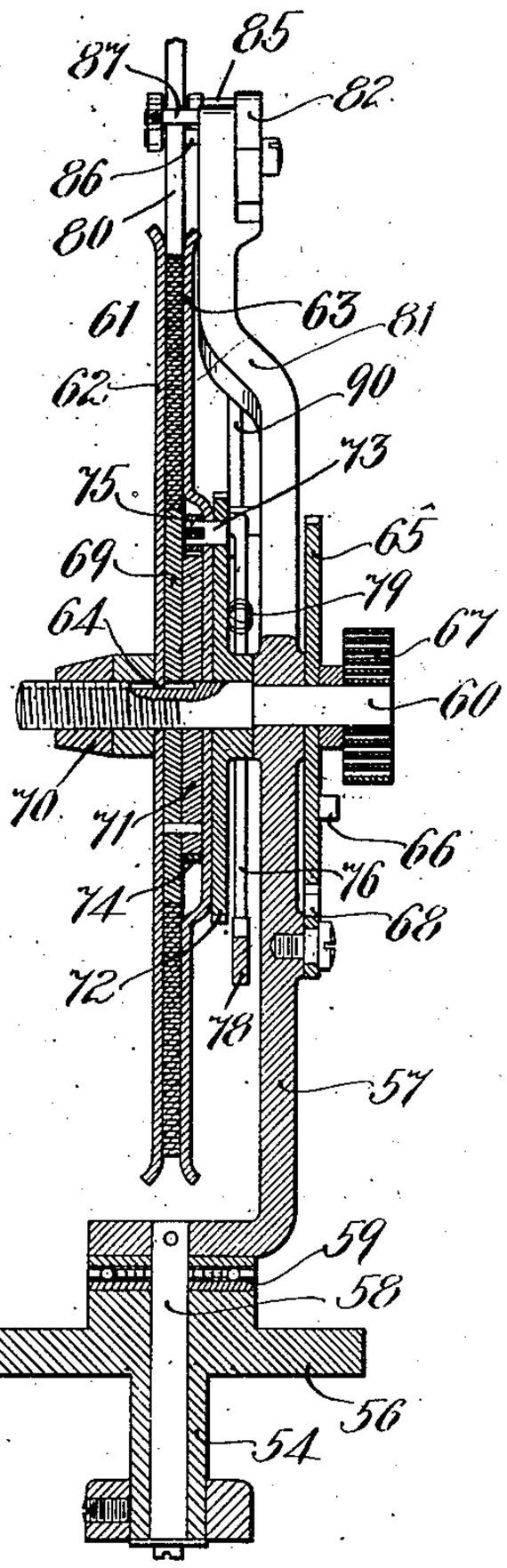

Fig. 8.

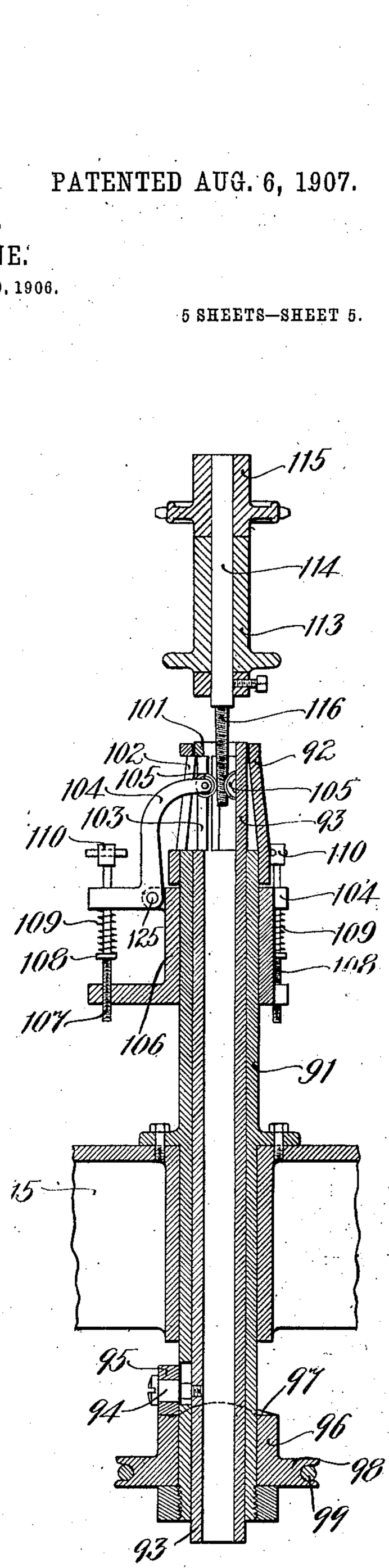

Fig. 9

Witnesses:
Everett N. Curtis
K. M. Sullivan

Inventor:
Victor Beauregard
by Chas. F. Perkins Attorney

UNITED STATES PATENT OFFICE.

VICTOR BEAUREGARD, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN CIRCULAR LOOM COMPANY, OF CHELSEA, MASSACHUSETTS, A CORPORATION OF MAINE.

BRAIDING-MACHINE.

No. 862,436. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed March 19, 1906. Serial No. 306,738.

To all whom it may concern:

Be it known that I, VICTOR BEAUREGARD, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented new and useful Improvements in Braiding-Machines, of which the following is a specification.

This invention relates to an improvement in braiding machines, of that class in which strips of sheet material are braided into the form of a tube, and the objects are, first, to provide a simple, cheap, and durable machine for tubular braiding in which strips of sheet material, such, for instance, as paper fiber may be braided into tubular form; second, to prevent the strands from catching and tearing off when they pass over one another; third, to maintain a substantially uniform tension on the portions of the strands which intervene between the reels and the point of braiding; fourth, to provide devices to lock the reels against backward rotation when strands become broken; and fifth, to provide feeding mechanism which shall not crush nor distort the tubular fabric and which shall feed said fabric at a constant uniform rate of speed, said feed being readily adjustable by the operator.

The invention consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings: Figure 1 is a plan view of my improved braiding machine. Fig. 2 is a section, partly in elevation, on line 2—2 of Fig. 1, looking in the direction of the arrows on said line. Fig. 3 is an enlarged detail plan section taken on line 3—3 of Fig. 2. Fig. 4 is a section, partly in elevation, on line 4—4 of Fig. 1, looking in the direction of the arrows on said line. Fig. 5 is an enlarged side elevation of one of the reels, together with a reel standard and reel carrier. Fig. 6 is a detail sectional elevation of a portion of the parts illustrated in Fig. 5, partly broken away and with a portion of the reel standard indicated in dotted lines. Fig. 7 is a plan section on line 7—7 of Fig. 5. Fig. 8 is a section, partly in elevation, taken on line 8—8 of Fig. 5, looking toward the right in said figure. Fig. 9 is an enlarged detail section, partly in elevation and partly broken away, on line 2—2 of Fig. 1, looking in the direction of the arrows in said figure.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings 15 is a guide-plate provided with sinuous intersecting guide slots 16 and 17. The guide-plate 15 is also provided with recesses 18, 19, 20, 21, 22, 23, 24 and 25 formed therein. Stationary shafts 26, 27, 28, 29, 30, 31, 32 and 33 extend upwardly within the recesses 18, 19, 20, 21, 22, 23, 24 and 25, respectively. Spur gears 34, 35, 36, 37, 38, 39, 40 and 41 are journaled on the shafts 26, 27, 28, 29, 30, 31, 32 and 33, respectively, said gears forming a continuous train and said train being driven by a spur gear 42 which meshes into the gear 35. The gear 42 is fast to a shaft 43 journaled in the guide-plate 15. A pulley 44 fast to the shaft 43 and driven by a belt (not shown) is adapted to rotate the shaft 43 and thus drive the train of gearing hereinbefore described. Exchange-plates 45, 46, 47, 48, 49, 50, 51 and 52 are fast to the gears 34, 35, 36, 37, 38, 39, 40 and 41, respectively. A series of four reel carriers 53, all identical in construction engage the slot 16 and are adapted to travel therein. A series of four reel carriers 54, all identical in construction, are adapted to travel in the guide-slot 17. The series of reel carriers 53 is moved in the direction of the arrows *a* and the series of reel carriers 54 is moved in the direction of the arrows *b* by the exchange-plates 45, 46, 47, 48, 49, 50, 51 and 52, each of said exchange-plates provided with substantially semi-circular notches in opposite ends thereof, respectively, said notches adapted to engage the cylindrical portions of said reel carriers.

Each of the reel carriers 53 is provided with an elongated portion 55, pointed at both ends, said elongated portion acting to guide said reel carrier across the intersections of the slot 16 with the slot 17. Each of the reel carriers 54 is provided with an elongated portion 56, pointed at both ends, said elongated portion acting to guide said reel carrier across the intersections of the slot 17 with the slot 16. Standards 57, provided with spindles 58 fast thereto, are journaled to the reel carriers 53 and 54 of both series. Each of said reel carriers is provided with a ball thrust bearing 59 which enable the reel standards to swivel easily upon said reel carriers.

Each of the reel standards 57 has a shaft 60 journaled therein. A reel 61, consisting of plates 62 and 63, is mounted on the shaft 60. The plate 62 is splined to the shaft 60 by a key 64 and the plate 63 is loose on said shaft and is free to move rotatively with relation thereto. A winding ratchet 65, journaled on the shaft 60, is provided with pins 66 by which said ratchet may be moved rotatively. A coil spring 67, fast at one end to the shaft 60 and at the other to the winding ratchet 65, acts to normally move the shaft 60 in the direction of the arrow *c* (Fig. 5). The tension of said spring may be adjusted by moving said winding ratchet 65 in the direction of the arrow *d* (Fig. 5), a stop-pawl 68 acting to hold said ratchet in its adjusted position. A disk 69, journaled on the shaft 60, has wound thereon a strip of paper fiber in the form of a roll, the inner end of said roll being fastened to said disk. A thumb-nut 70 having screw-threaded engagement with the shaft 60 may be adjusted on said shaft to cause the reel plate 62 to bear with more or less pressure upon the disk 69 and the strip of paper fiber rolled thereon. A brake-drum 71 is pinned to the disk 69 and moves rotatively therewith. A ratchet 72 is journaled on the shaft 60

and rotates with the reel plate 63 by reason of a stud 73 which passes through said ratchet and said reel plate. A brake-band 74, preferably formed of very thin sheet metal, surrounds the brake-drum 71 and both ends of said brake-band are inserted in a jaw 75 formed in the stud 73, as illustrated in Figs. 5, 6 and 8. It will be seen that by turning the stud 73 in the direction of the arrow *e* (Fig. 6) the brake-band 74 is caused to grip the brake-drum 71. A brake-arm 76, fast at one end to the stud 73 bears at its other end 77 against a spring-pressed stop 78. A helical extension spring 79, fast at one end to the brake-arm 76 and at the other end to the ratchet 72, acts to hold the end 77 of said brake-arm in contact with the stop 78.

In the normal operation of the machine the tension of the strand 80, leading from the reel 61, acts to hold the end 77 of the brake-arm 76 against the stop 78 with such force as to overcome the tension of the spring 79 sufficiently to allow the brake-arm 76 to be swung toward the right (Figs. 5 and 6) thereby holding the brake-band 74 loosely around the brake-drum 71. If the friction of the reel plate 62 against the disk 69 and the roll of fiber should not be great enough, or, if the vibration of the machine should cause a slipping of said roll of fiber faster than the strand leading therefrom is taken up by the braiding process, the tension of the spring 67 would become diminished by a tendency to left-handed rotation of the shaft 62 in the nature of a gradual slipping of the reel plate 62 against said disk and roll, if it were not for the brake hereinbefore described. Should such a slipping occur beyond the normal slipping, due to the unwinding of the roll in the process of braiding, the tension upon the strand 80 becomes diminished to such an extent that the end 77 of the brake arm 76 has a tendency to move away from the stop 78, but said end being held in contact with said stop by the spring 79, the reel plate 63, through which the stud 73 passes, moves very slightly in the direction of the arrow *f* (Fig. 6), thus causing said stud to be rocked in the direction of the arrow *e* (Fig. 6) by the pull of the spring 79 upon the brake-arm 76, thus causing the brake-band 74 to grip the brake-drum 71. The brake-band 74 acts to hold the brake-drum 71, together with the disk 69 and the roll of fiber thereon, against rotation until in the operation of braiding the slack hereinbefore mentioned has been taken up and the normal tension on the strand 80 has been restored, whereupon the friction of said roll of fiber against the reel plate 63 acts to move said reel plate in the direction of the arrow *g* (Fig. 6) with sufficient force to cause the end 77 of the brake-arm 76 to bear against the stop 78 with its normal pressure, thus causing the brake-band 74 to become loosened from the brake-drum 71, whereupon the roll of fiber resumes its normal slipping with relation to the reel 61.

The reel standard 57 is provided with an arm 81 formed integral therewith. A guide-finger 82, pivoted at 83 to the arm 81, is provided with guide-pins 84 and 85, between which the strand 80 passes. The arm 81 is provided with pins 86 and 87 through which the strand 80 also passes. In the normal operation of the machine the tension on the strand 80 holds the guide-finger 82 in the position shown in full lines (Figs. 2 and 5.). A stop-pawl 88, pivoted at 89 to the arm 81, is adapted to engage the ratchet 72 and is connected to the guide-finger 82 by a link 90. While the strand 80 is under tension, the guide-finger 82 acting on the link 90 and the stop-pawl 88 acts to hold said stop-pawl out of engagement with the ratchet 72. If, however, the strand 80 should become severed, the right hand end of the guide-finger 82 (Fig. 5) drops of its own weight to the position shown in dotted lines, thereby causing the stop-pawl 88 to engage the ratchet 72, locking the reel 61 against backward rotation. It will be understood that the reel mechanisms are all identical in construction and that the foregoing description applies to them all.

A hollow post 91 is provided at its upper end with a stationary ring 92 fast thereto. A tube 93 is arranged to slide within the hollow post 91 and fast thereto is a stud 94 on which is journaled a cam-roll 95. A cam 96, journaled on the exterior of the hollow post 91, is provided with an undulatory face 97 which engages the cam-roll 95. A grooved pulley 98, formed integral with the cam 96, is driven by a round belt 99 from a grooved pulley 100 fast to the shaft 43. The rotation of the cam 96 acts to impart a vertical reciprocatory movement to the tube 93. A movable ring 101 is formed integral with the tube 93. The stationary ring 92 is provided with slots 102 which register with slots 103 formed in the tube 93. Through these slots extend presser arms 104 provided with presser rolls 105, journaled on said arms. The presser arms 104 are pivoted at 125 to a collar 106 surrounding the post 91 and fast thereto. Adjusting screws 107, having screw-threaded engagement with the collar 106, are provided with collars 108 fast thereto. Helical compression springs 109 bear at their lower ends against the collars 108 and at their upper ends against the presser arms 104 which are slotted to receive the adjusting screws 107. The presser arms 104 may be adjusted by turning the handles 110 of the adjusting-screws 107.

Extending upwardly from the guide-plate 15 are posts 111 and 112 on which is mounted a frame 113. A vertical shaft 114 is journaled in the frame 113 and has fast to its upper end a sprocket-wheel 115 and to its lower end a tapered mandrel 116, said mandrel being provided with a screw-thread upon which to braid the fabric. The sprocket-wheel 115 is driven by a chain 117 from a sprocket-wheel 118 fast to a vertical shaft 119. The shaft 119 is journaled in bearings in the frame 113 and the guide-plate 15, respectively, and is driven by a gear 120 which meshes into the gear 42. The tension of the chain 117 is maintained by an idler roll 121 journaled on an idler arm 122, said arm being adjustably mounted on the frame 113.

The operation is as follows: Starting with the parts shown in the positions illustrated in Figs. 1 and 2, the strands 80 leading from the reels 61 having been previously braided upon the mandrel 116, the series of reel carriers 53, together with the reels and mechanism thereon, are moved in the guide-slot 16 in the direction of the arrows *a*, while the reel carriers 54, together with the reels and mechanism thereon, are moved in the guide-slot 17 in the direction of the arrows *b*, thus crossing and re-crossing each other in a manner well known to those skilled in the art and thereby interlacing said strands at the point of braiding on the mandrel 116. The reel standards 57 are

free to swivel upon their respective reel carriers, and by reason of the strands 80 leading therefrom through the guide-fingers 82 are maintained in their radial relation to the center of the mandrel 116—that is, the axis of each reel is at all times at right angles to a plane in which the median axial line of said mandrel and the median axial line of the spindle 58 are located. As the tubular fabric is braided on the mandrel 116 it is fed downwardly therefrom by the rotation of said mandrel. Its rate of feed may be governed by adjusting the presser rolls 105 with more or less pressure against said fabric. The braided fabric passes downwardly through the tube 93 and from thence may be carried through the flooring and rolled up upon any suitable reel (not shown). As the strands 80 cross and re-cross on the stationary ring 92, any tendency which they may have to catch on the edges of each other is overcome by the movable ring 101 which is reciprocated vertically, as hereinbefore described, and which imparts to the portions of the strands which intervene between the guide-fingers 82 and the mandrel 116 a very rapid vertical vibratory movement.

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

1. In a machine for braiding strips of sheet material in the form of a tube, two series of reels, mechanism for moving each series in an opposite direction to that of the other, a tapered mandrel provided with a screw-thread upon which to braid the fabric, and mechanism for imparting a rotary movement to said mandrel, whereby said fabric is fed off of said mandrel.

2. In a machine for braiding flat strips of resilient material in the form of a tube, two series of reels, mechanism for horizontally moving each series in an opposite direction to that of the other, and a tapered mandrel provided with a screw-thread upon which to braid said fabric, and mechanism for imparting a rotary movement to said mandrel whereby said tube is fed off of said mandrel.

3. In a machine for braiding strips of sheet material in the form of a tube, two series of reels, mechanism for moving each series in an opposite direction to that of the other, a mandrel provided with a screw-thread upon which to braid the fabric, and mechanism for imparting a rotary movement to said mandrel, whereby said fabric is fed off of said mandrel.

4. In a machine for braiding strips of sheet material in the form of a tube, two series of reels, mechanism for moving each series in an opposite direction to that of the other, a mandrel provided with a screw-thread upon which to braid the fabric, mechanism for imparting a rotary movement to said mandrel, whereby said fabric is fed off of said mandrel, and a plurality of presser rolls adapted to press said fabric against said mandrel.

5. In a machine for braiding strips of sheet material in the form of a tube, two series of reels, mechanism for moving each series in an opposite direction to that of the other, a mandrel provided with a screw-thread upon which to braid the fabric, mechanism for imparting a rotary movement to said mandrel, whereby said fabric is fed off of said mandrel, a plurality of presser rolls adapted to press said fabric against said mandrel, and means for varying the pressure of said presser rolls against said fabric.

6. In a machine for braiding strips of sheet material in the form of a tube, two series of reels, mechanism for moving each series in an opposite direction to that of the other, guide-fingers adapted to guide the strands as they are unwound from said reels, a mandrel provided with a screw-thread upon which to braid the fabric, mechanism for imparting a rotary movement to said mandrel, whereby said fabric is fed off of said mandrel, and means for imparting a vertical movement to the portions of said strands which intervene between said guide-fingers and said mandrel.

7. In a tubular braiding machine, two series of reel carriers, a guide plate provided with two sinuous intersecting guide-slots one of which is adapted to guide one of said series, and the other of which is adapted to guide the other of said series, mechanism for moving said series of reel carriers in opposite directions, respectively, reel-standards journaled to oscillate about vertical axes on said reel carriers, reels journaled on said reel-standards with their axes in a substantially horizontal plane, a mandrel provided with a screw-thread upon which to braid the fabric, and mechanism for imparting a rotary movement to said mandrel, whereby said fabric is fed off of said mandrel.

8. In a tubular braiding machine, two series of reel carriers, a guide plate provided with two endless sinuous intersecting guide-slots one of which is adapted to guide one of said series, and the other of which is adapted to guide the other of said series, mechanism for moving each of said series of reel carriers horizontally in opposite directions, respectively, reel-standards journaled to oscillate about vertical axes on said reel carriers, a mandrel provided with a screw-thread upon which to braid the fabric, and mechanism for imparting a rotary movement to said mandrel, whereby said fabric is fed off of said mandrel.

9. In a machine for braiding strips of sheet material in the form of a tube, a guide-plate provided with two sinuous intersecting guide-slots, two series of reel carriers, each series adapted to engage, respectively, one of said guide-slots, mechanism for moving said series of reel carriers in opposite directions, respectively, reel-standards journaled to oscillate about vertical axes on said reel-carriers, reels journaled on said reel standards with their axes in a substantially horizontal plane, a mandrel provided with a screw-thread upon which to braid the fabric, mechanism for imparting a rotary movement to said mandrel, whereby said fabric is fed off of said mandrel, a plurality of presser rolls adapted to press said fabric against said mandrel, and means for varying the pressure of said presser rolls against said fabric.

10. In a machine for braiding strips of sheet material in the form of a tube, a guide-plate provided with two sinuous intersecting guide-slots, two series of reel carriers, each series adapted to engage, respectively, one of said slots, mechanism for moving said series of reel-carriers in opposite directions, respectively, reel-standards journaled to oscillate about vertical axes on said reel-carriers, reels journaled on said reel-standards with their axes in a substantially horizontal plane, posts extending upwardly from said guide-plate, a frame supported upon said posts, a substantially vertical shaft journaled on said frame with its axis coincident with the vertical median line of said guide-plate, a downwardly extending screw-threaded mandrel fast to said vertical shaft, and mechanism for rotating said shaft.

11. In a machine for braiding strips of sheet material in the form of a tube, two series of reels, mechanism for moving each series in an opposite direction to that of the other, a mandrel provided with a screw-thread upon which to braid the fabric, mechanism for imparting a rotary movement to said mandrel, whereby said fabric is fed off of said mandrel, a stationary ring surrounding said mandrel and substantially concentric therewith, a hollow post to which said stationary ring is fast, a movable ring within said stationary ring and substantially concentric therewith, a tube to which said movable ring is fast, said tube arranged to slide vertically in said hollow post, and mechanism to reciprocate said tube.

12. In a machine for braiding strips of sheet material in the form of a tube, a guide-plate provided with a sinuous guide-slot, a reel carrier adapted to engage said slot, mechanism for moving said reel carrier in said slot, a reel-standard journaled to oscillate about a vertical axis on said reel carrier, a reel journaled on said reel-standard with its axis in a substantially horizontal plane, said reel adapted to contain a strip of sheet material, in the form of a roll, frictional tension means operatively connected to said reel, spring-actuated take-up means operatively connected to said reel, a guide-finger adapted to guide said strip as it is unwound from said reel, and locking means adapted to lock said take-up means when a strand controlled by said take-up means is severed, said locking means operatively connected to said guide-finger.

13. In a machine for braiding strips of sheet material in the form of a tube, a guide-plate provided with a sinuous guide-slot, a reel carrier adapted to engage said slot, mechanism for moving said reel carrier in said slot, a reel-standard journaled to oscillate about a vertical axis on said reel carrier, a reel journaled on said reel standard with its axis in a substantially horizontal plane, said reel adapted to contain a strip of sheet material, in the form of a roll, frictional tension means operatively connected to said reel, spring-actuated take-up means operatively connected to said reel, and means to lock said take-up means when a strand controlled by said take-up means is severed.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses, this twelfth day of March 1906.

VICTOR BEAUREGARD.

Witnesses:
JAMES F. BRAGG,
CHAS. G. CHRISTIE.