No. 652,646. Patented June 26, 1900.

J. F. SCHENCK.

THREAD WINDING MACHINE.

(Application filed Jan. 2, 1900.)

(No Model.) 5 Sheets—Sheet 1.

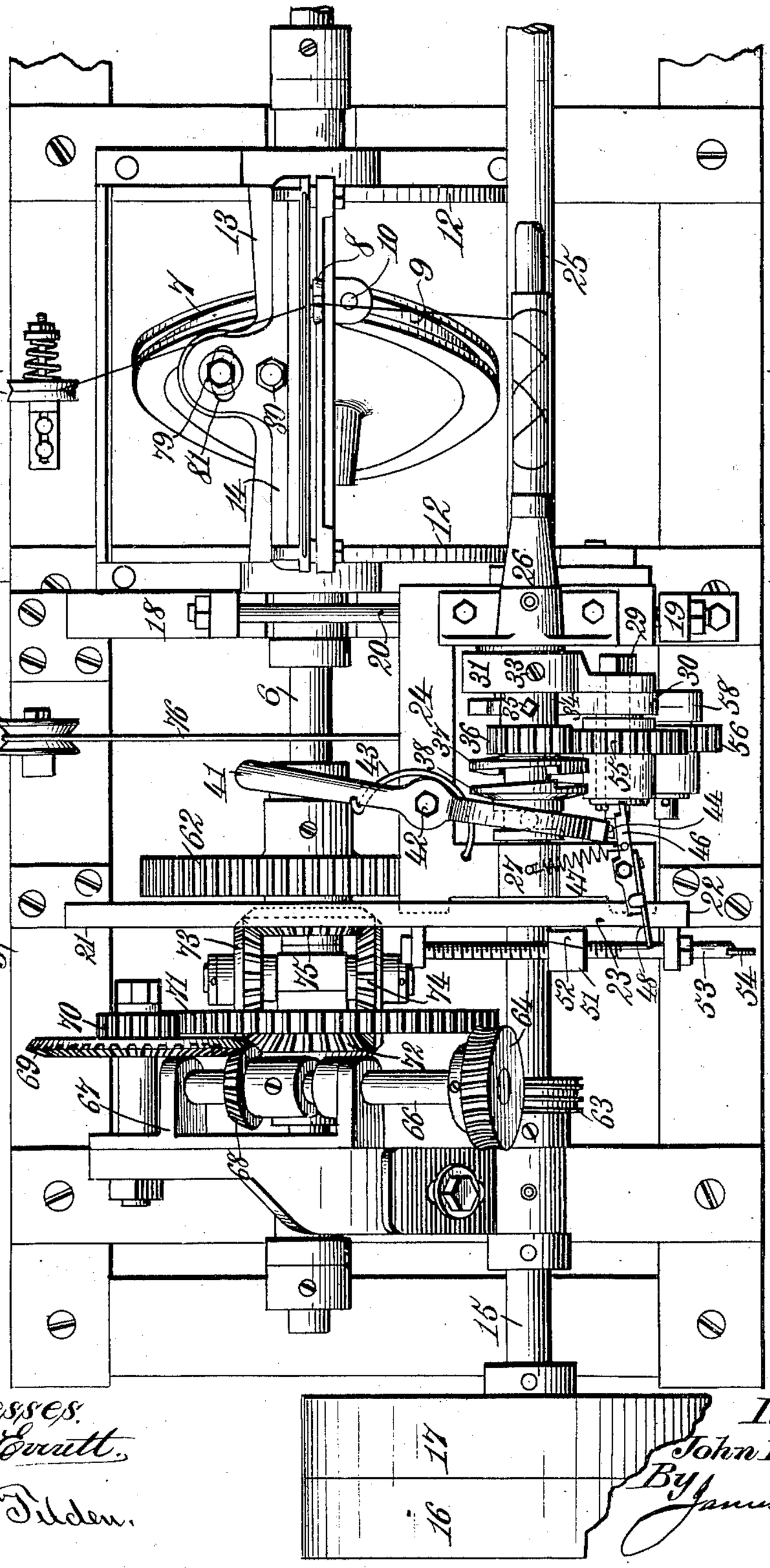

Fig. 1.

Witnesses.
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B. N. Tilden.

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5 Sheets—Sheet 2.

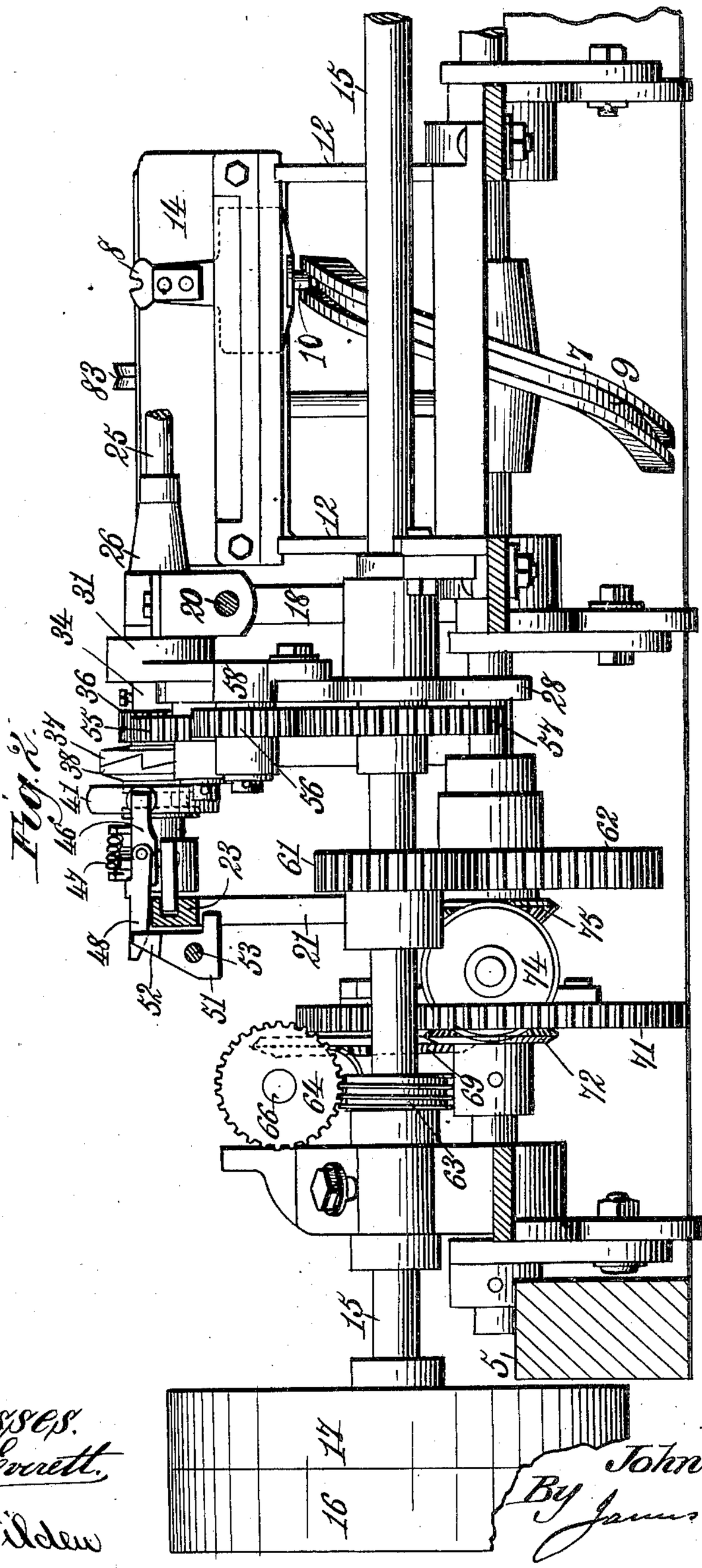

Fig. 2.

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(No Model.) 5 Sheets—Sheet 3.

Fig. 3.

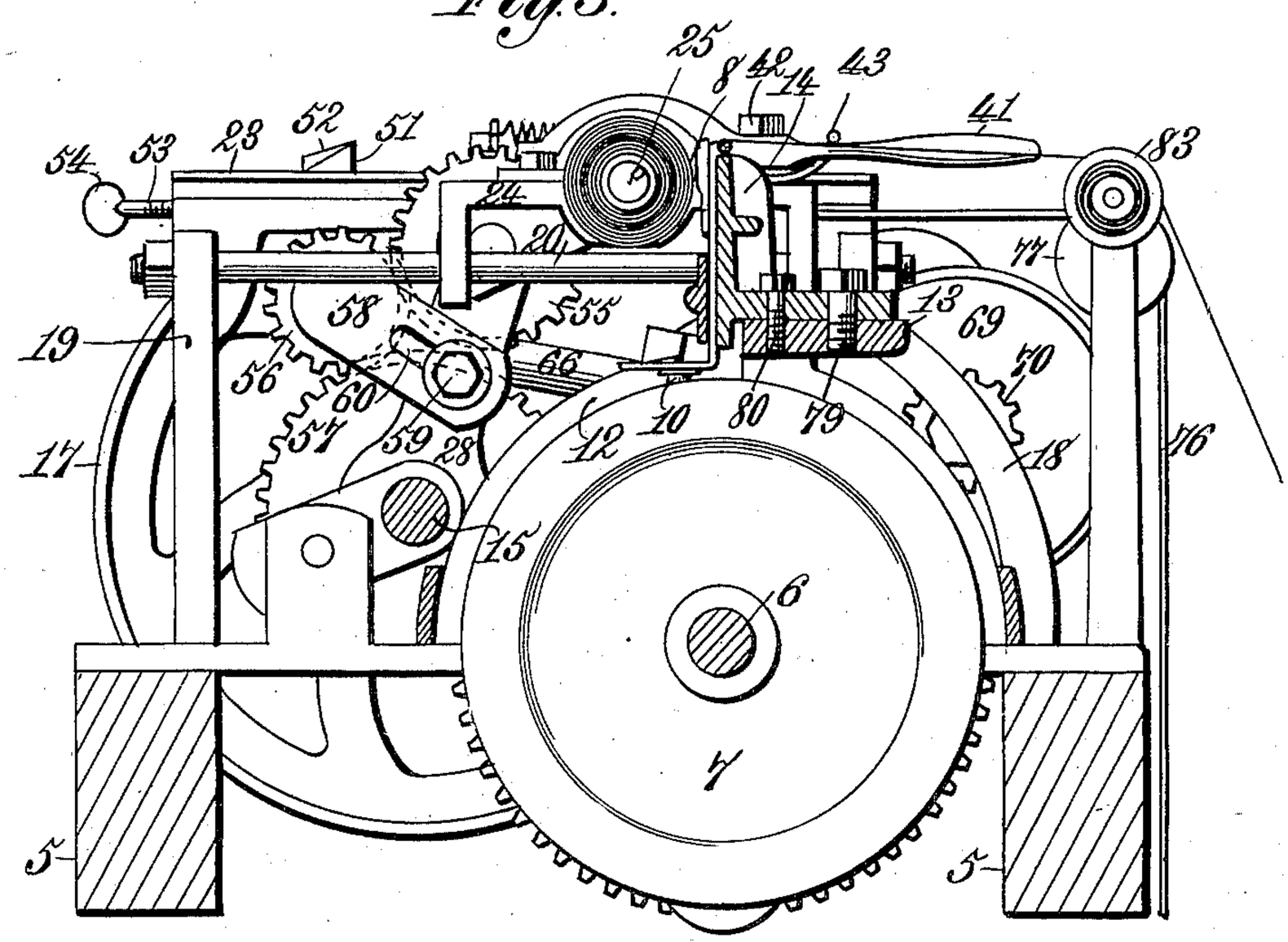
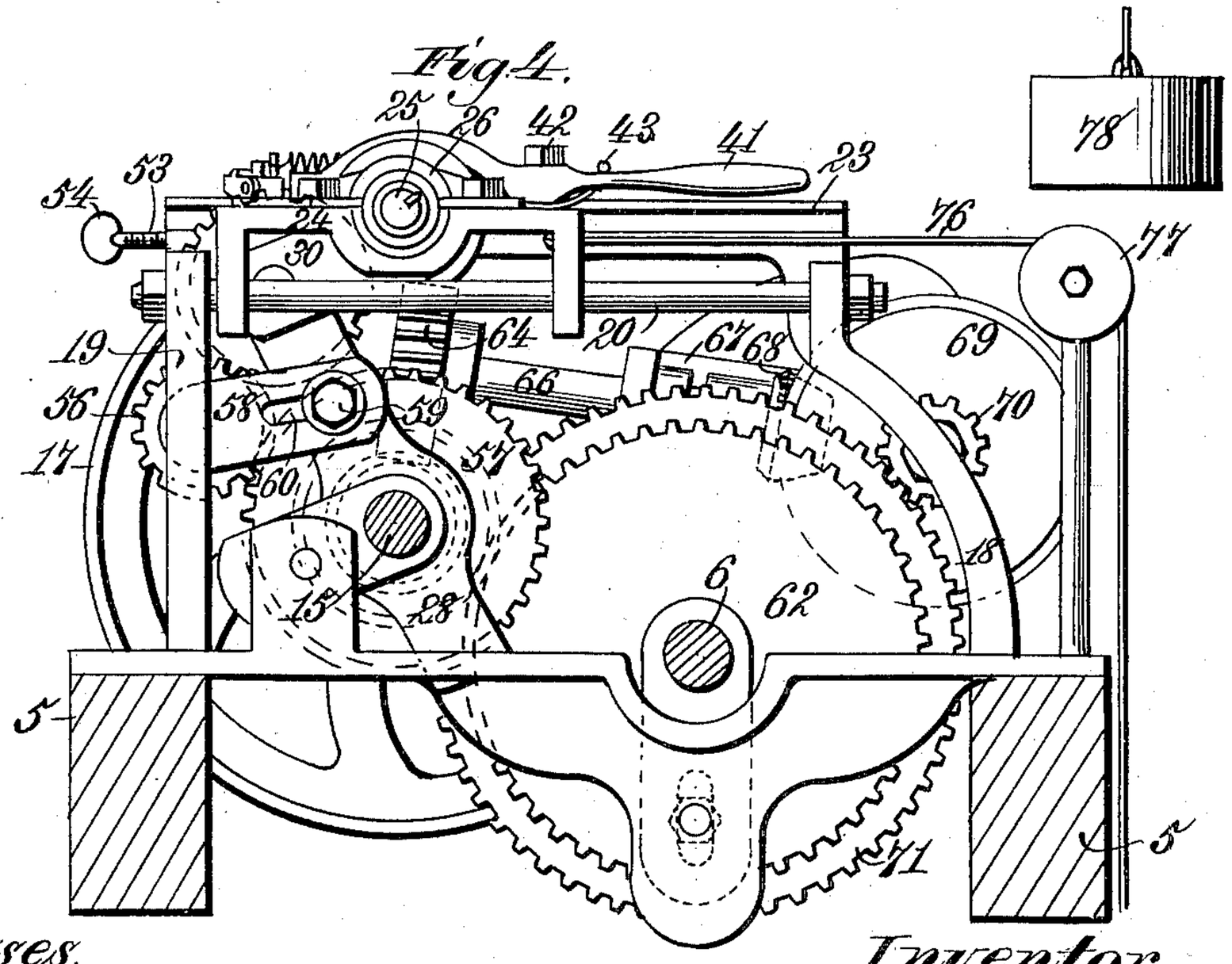


Fig. 4.



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THREAD WINDING MACHINE.

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(No Model.) 5 Sheets—Sheet 4.

Fig. 5.

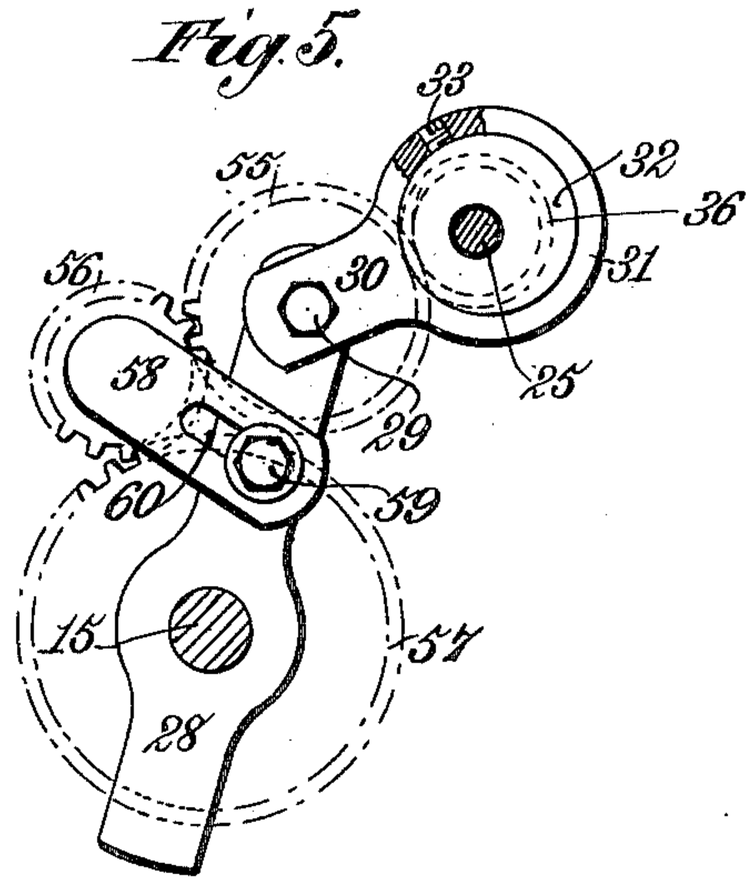


Fig. 6.

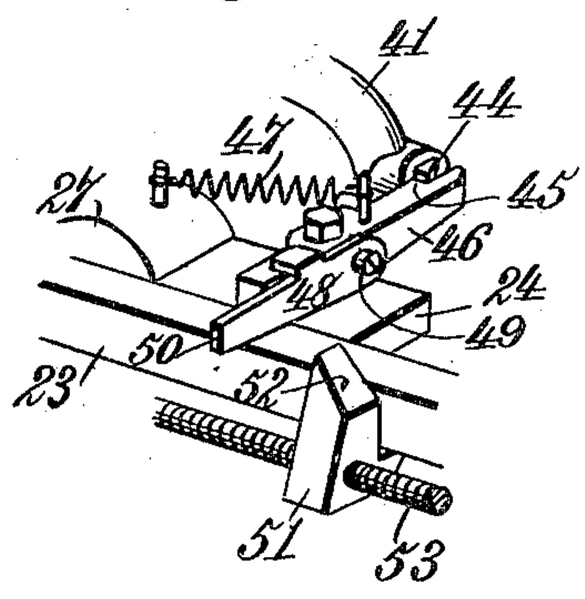
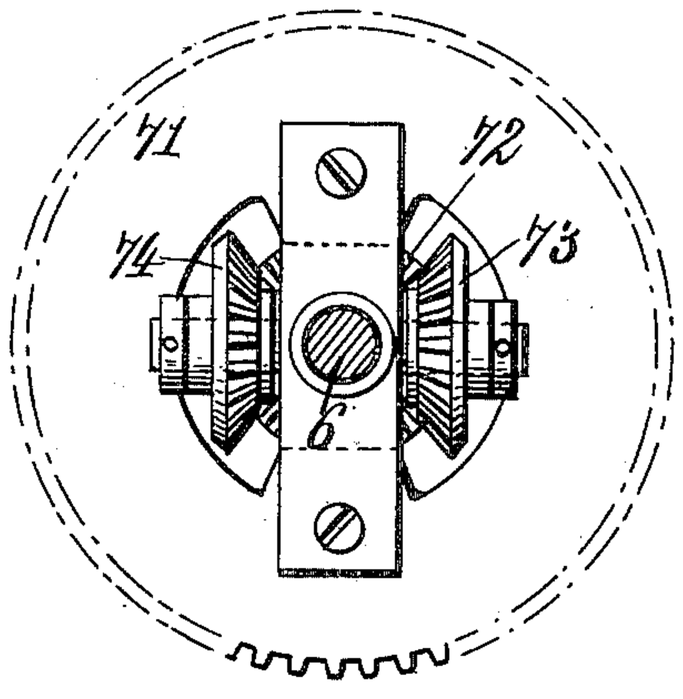


Fig. 7.



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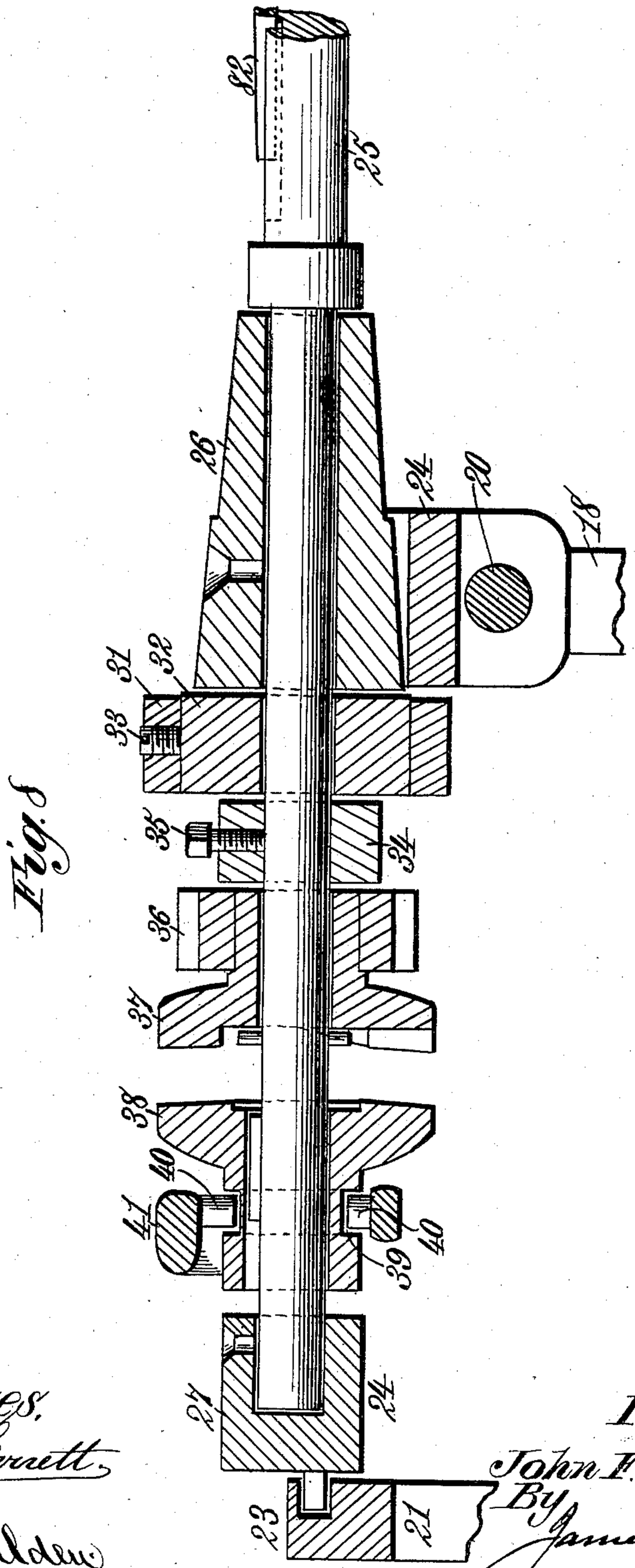
(No Model.) (Application filed Jan. 2, 1900.)

5 Sheets—Sheet 5.

Fig. 5.



Witnesses.
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UNITED STATES PATENT OFFICE.

JOHN F. SCHENCK, OF LAWNDALE, NORTH CAROLINA.

THREAD-WINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 652,646, dated June 26, 1900.

Application filed January 2, 1900. Serial No. 109. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. SCHENCK, a citizen of the United States, residing at Lawndale, in the county of Cleveland and State of North Carolina, have invented new and useful Improvements in Thread-Winding Machines, of which the following is a specification.

This invention relates to the thread-winding machine for forming balls or cops by winding cord or thread in recrossing spirals running alternately in opposite directions upon and from end to end of a cop-tube carried by a rotary winding-spindle, as described and shown in Letters Patent No. 638,360, issued to me December 5, 1899.

The chief objects of my present invention are to generally improve the former thread-winding machine; to simplify the machine by avoiding the employment of an oscillatory thread-guide carrier pivotally mounted concentric with the axis of the cam-shaft which reciprocates the thread-guides; to provide a new and improved thread-winding machine wherein the thread-guide carrier is immovable during the winding operation and the frame which carries the rotary winding-spindle recedes in a horizontal path, while preserving operative gear connection of the spindle with the shaft which drives it; to provide novel, simple, and efficient means for automatically stopping the winding-spindle during its receding motion from the thread-guide when the ball or cop has reached the required diameter or is of the desired size, and to provide a thread-winding machine having a winding-spindle which recedes during the winding operation with novel means whereby either cylindrical or conoidal-shaped balls or cops may be wound.

To accomplish all these objects my invention involves the features of construction, the combination or arrangement of parts, and the principles of operation hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a top plan view of sufficient of the thread-winding machine to enable my invention to be clearly understood, the spindle being moved back from the thread-guide. Fig. 2 is a rear side elevation, partly in section. Fig. 3 is a vertical sectional view taken on the line 3 3, Fig. 1, the spindle being moved forward to its normal or winding position. Fig. 4 is a vertical sectional view taken on the line 4 4, Fig. 1, showing the position of the parts when the spindle and its carriage have receded their full extent. Fig. 5 is a detail sectional elevation showing the eccentric in which the winding-spindle rotates and a portion of the gearing and supporting devices by which the winding-spindle is driven from the main driving-shaft. Fig. 6 is a detail perspective view of the locking-dog and its adjustable tripping device by which the clutch of the winding-spindle is automatically disengaged to stop the winding-spindle when the ball or cop reaches the required diameter or is of the desired size. Fig. 7 is a detail view of a portion of the differential or epicycle train of gearing by which motion is transmitted to the cam-shaft from the main driving-shaft; and Fig. 8 is a detail longitudinal sectional view through the winding-spindle, its bearings, and the sliding carriage.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein the numeral 5 indicates a main frame of any construction for the purpose in hand, provided at proper points with shaft-bearings, in which is mounted a continuous longitudinal shaft 6, provided with a cam 7 for reciprocating the thread-guide 8. As shown, the cam is constructed with a cam-groove 9, into which projects a roller-stud 10, Fig. 2, on the lower portion of the thread-guide 8.

The main frame is provided with perpendicular semicircular plates or supports 12, connected at their top portions by a flat horizontal plate 13, on which is mounted the thread-guide carrier 14, having a rectilinear guideway in its rear side by which the thread-guide 8 is accurately guided in its reciprocating motions. The thread-guide carrier is immovable during the winding operation in contradistinction to being pivotally mounted to oscillate in the arc of a circle, as in my patent hereinbefore mentioned; but the carrier 14 is made adjustable on the plate or support 13, as will be hereinafter described in detail, for the purpose of winding either cylindrical or conoidal-shaped balls or cops. The main frame is also provided with suitable bearings

in which a continuous main driving-shaft 15 is mounted. This shaft is parallel with the cam-shaft 6 and may be operated in any suitable manner; but as here shown it is provided at one end with fast and loose pulleys 16 and 17, Fig. 1, for use in connection with a belt actuated by an engine or motor. The driving and cam shafts may extend any desired length, according to the length of the machine and the number of winding-spindles to be operated in a single machine; but in the drawings I have only illustrated a single winding-spindle and the mechanism necessary in connection therewith for winding a ball or cop.

The main frame is provided with uprights or standards 18 and 19, supporting a cylindrical guide-rod 20 at their upper ends, and said frame is also provided with similar uprights or standards 21 and 22, supporting a horizontal guide-bar 23 at their upper ends. The rod 20 and bar 23 are thus held in an elevated position and extend transversely of the machine to constitute supporting-guides for a transversely-slidable carriage or frame 24, which carries the rotary winding-spindle 25. This spindle extends through a bearing 26, mounted on one end of the carriage or frame 24, and into a bearing 27 on the opposite end of said carriage or frame.

An oscillatory or swing arm 28, journaled on the driving-shaft 15, (best seen in Figs. 3 and 5,) is pivotally connected at its upper end, as at 29, with a lever-arm 30 on a collar, ring, or eccentric-strap 31, containing a disk 32, through which the winding-spindle 25 eccentrically passes, whereby the disk 32 becomes an eccentric, susceptible of being turned in the collar or ring 31 and to be rigidly locked to the collar through the medium of a set-screw 33, for a purpose which will hereinafter appear.

At one side of the collar or ring 31 the winding-spindle is provided with a collar 34, rigidly secured to the spindle by a set-bolt 35, and on the spindle at one side of the collar 34 is loosely mounted a pinion 36, to which is attached one section 37 of a clutch, the other section 38 of this clutch being adapted to slide longitudinally on the spindle, but compelled to rotate with the latter in any suitable manner—as, for example, by connecting the clutch-section 38 with the winding-spindle by a feather or spline, as will be obvious. The clutch-section 38 is provided with an annularly-grooved hub 39, into which projects a pin 40 on a clutch-lever 41, pivoted centrally between its extremities to the carriage or frame 24 through the medium of a pivot pin or bolt 42. The clutch-lever 41 is acted upon by a suitable spring 43 to swing it in the direction which will throw the clutch-section 38 out of engagement with the clutch-section 37. The clutch-lever is operated manually to engage the clutch-sections, and it is automatically locked to hold the clutch-sections in engagement through the medium of the following devices: The rear end of the clutch-lever is provided with a lug 44, which engages the shouldered end 45 of a pivoted dog 46 when the clutch-lever is manually operated to throw the clutch-section 38 into engagement with the clutch-section 37. The dog 46 is pivoted centrally between its ends to the carriage or frame 24, and its shouldered end 45 is thrown into the path of the lug 44 through the medium of a suitable spring 47. The dog 46 carries a latch 48, pivoted, as at 49, Fig. 6, so that the latch can swing vertically. This latch bears squarely against the rear side of the dog 46, and its outer free extremity 50 is adapted to strike a trip-block 51 when the carriage 24 is slid horizontally toward the rear side of the machine, thereby disengaging its shouldered end 45 from the lug 44, which releases the clutch-lever, so that the latter is instantly swung by the action of the spring 43 in the proper direction to disengage the clutch-sections, whereby the rotary motion of the winding-spindle will be instantly stopped. The winding-spindle is rotated by the mechanism hereinafter explained.

On first starting to wind a cop the carriage is moved backward to place the winding-spindle at the greatest distance from the thread-guide for the beginning of the winding operation for reasons appearing later on. The clutch-lever 41 is then manually operated to engage the clutch-sections and cause the lug 44 of the clutch-lever to engage and be locked by the shouldered end 45 of the dog 46, after which the carriage may be drawn forward to its operative position. As the carriage or frame 24 is drawn forward or toward the front of the machine the latch 48 will ride up the inclined upper end 52 of the trip-block 51 to enable the latch and dog to pass by this trip-block.

The trip-block 51 is mounted on a screw-threaded shaft 53, arranged in bearings on one side of the guide-bar 23. The screw-threaded shaft is provided with a suitable handle or finger-piece 54, by which it may be rotated to adjust the trip-block 51 forward or backward, and thus vary the time at which the dog 46 is actuated to release the clutch-lever and disengage the clutch-section for stopping the winding-spindle. Obviously the trip-block can be set in any desired position to disengage the clutch-sections and stop the winding-spindle at a predetermined time for winding balls or cops of any desired diameter or size.

The pinion 36, loosely mounted on the winding-spindle 25, meshes with an intermediate traveling gear-wheel 55, engaging a pinion 56, which is constantly engaged with and is adapted to travel partially around a spur-gear 57, secured to the main driving-shaft 15. The gear-wheel 55 is journaled on a bearing formed on the swing-arm 28, and the pinion 56 is journaled on an arm 58, adjustably secured to the swing-arm 28 by a set-bolt 59, passing through a slot 60 in the arm 58 into

the swing-arm 28. (Best seen in Fig. 5.) The rotation of the main driving-shaft 15 transmits rapid motion to the pinion 36 on the winding-spindle 25 through the medium of the spur-gear 57, pinion 56, and gear 55, and the swing-arm 28, in connection with the collar or ring 31, adapted to slightly turn with the eccentric 32 on the spindle 25, enables the sliding carriage or frame 24 to move back and forth in a horizontal plane, while preserving the operative gear connection between the winding-spindle carried by such sliding carriage or frame and the spur-gear 57 on the main driving-shaft 15. In this manner the winding-spindle as the ball or cop grows or increases in diameter or size is forced to recede in a rectilinear pathway in a horizontal plane away from the reciprocating thread-guide and stationary thread-guide carrier; but at the same time during the entire winding operation the pinion on the winding-spindle will remain in gear with the driving spur-gear on the driving-shaft.

The purpose of the eccentric 32 is to enable pinions of varying diameter, like pinion 36, to be placed upon the winding-spindle for the purpose of increasing or diminishing the speed of the spindle, and thereby varying the distance between the spirals of the thread wound during the winding operation. If it is desired to place a larger pinion, similar to pinion 36, on the winding-spindle 25, the eccentric is turned in the collar or ring 31 to increase the distance between the axis of the winding-spindle and the axis of the pivot 29, thus providing the space necessary to apply the larger pinion in operative connection with the winding-spindle and the gear-wheel 55. The substituted larger pinion will diminish the speed of the winding-spindle, and consequently the spirals or threads will be wider apart, and, conversely, if a smaller pinion be substituted for the pinion 36 the speed of the winding-spindle will be increased, thus placing the spirals of thread closer together. As the winding-spindle and its carriage or frame bodily move back and forth in a horizontal plane the swing-arm 28 rocks on the driving-shaft 15, and the collar or ring 31 and eccentric 32 slightly oscillate on the winding-spindle, so that under all circumstances or conditions the winding-spindle is maintained in correct operative gear connection with the spur-gear 57 on the driving-shaft. When the swing-arm rocks on the driving-shaft, the pinion 56, carried by the arm 58, travels partially around the circumference of the spur-gear 57.

The main driving-shaft 15 is provided with a pinion 61, engaging a pinion 62, loosely mounted on the cam-shaft 6 and connected by differential or epicycle gearing with the worm 63, the same as in my Letters Patent hereinbefore mentioned, in such manner that by interchangeable worm-gears, as at 64, engaging the worm 63 on the driving-shaft the speed of rotation of the cam-shaft may be varied for varying the speed of the reciprocating thread-guide to suit the conditions required where fine or coarse thread is to be wound into balls or cops. As in the former patent, a change in the speed of the cam-shaft correspondingly changes the speed of the thread-guide. If a fine thread is being wound, the speed of the thread-guide should be slightly varied to cause it to move less rapidly, and if a coarse thread is being wound the variation in the speed of the thread-guide should be such as to cause it to move more rapidly.

The worm-gear 64 is fixed to an inclined shaft 66, mounted in bearings in a suitable adjustable frame 67 and carrying a bevel gear-wheel 68, meshing with a larger bevel-gear 69, having an attached pinion 70 meshing into a comparatively-large differential gear 71, connected by the bevel-gears 72, 73, 74, and 75, Fig. 1, with the spur-gear 62. The adjustable frame 67, carrying the shaft 66, renders it possible to substitute a larger or smaller worm-wheel for the worm-wheel 64. This entire differential or epicycle gear mechanism is constructed and operates substantially the same as in my patent before referred to and enables the speed of rotation of the cam-shaft to be varied. Further description of this mechanism is therefore not considered essential herein.

A cable or cord 76, secured at one end to the carriage or frame 24, passing over a guide-pulley 77 and supporting a weight 78, Fig. 3, constantly tends to pull the sliding carriage or frame forward or toward the reciprocating thread-guide to hold the ball or cop being wound in close contact with the thread-guide for the purpose of regularly and uniformly winding the balls or cops. As the ball or cop grows or increases in diameter or size the winding-spindle and the sliding carriage or frame are caused to recede or remove in a direction away from the thread-guide, and when the ball or cop has reached the desired diameter or size the trip-block actuates the locking-dog of the clutch-lever, thus releasing the latter and unclutching the clutch-sections, so that the winding-spindle instantly ceases to rotate.

The thread-carrier 14 is adjustable to different angles relative to the longitudinal axis of the winding-spindle through the medium of bolts 79 and 80, Figs. 1 and 3, for the purpose of causing the thread-guide to travel in a plane parallel with the axis of the winding-spindle or at any required angle with relation thereto in order to wind either cylindrical or conoidal balls or cops. The bolt 80 constitutes a fulcrum or pivot on which the thread-guide carrier 14 can be swung horizontally. The bolt 79 passes through a segmental slot 81 in the carrier 14 at a point in front of the fulcrum or pivot bolt 80 and screws into the horizontal plate 13 in such manner that by loosening the bolt 79 the thread-guide carrier can be adjusted or turned on the bolt 80 as a fulcrum or pivot to the required position and

then be rigidly fixed by tightening the bolt 79 in its screw-threaded orifice in the plate 13.

The cop-tube may be secured to the winding-spindle in any suitable manner—as, for instance, by a friction-spring 82, a portion of which is shown in Fig. 8 and which is constructed the same as in my former patent. The thread to be wound is led to the cop-tube on the winding-spindle through any suitable tension device—as, for example, that indicated at 83.

The motion of the winding-spindle and its sliding carriage or frame in a rectilinear path not only simplifies the gear connections with the driving-shaft, but enables me to employ a comparatively-short thread-guide and to constantly maintain the eye of the thread-guide in a plane coincident with a horizontal line drawn through the centers of such eye and the winding-spindle, thereby obtaining perfect winding under all conditions, particularly at the ends of the ball or cop, which is difficult if not impossible to accomplish where the winding-spindle bodily recedes in the arc of a circle or in a circular path, as has heretofore been proposed. Further, by preserving the centers of the winding-spindle and the thread-eye in the thread-guide coincident with a horizontal line taken through the centers of such eye and spindle I am able to wind any desired size of ball or cop, due to the fact that in the motions of the sliding carriage or frame the spindle never approaches any part of the machine beneath such spindle and carriage, as is the case where a winding-spindle moves in the arc of a circle or in a circular path. In machines having a winding-spindle which recedes in the arc of a circle from a reciprocating thread-guide the spindle as it recedes approaches a part or parts of the machine-frame beneath the spindle, and consequently the size of the ball or cop which can be wound on a particular machine is limited. This is objectionable and is avoided by my invention in that balls or cops of much larger diameter or size can be wound on the one machine, as there is ample room or space for this purpose.

Another advantage resulting from the carriage or frame sliding in a right line horizontally resides in the fact that the carriage always moves in a steady manner and does not absolutely necessitate the employment of a counterbalancing-weight, and, further, bouncing or vibrating motions of the winding-spindle or of the ball or cop being wound are avoided, which bouncing or vibrating motions are incident to those machines wherein the spindle recedes in the arc of a circle, due to the fact that the carrier of the spindle is not steadily supported and guided in a firm and substantial manner, as is the case with my firmly-supported and accurately-guided carriage or frame, on which the winding-spindle is mounted. Where a winding-spindle recedes in the arc of a circle, it is essential to employ a counterbalancing-weight, because if the ball or cop is rough there will be a tendency for it to bounce or vibrate. By my horizontal sliding carriage, firmly supported and accurately guided in a right line, I am able to wind the ball or cop accurately and uniformly from end to end and can wind large or small balls or cops without altering or changing the size, length, or height of the thread-guide. The carriage or frame moving according to my invention is not subject to jumping or vibrating movements, and this materially contributes to obtaining perfect winding. In my construction it is possible to push the sliding carriage or frame and the winding-spindle to the limit of its motion back of the trip-block, so that the winding operation can be commenced while the winding-spindle and its carriage are pushed to the rear side of the machine, thereby affording every convenience and facility for properly placing the cord or thread in engagement with the thread-eye in the thread-guide, which cannot be conveniently effected when the winding operation is taking place with the winding-spindle or the ball or cop being wound bearing against or in close proximity to the thread-guide itself.

A further advantage resulting from this construction of sliding carriage resides in the fact that I am thereby enabled to prevent danger of the thread being pushed off of the end of the cop and wound upon the spindle on first starting the machine. This is liable to occur more especially when the spindle has been stopped, the cop not being of the full or required size and it is desirable to wind on more thread. Under these circumstances it frequently occurs that when the thread-carrier is oscillating rapidly against the surface of the revolving spool the thread-carrier does not take up the thread into the notch, but pushes it to one side. If the thread-carrier be right against the surface of the cop, it then forces the thread of the cop onto the revolving hub of the spindle and cannot pick it up and the spindle will wind the thread about itself and cause much waste. When the thread-carrier is running against the surface of the cop, it necessarily forces the thread to traverse the full length of the cop, which is of course the full length of the traverse of the thread-guide, and if the thread does not lie in the eye or notch of the thread-guide at the center thereof, but instead slips down to one side of the thread-carrier, it will clearly be seen that the thread will be carried beyond the end of the cop, as above stated. It will be apparent, however, that if the thread-carrier is some distance from the cop it will not force the thread to traverse so far right and left on the cop as the carrier itself goes, and the farther away the thread-carrier is from the spindle the shorter will be the traverse of the thread on the cop as compared with the actual traverse of the thread-carrier. Thus if the clutch mechanism should be operated to start the spindle in the position of the parts

shown in Fig. 1 and the thread should not be in the eye of the thread-guide it will be seen that the thread will not wind to the extreme ends of the cop-tube, and hence the thread could not slip off and be wound upon the spindle and in a few traverses of the thread-guide it would take up the thread in its notch, which it could not do if the thread were being wound about the spindle. In other words, when the carrier works against the surface of the cop the thread is forced to travel practically so far on the cop as the thread-carrier, no matter what be the speed or take-up of the spindle; but when the thread-carrier is reciprocating at a distance from the spindle the traverse on the cop depends upon the speed or take-up of the spindle, and no matter how fast the spindle runs the thread-carrier must and will run ahead of or lead the traverse of the thread on the cop. Consequently under all circumstances it is desirable to start the spindle when it is at its greatest distance from the moving thread-carrier, so as to avoid the possibility of pushing the thread off the end of the cop and letting it wrap about the spindle-hub. As soon as the thread falls into the notch of the carrier the spindle and carrier may then be brought together.

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

1. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a carriage mounted to slide in a rectilinear path, a winding-spindle revolubly mounted in said carriage and having a pinion, and gearing interposed between said pinion and the pinion on the drive-shaft, the arrangement being such that as the cop is wound upon the spindle the thread-guide will bear directly upon the surface of the cop at the point of delivery of the thread, substantially as described.

2. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a winding-spindle mounted to move in a rectilinear path toward and from said thread-guide and having a pinion and gearing interposed between said pinion and the pinion on the drive-shaft, the arrangement being such that as the cop is wound upon the spindle the thread-guide will bear directly upon the surface of the cop at the point of delivery of the thread, substantially as described.

3. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said shaft, a pinion on the drive-shaft, a winding-spindle mounted to move in a rectilinear path and having a pinion, and gearing interposed between said pinion and the pinion on the drive-shaft, including a traveling gear, substantially as described.

4. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a carriage mounted to slide in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion, and gearing interposed between said pinion and the pinion on the drive-shaft including a traveling gear mounted to move in an arc concentric with the axis of the pinion on the drive-shaft in the movement of said carriage, substantially as described.

5. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a carriage mounted to slide in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion, a gear in mesh with the pinion on the drive-shaft, a second gear interposed between the former gear and the pinion on the spindle, said gears being mounted to move in arcs concentric with the axis of the pinion on the drive-shaft in the movement of said carriage, substantially as described.

6. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a carriage mounted to slide in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion, and an adjustable gear in mesh with the pinion on the drive-shaft, a second gear interposed between the former gear and the pinion on the spindle, said gears being mounted to move in arcs concentric with the axis of the pinion on the drive-shaft in the movement of said carriage, substantially as described.

7. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a carriage mounted to slide in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion, a gear in mesh with the pinion on the drive-shaft, a second gear interposed between the former gear and the pinion on the spindle, said gears being carried by a swing-arm supported on the drive-shaft, and an arm loosely mounted on the spindle and pivotally connected to the outer end of said swing-arm, whereby to cause said gears to travel in arcs concentric with the axis of the pinion on the drive-shaft in the movement of said carriage, substantially as described.

8. In a thread-winding machine, in combi-

nation with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a carriage mounted to slide in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion on its shaft, a gear in mesh with the pinion on the drive-shaft, a second gear interposed between the former gear and the pinion on the spindle-shaft, said gears being carried by a swing-arm supported on the drive-shaft, an arm loosely mounted on the spindle and pivotally connected to the outer end of said swing-arm, whereby to cause said gears to travel in arcs concentric with the axis of the pinion on the drive-shaft in the movement of said carriage, and means for varying the distance between said interposed gear and the spindle-shaft, whereby to permit pinions of different sizes to be mounted on the spindle-shaft, substantially as described.

9. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a carriage mounted to slide in a rectilinear path, a winding-spindle revolubly mounted in said carriage and having a pinion, gearing interposed between said pinion and the pinion on the drive-shaft, the arrangement being such that as the cop is wound upon the spindle the thread-guide will bear directly upon the surface of the cop at the point of delivery of the thread, and means carried by said carriage for causing the rotation of the spindle to cease when the cop or ball has reached a predetermined size, substantially as described.

10. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a stationary guide-frame, a carriage slidably mounted therein to move in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion, gearing interposed between said pinion and the pinion on the drive-shaft, the arrangement being such that as the cop is wound upon the spindle the thread-guide will bear directly upon the surface of the cop at the point of delivery of the thread, a trip or stop on said guide-frame, and mechanism carried by the carriage and coöperating with said trip or stop to automatically cause the rotation of the spindle to cease when the ball or cop has reached a predetermined size, substantially as described.

11. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a stationary guide-frame, a carriage slidably mounted therein to move in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion, gearing interposed between said pinion and the pinion on the drive-shaft, the arrangement being such that as the cop is wound upon the spindle the thread-guide will bear directly upon the surface of the cop at the point of delivery of the thread, an adjustable trip or stop on said guide-frame, and mechanism carried by the carriage and coöperating with said trip or stop to automatically cause the rotation of the spindle to cease when the ball or cop has reached a predetermined size, substantially as described.

12. In a thread-winding machine, in combination with a drive-shaft, a cam-shaft driven thereby, a reciprocatory thread-guide operated from said cam-shaft, a pinion on the drive-shaft, a stationary guide-frame, a carriage slidably mounted therein to move in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion, gearing interposed between said pinion and the pinion on the drive-shaft, a trip or stop on said guide-frame, throw-off mechanism carried by the carriage, and coöperating with said trip or stop to automatically cause the rotation of the spindle to cease when the ball or cop has reached a predetermined size, and means for adjusting said trip or stop relatively to said throw-off mechanism, whereby to vary the size of the cops or balls being wound, substantially as described.

13. In a thread-winding machine, in combination with a reciprocatory thread-guide, a stationary guide-frame, a carriage slidably mounted therein to move in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion on its shaft, means for operating said thread-guide and for driving said pinion, a clutch on the spindle-shaft, a spring-pressed arm pivotally mounted on said carriage and engaging a movable member of said clutch for locking and unlocking the clutch and operating normally to hold the clutch in an unlocked position, a spring-controlled dog pivotally mounted on said carriage and having a shouldered end for engaging an end of said arm when the clutch members have been locked by the movement thereof, and a trip or stop mounted on said guide-frame in the path of said dog, whereby when the cop or ball has reached a predetermined size, said dog will engage the trip or stop and be turned out of engagement with the end of said arm, and the spring of the latter will cause it to unlock the clutch, substantially as described.

14. In a thread-winding machine, in combination with a reciprocatory thread-guide, a guide-frame, a carriage slidably mounted therein to move in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion on its shaft, means for operat-

ing said thread-guide and for driving said pinion, a clutch on the spindle-shaft, a spring-pressed arm pivotally mounted on said carriage and engaging a movable member of said clutch for locking and unlocking the clutch and operating normally to hold said clutch in an unlocked position, a spring-controlled dog pivotally mounted on said carriage and having a shouldered end for engaging an end of said arm when the same has been moved to lock the clutch, a latch mounted on the side of said dog, a trip or stop mounted on said guide-frame in the path of said latch and having its rear side inclined, whereby when the ball or cop being wound has reached a predetermined size, said latch will engage the trip or stop to move the dog out of engagement with said arm to cause the clutch to unlock, and said latch having sprung past the trip or stop will ride up the incline thereof and pass over said trip or stop in the forward movement of the carriage, substantially as described.

15. In a thread-winding machine, in combination with a reciprocatory thread-guide, a guide-frame, a carriage slidably mounted therein to move in a rectilinear path toward and from the thread-guide, a winding-spindle revolubly mounted in said carriage and having a pinion on its shaft, means for operating said thread-guide and for driving said pinion, a clutch on the spindle-shaft, a spring-pressed arm pivotally mounted on said carriage and engaging a movable member of said clutch for locking and unlocking the clutch and operating normally to hold said clutch in an unlocked position, a spring-controlled dog pivotally mounted on said carriage and having a shouldered end for engaging an end of said arm when the same has been moved to lock the clutch, a latch mounted on the side of said dog, a screw-threaded rod journaled at its ends on said guide-frame, a trip or stop mounted on said rod and adjustable thereon by turning the rod, said trip or stop having its rear side inclined, whereby when the ball or cop being wound has reached a predetermined size, said latch will engage the trip or stop to move the dog out of engagement with said arm to cause the clutch to unlock, and said latch, having sprung past the trip or stop, will ride up the incline thereof and pass over said trip or stop in the forward movement of the carriage, and whereby by adjusting said trip or stop the size of the ball or cop can be varied, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN F. SCHENCK.

Witnesses:
WILL LEE MCCURRY,
CARME ELAM.