(No Model.)

4 Sheets—Sheet 1.

A. B. MORSE.

WINDING MACHINE.

No. 572,309. Patented Dec. 1, 1896.

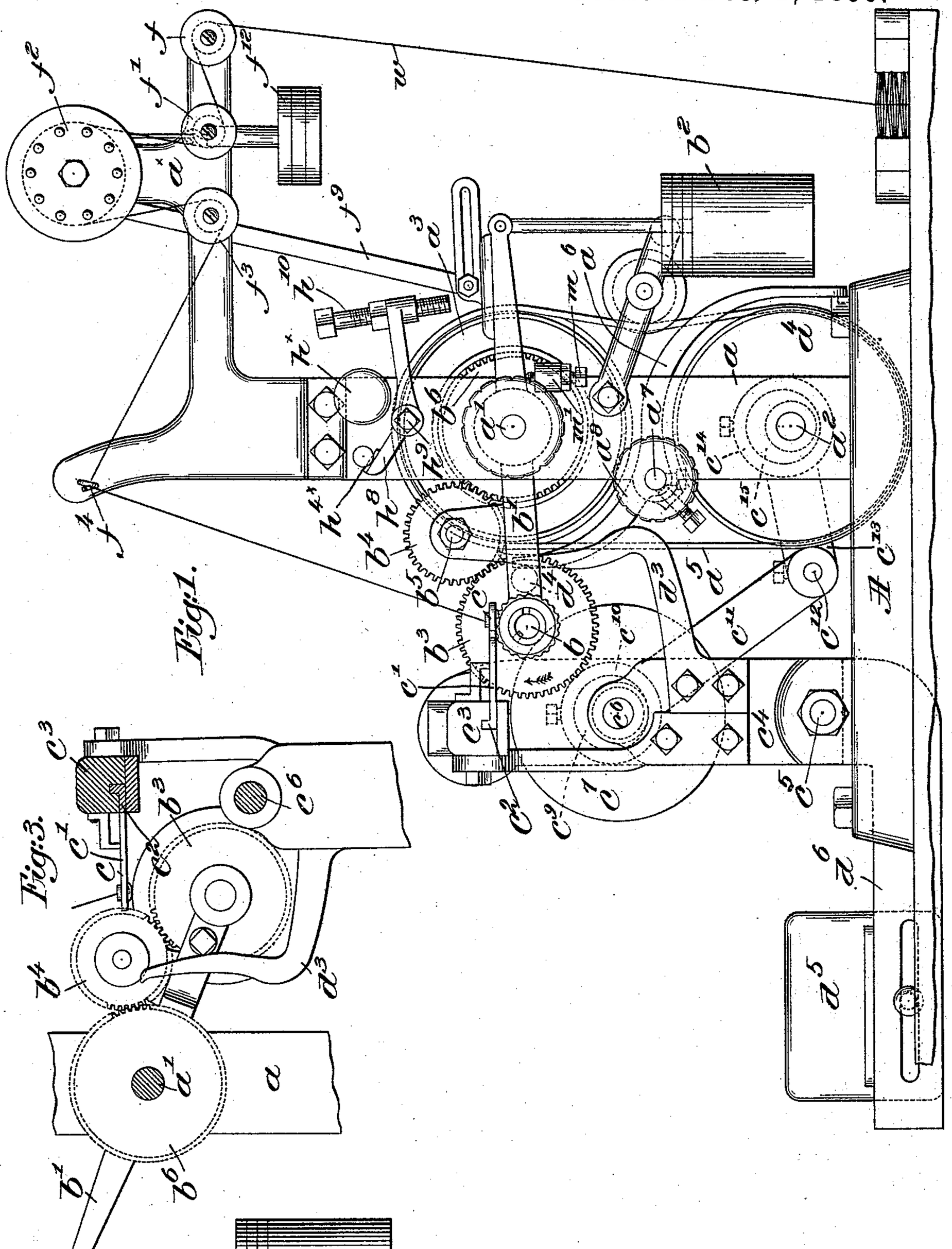

Fig. 1.

Fig. 3.

Witnesses.
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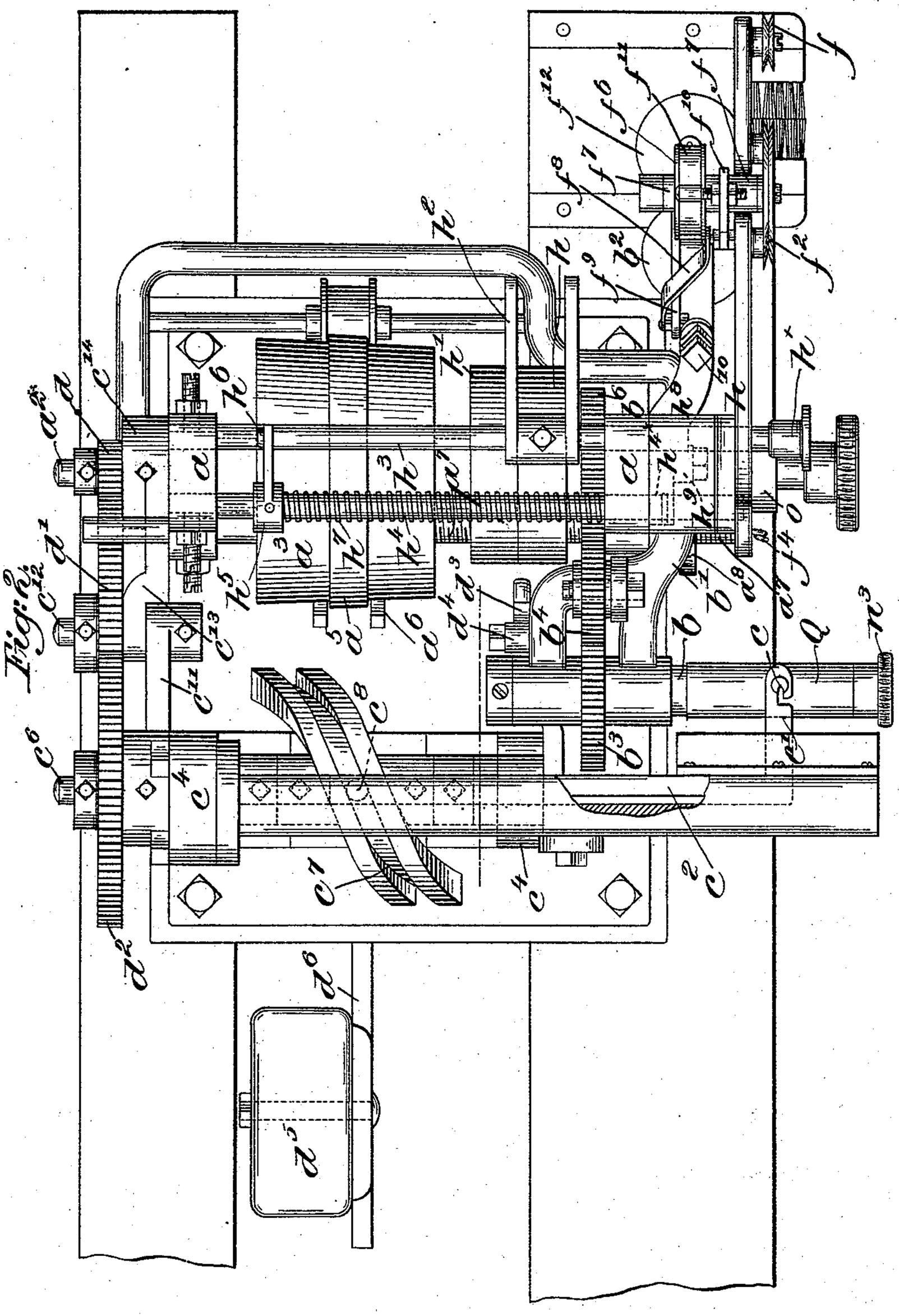
(No Model.) 4 Sheets—Sheet 2.

A. B. MORSE.

WINDING MACHINE.

No. 572,309. Patented Dec. 1, 1896.

Fig. 2.



Witnesses.
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(No Model.) 4 Sheets—Sheet 3.

A. B. MORSE.

WINDING MACHINE.

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Fig: 4.

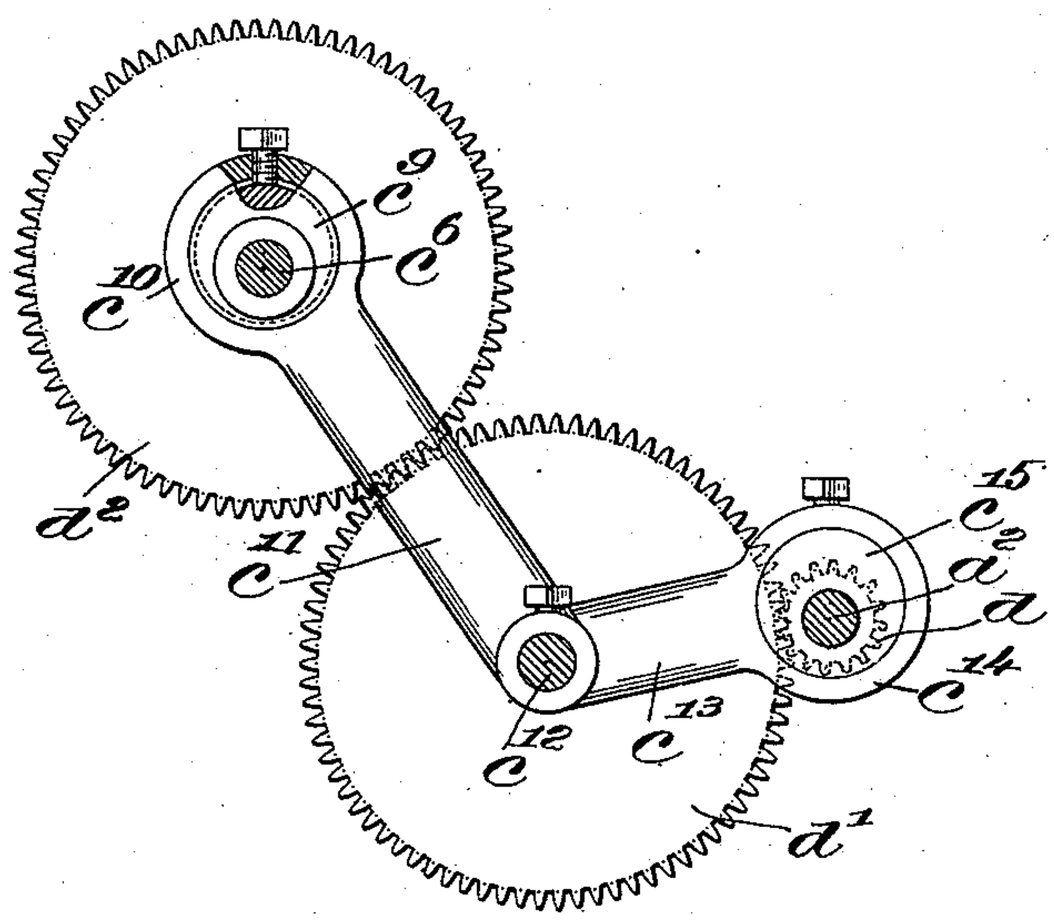


Fig: 6.

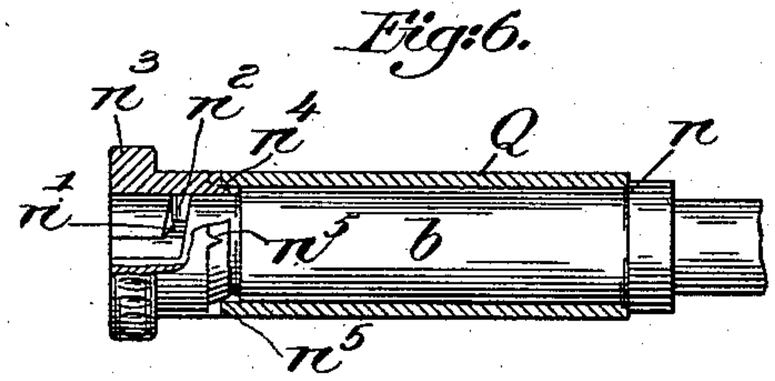


Fig: 7.

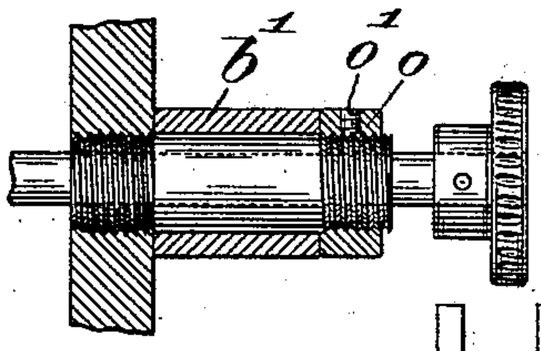


Fig: 8.

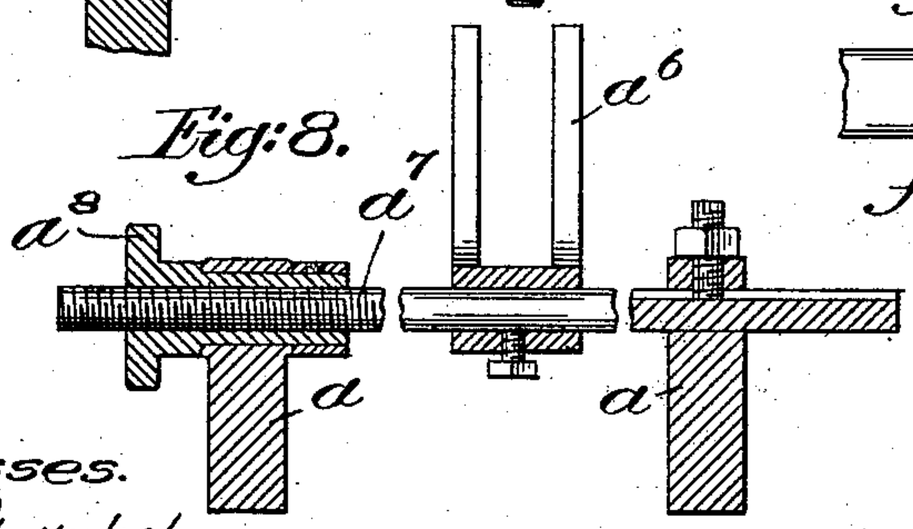
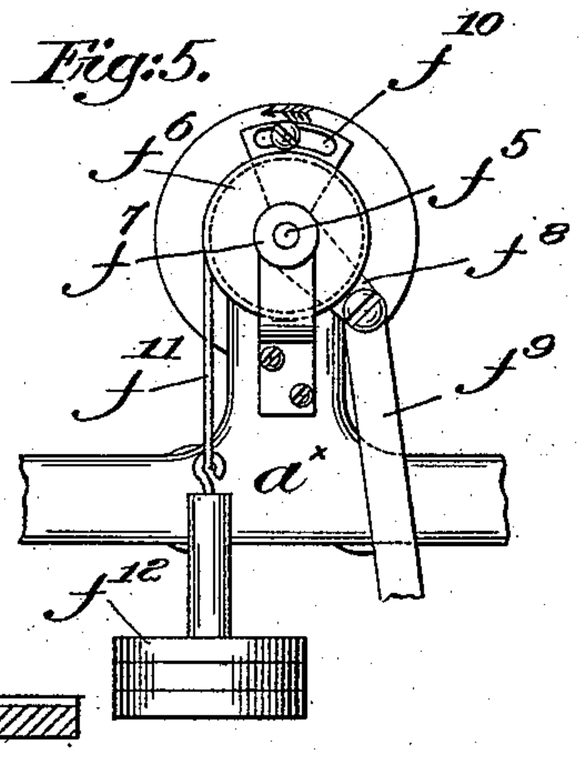


Fig: 5.



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(No Model.) 4 Sheets—Sheet 4

A. B. MORSE.

WINDING MACHINE.

No. 572,309. Patented Dec. 1, 1896.

Fig: 9.

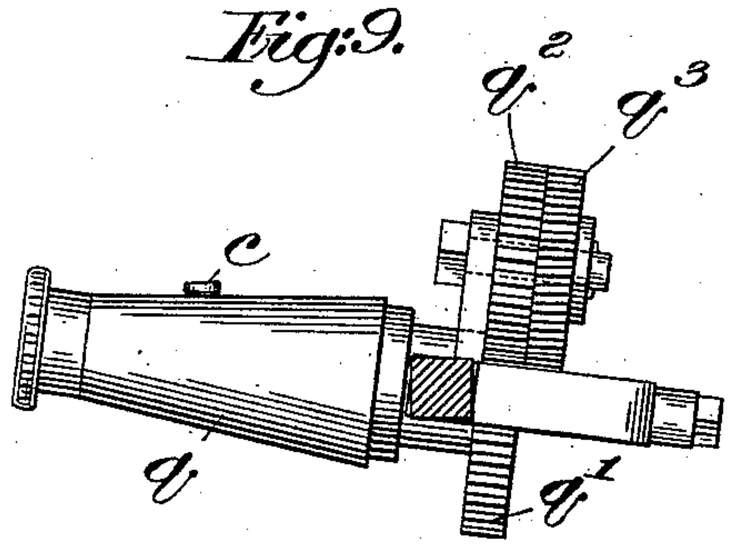


Fig: 10.

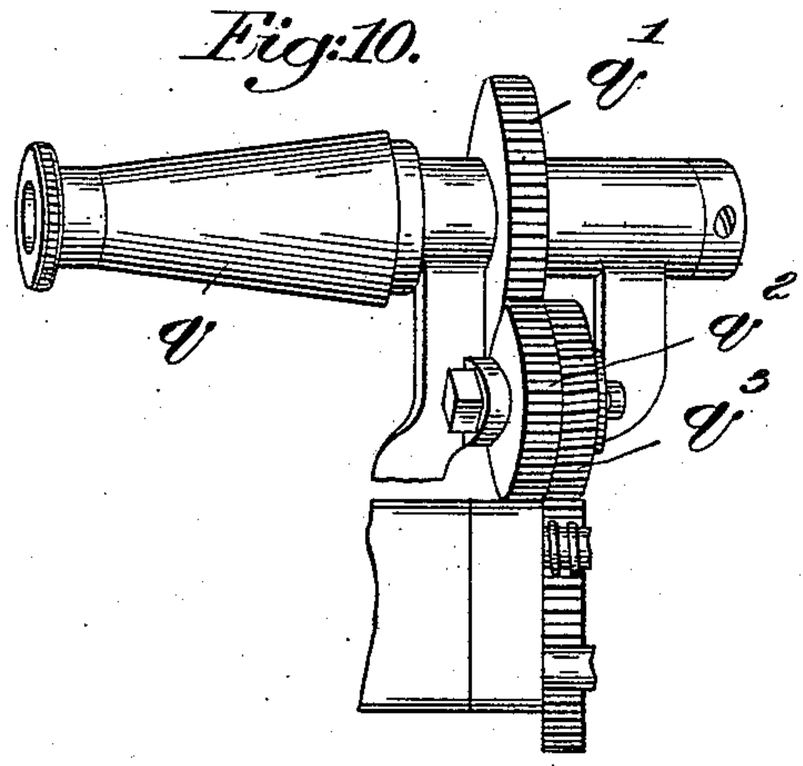
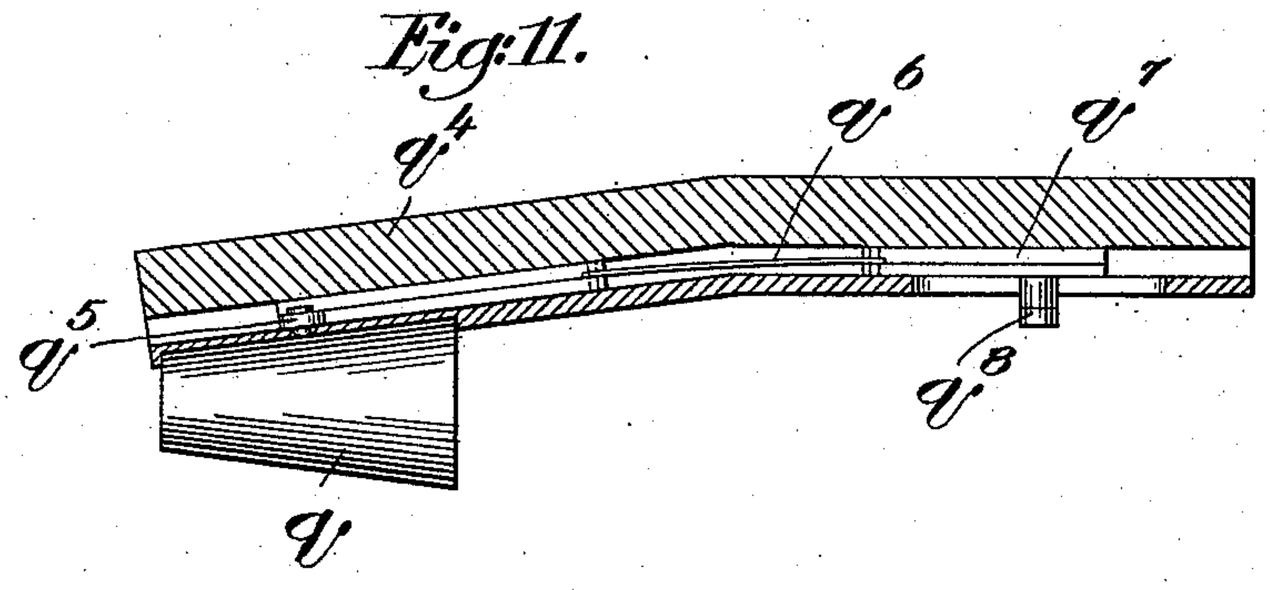


Fig: 11.



Witnesses.
Fred S. Grinnell.
Thomas J. Drummond.

Inventor:
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UNITED STATES PATENT OFFICE.

ALFRED B. MORSE, OF EASTON, MASSACHUSETTS.

WINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 572,309, dated December 1, 1896.

Application filed October 11, 1895. Serial No. 565,314. (No model.)

To all whom it may concern:

Be it known that I, ALFRED B. MORSE, of Easton, county of Bristol, State of Massachusetts, have invented an Improvement in Winding-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object to provide an improved machine for winding thread, string, yarns, and the like onto cops, cones, or other equivalent or well-known forms.

My invention comprehends a rotatable spindle upon which the quill, cone, or other core which is to receive the yarn or string is mounted to swing about an axis, and a thread-guide also preferably mounted to swing about an axis, and means to move this movable thread-guide in such manner as to cause it to maintain a substantially fixed line of travel relatively to the swinging spindle.

My invention comprehends a novel variable tension for the string or yarn and other features which with the foregoing will be hereinafter fully described, and particularly pointed out in the claims.

In the drawings, Figure 1 is a front elevation of a machine illustrating one embodiment of my invention; Fig. 2, a top or plan view of the machine, Fig. 1; Fig. 3, a partial rear side view of Fig. 1; Fig. 4, a detail showing the manner of gearing the thread-guide cam with its driving-shaft; Fig. 5, a detail showing the variable-tension device; Fig. 6, a sectional detail showing the winding-spindle and means for attaching the quill or cone thereto; Fig. 7, a sectional detail illustrating one method of forming and adjusting the bearing-surfaces; Fig. 8, a detail of the shipper-moving mechanism to be referred to; Figs. 9 and 10, details, respectively, in side and plan view of a modification of my invention adapted for winding-cones; and Fig. 11, a detail showing yet another modification, also for winding-cones.

Referring to the drawings, showing one embodiment of my invention, A is the base, upon which are erected, as shown, two standards a a, in which are mounted the two parallel shafts a' a^2, the former of which, as shown, constitutes the driving-shaft. Upon the shafts a' a^2 I have mounted, respectively, the oppositely-facing cones or cone-pulleys a^3 a^4, connected by a belt a^5 under the control of a shipper a^6, fast on a shipper-rod a^7, mounted at the rear end of the machine in a suitable bearing in the standard a at that side of the machine and at its front end (see Fig. 8) threaded to engage the interiorly-threaded adjusting-nut a^8, journaled in the front standard a. Rotation of the thumb-nut a^8 causes axial movement of the shipper-rod a^7 and travel of the shipper to move the belt a^5 along its cones for varying the relative speed of the two shafts.

The winding-spindle b is journaled in the forked free end of a swinging support or lever b', (see Fig. 1,) loosely journaled on a sleeve surrounding the projecting front end of the shaft a', and is extended at the opposite side of the said shaft a' to sustain the counterweight b^2. At its rear end the spindle b, between the two arms of the forked end of the lever b', has fast upon it a gear-wheel b^3 in mesh with a gear-wheel b^4, loosely mounted upon a spindle b^5, carried by the lever b', said wheel b^4 in turn meshing with a gear-wheel b^6, fast on the main shaft a' of the machine, rotation of said main shaft causing corresponding rotation of the winding-spindle.

The winding-spindle and its lever-like support b' may be swung into any desired position about the main driving-shaft a' without in any way interfering with the rotation of the spindle from said shaft, the intermediate idler-wheel b^4 always following and being in mesh with the two wheels at its opposite sides.

The thread-guide c, shown as an eye formed in a finger c' on the end of a slide-bar c^2, mounted to slide in suitable guideways in the top or cross bar c^3, rigidly connected with the two carrying-arms c^4, fulcrumed at c^5 on the base. These supporting-arms c^4 have journaled in them a shaft c^6, fast on which between the said supports is a path-cam c^7, which acts upon a roller or other stud c^8 on and to reciprocate the bar c^2 and its thread-guide c.

Mounted loosely upon a boss on the rear support c^4, surrounding the shaft c^6, is an eccentric c^9, the strap c^{10} of which is provided with an arm c^{11}, in the end of which is journaled a stud c^{12}, fast on the end of an arm c^{13}

of a strap c^{14}, surrounding an eccentric c^{15}, loosely journaled on a boss of the rear standard a, surrounding the shaft a^2.

The shaft a^2 is provided with a change-pinion d, which meshes with and drives a toothed wheel d', loosely mounted on the stud c^{12}, and which in turn meshes with and drives a toothed wheel d^2, fast on and to rotate the cam-shaft c^6. This connection between the shaft a^2 and the cam-shaft c^6, whereby the latter is driven from the former, is such as to permit the supports c^4, carrying the thread-guide, to be swung about their fulcrum c^5 to carry the line of travel of the thread-guide into any desired position without in any way disturbing the driving connections.

By adjustment of the eccentrics c^9 and c^{15} the stud c^{12}, on which the idler-wheel d' is mounted, may be drawn toward or moved from either the pinion d or the wheel d^2 for fine adjustments, or for making changes in the gearing, if desired.

One of the supports c^4 (see Fig. 1) is provided with an L-shaped arm d^3, the upturned end of which is engaged by a roller or other suitable stud d^4 on the lever-support b', carrying the winding-spindle.

A weight d^5, adjustably mounted on an arm d^6 on one of the supports c^4, acts to hold the said arm d^3 always in operative contact with the said roller-stud d^4.

The thread, yarn, string, twine, or whatever it is desired should be wound into cop, cone, or other form by the machine is taken from a suitable source and is led, as shown at w, Fig. 1, over a suitable pulley f, thence under a second pulley f', thence up and over a grooved tension-wheel f^2, down and about a pulley f^3, thence through a pigtail guide f^4 about and through the guide c to the quill, cone, or other core mounted upon the spindle.

The tension-wheel f^2 is fast on a short arbor f^5, loosely mounted in a forked arm $a^\times$ on the front support a of the frame, and near the inner end of this short arbor f^5 and between the arms of the forked support is made fast a grooved pulley f^6. (Shown best in Figs. 2 and 5.)

Loosely mounted upon a sleeve-bearing frame surrounding the arbor f^5 is a sleeve f^7, provided with an arm f^8, connected by a rod f^9 with the weighted end of the lever-support b', said sleeve being also provided with a segment-like arm f^{10}, to which is connected one end of a cord or strap f^{11}, which rests in the groove of the pulley f^6 and sustains at its lower end one or more weights f^{12}, the latter acting to keep the cord or strap f^{11} in frictional contact with the bottom of the groove of the said pulley f^6 to exert more or less retarding effect upon and to resist rotation of the arbor f^5 and its tension-wheel f^2, about which the thread, yarn, &c., is passed to the winding-arbor.

The operation of the machine is as follows, viz: The quill, cone, or other suitable core Q, upon which the thread, &c., is to be wound, is suitably secured to and upon the winding-spindle b and the machine set in operation. Rotation of the main driving-shaft a' acts, through the gears b^6, b^4, and b^3, to rotate the winding-spindle in the direction of the arrow, Fig. 1, to wind the thread upon the quill or cone carried by the spindle. The driving-shaft a' also acts, through the belt a^5 and the cone-pulleys, to rotate the shaft a^2, which, through the gearing shown in Fig. 4, also rotates the cam c^7, which in turn reciprocates the thread-guide c, causing it to traverse the length of the quill or cone and lay the thread thereupon in manner well understood by those skilled in the art. As the cop or body of thread builds up in thickness upon its core the winding-spindle b will be depressed, its supporting-lever b' turning about its fulcrum a', the weight b^2, however, keeping the surface of the body of thread always in contact with the under side of the thread-guide. It is essential in winding-machines of this class that the thread-guide maintain a substantially constant position with relation to the body of thread being built up upon the cone, and this desired uniformity of position is preserved in the present instance by the roller d^4 on the lever b', which as the lever is depressed by the building up of the body of thread acts, through the L-shaped arm d^3, to draw the fulcrumed supports c^4 to the right, Fig. 1, against the action of the weight d^5 to carry the line of travel of the thread-guide to the right, Fig. 1, thus maintaining it always in substantially vertical position over the middle of the body of thread upon the spindle. As the body of thread upon the core or spindle builds up it is desirable for the best results that the tension be gradually reduced to compensate for the greater diameter of the body of thread and the more rapid travel of the thread, which of itself acts in the nature of a tension. This is provided for in my improved machine by the rod f^9, which as the body of thread is built up and depressed, as described, is raised by the raising of the weighted end of the lever b', and when so raised acts (see Fig. 5) to rotate the segment f^{10} to the left in the direction of the arrow, Fig. 5, to carry the point of attachment of the friction cord or strap f^{11} farther down on the periphery of the grooved wheel f^6, and as the said friction cord or belt always hangs straight, by reason of the weights suspended thereupon, it is clear that the farther the point of attachment is moved toward a horizontal line passing through the axis of the tension-wheel arbor the less the length of the cord or strap which remains in frictional contact with the said grooved wheel. Consequently as the body of thread is depressed the weighted end of the lever b' is raised and the segment turned down to gradually reduce the frictional action of the cord or strap f^{11} on the grooved pulley, and thereby lessen the tension thus put upon the thread. This is an important feature of my invention, for it en-

ables me to obtain a uniformity of product which is impossible with an unvarying tension.

By means of the weights f^{12} and b^2, which, in fact, act in opposition to each other, one counterbalancing to a greater or less extent the other, a very nice adjustment may be had, which is valuable in winding high-grade threads, twine, &c.

Referring now to Fig. 2, upon the driving-shaft a' back of the front standard a are the fast and loose driving-pulleys h and h', the belt-shipper for the same being shown at h^2, fast on a sliding shaft h^3, mounted in suitable bearings in the standards $a\,a$. Parallel with the shipper-shaft h^3 and also mounted in the supports $a\,a$ is a second shaft h^4, provided near the rear standard with an arm h^5, which overreaches the shaft h^3 and lies in the line of travel of a lug h^6 on the said shipper-shaft h^3. A spring h^7, interposed between the front standard h and the said arm h^5, acts to press the shaft h^4 rearwardly. At its outer end in front of the front standard a the shaft h^4 is notched to receive one end of a lever h^8, fulcrumed at h^9 and provided with a set-screw h^{10}, adapted to be engaged by the weighted end of the lever-support b' as the latter is raised by the building up of the body of thread on the core.

Assuming the driving-belt to be upon the loose pulley h', the machine is started by drawing the shipper-shaft h^3 toward the front of the machine, a suitable knob $h^\times$ thereon being provided for engagement by the operator, such forward movement of the said shipper-shaft also through its lug h^6 and the arm h^5 causing a similar forward movement of the shaft h^4, and when the latter has reached the limit of its forward movement the lever h^8, acted upon by the weight of the set-screw h^{10}, drops into the notch $h^{4\times}$, referred to, and holds the said shaft h^4 in its forward position. When the body of thread has been built up to the desired diameter, determined by the adjustment of the screw h^{10}, the rising weighted end of the lever b' engages said set-screw and lifts the latter, thereby disengaging the lever h^8 from the notch in the rod h^4 and permitting its spring h^7 to throw the said rod and also the shipper-rod into their rearmost positions carrying the driving-belt from the fast onto the loose pulley and stopping the machine.

If it is desired to temporarily stop the machine before the body of thread has been built up to the final size, the operator may push inwardly the shipper-shaft and stop the machine without interfering with the automatic stop mechanism described, and he may thereafter again draw forward the shipper-shaft to start the machine without disturbing the automatic stop-shaft h^4, leaving the latter in readiness to automatically stop the machine when the full size of the body of thread has been reached.

A stop-screw m, threaded in a lug m' on the front standard a, acts to limit the upward movement of the winding-spindle, keeping the latter always at a proper desired distance from the thread-guide c.

The quill, cone, or core upon which the thread is to be wound may be mounted upon and secured to the winding-spindle in any suitable or desired manner. In the present embodiment of my invention, however, (see Fig. 6,) I have provided the spindle adjacent its supporting-lever with a conical or tapering shoulder n, and at its front end the said spindle is provided with a cam-groove n' for the reception of a pin n^2 on the clamping-sleeve n^3, provided not only with a slightly-tapering shoulder n^4, opposed to the shoulder n, but also preferably with one or more pointed projections n^5.

The quill Q, (shown in Fig. 6,) or it may be a cone or other core, is slipped upon the spindle and the clamping-sleeve applied and turned, the pin n^2 in the cam-groove n' acting to force the said sleeve inwardly to wedge the quill upon the tapering shoulders n and n^4, and at the same time impress the projections n^5 into the end of the quill to insure rotation of the quill or core by and with the spindle.

By means of the shipper-rod a^7 the belt a^5 may be shifted on its cone-pulleys, and the relative speed of the winding-spindle and the cam and thread-guide actuated thereby may be varied for different sizes of thread or yarn.

Referring to Fig. 7, it is desirable that the lever-support b' for the winding-spindle be always accurately positioned, and to provide for the take up of wear I have threaded the end of the bearing-sleeve to receive a check-nut o, which may be screwed up as little as desired to take up wear and hold the lever-support in proper position, a set-screw o' furnishing means by which to lock said nut in its adjusted position.

Referring now to Figs. 9 and 10, the winding-spindle is mounted on an angle, so that the cone-shaped core q shall be rotated with its upper side coincident with a plane parallel with the base or parallel with the line of travel of the thread-guide c, as it is necessary that the thread-guide always travel in contact or parallel with the surface of the body of the thread on the core. In this modified construction the winding-spindle is provided with a gear q', similar to the construction Figs. 1 and 2, which gear meshes with an idler q^2, attached to which is a skew-gear q^3, which meshes with and is driven by the gear b^6, Fig. 3. By this construction the spindle standing at an angle is suitably driven from the mechanism, Fig. 1.

In Fig. 11 the cone-like core q is rotated about a spindle having its axis horizontal, as in Fig. 1, so that the upper surface of the body of the thread wound upon the core, in case the latter is a cone, as stated, is not parallel to the line of travel of the thread-guide, as shown in Fig. 1. Accordingly in Fig. 11 I show means to cause the thread-guide to

travel obliquely to the path of the same, as shown in Fig. 1, so that it shall be parallel to the conical surface of the core g, as desired. In this construction the support q^4 for the traveling thread-guide is turned downwardly at an angle, as shown, and the thread-guide q^5, traveling in the angular part of the support, is connected by a suitable link or flexible member q^6 with a portion q^7, carrying the stud q^8, driven by the cam.

It is evident my invention is not limited to the particular construction herein illustrated, for the same may be varied without departing from the spirit and scope of my invention.

Having described my invention, what I claim is—

1. A machine of the class described, containing a winding-spindle, a swinging support therefor, means to rotate said spindle in the different positions into which it is swung, a thread-guide arranged to travel in a line lying in a plane perpendicular to the radius of said swinging support and embracing the axis of said winding-spindle, means to reciprocate said thread-guide along its said line of travel, said line of travel and said winding-spindle axis separating one from the other as and to compensate for the building up of the body of the thread on said spindle, and a cam-surface interposed between said spindle and thread-guide, the movement of the former maintaining the line of travel of the latter in substantially the same said plane during the said separation, substantially as described.

2. In a machine of the class described, a frame, a thread-guide, a winding-spindle movable bodily from said thread-guide during the winding of the thread thereupon, a support for said bodily-movable spindle, and mechanism to positively rotate the said spindle in any of the positions into which it is moved during the winding operation, substantially as described.

3. In a machine of the class described, a driving-shaft, a winding-spindle mounted to swing about the said shaft, intermediate driving connections for driving said spindle by said shaft in any position of the former, a thread-guide, a swinging support therefor, a cam mounted in said support connected to said thread-guide to operate the same, and connections intermediate the cam and said driving-shaft for driving the said cam in any position of said support, substantially as described.

4. In a winding-machine, the frame, a shaft journaled therein, and means to drive it, a spindle, a spindle-support mounted to swing about the axis of said shaft, a reciprocating thread-guide, its support, means to actuate said guide, and a weight acting upon the said spindle-support to press the spindle normally toward said thread-guide, substantially as described.

5. In a machine of the class described, a frame, a shaft journaled therein, and means to drive it, a support mounted to swing about the axis of said shaft, a spindle journaled in the outer end of said support and means for driving the same from said shaft, a reciprocating thread-guide, a swinging support therefor, means to press the said spindle and thread-guide one toward the other, and connecting devices between the said spindle-support and thread-guide support to cause movement of one by the other, substantially as described.

6. The frame, the shaft journaled therein, and means to drive it, a spindle-support mounted to swing about the axis of said shaft, a winding-spindle journaled in the said support, and means for driving said spindle by said shaft, a reciprocating thread-guide, its support, a stud on the said spindle-support, and an arm on the thread-guide support acted upon by said stud to cause movement of one support by the other, substantially as described.

7. In a machine of the class described, a frame, a driving-shaft journaled therein, a spindle-support fulcrumed about the axis of said driving-shaft, and the spindle therein, means for driving said spindle from said shaft, a driven shaft, cones on the same and said driving-shaft, and connections for driving the former by the latter, a reciprocating thread-guide, a fulcrumed support therefor, a thread-guide-actuating cam mounted in the said support, and connecting means between said cam-shaft and said driven shaft, substantially as described.

8. In a machine of the class described, the frame, the driving-shaft journaled therein, a driven shaft driven thereby, the fulcrumed spindle-support, its spindle geared to and driven by the driving-shaft, the reciprocating thread-guide, a fulcrumed support for said thread-guide, the thread-guide-actuating cam journaled in said support, and geared to and driven by said driven shaft, means to vary the speed of said cam relatively to said spindle, substantially as described.

9. In a machine of the class described, the combination with thread-winding devices, of a tension-wheel adapted to be rotated by the thread traveling to the said winding devices, a rotatable friction-surface connected with the said wheel, a flexible friction-belt in contact with said friction-surface, and means connected with the winding devices for varying the area of frictional contact of said belt and rotatable friction-surface to thereby vary the tension on the thread, substantially as described.

10. In a machine of the class described, the combination with winding devices, of the thread-tension wheel, the friction-wheel connected therewith, the flexible friction-belt, a movable arm to which it is attached, and means to vibrate said arm to change the position of the said friction-belt to vary the tension, substantially as described.

11. In a winding-machine, a winding-spin-

dle, and a thread-guide, supports for the same movable one toward and from the other, a tension-wheel, a rotatable friction-surface connected therewith, a flexible friction-belt acting upon said friction-surface, and connections between the said belt and said movable support whereby the said relative movements of said supports, as the body of thread being wound increases, reduces the frictional contact of said belt upon said surface, substantially as described.

12. In a machine of the class described, a frame and a shaft journaled therein, the fulcrumed support, the spindle thereon driven from said shaft, the reciprocating thread-guide and support therefor, means to move the said spindle normally toward said thread-guide, and automatic stopping devices adapted to be set in operation by movement of the said fulcrumed spindle-support, substantially as described.

13. A machine of the class described, containing suitable winding devices, and a main shaft for actuating the same, fast and loose pulleys on the said shaft, a longitudinally-movable shipper-shaft and its shipper, a spring-actuated shaft, and connections between said shipper-shaft and said spring-actuated shaft, whereby movement of the shipper-shaft to change the belt from the loose to the fast pulley also causes movement of the said spring-shaft against the action of its spring, opposite movement of the said shipper-shaft taking place independent of the said spring-shaft, locking devices to engage and hold the said spring-shaft in its position where moved by said shipper-shaft, and connections between the locking devices and winding devices whereby release of the locking devices permits return movement of the spring-shaft and with it the shipper-shaft to change the belt from the fast to the loose pulley, substantially as described.

14. In a machine of the class described, a winding-spindle provided at its inner end with a tapering shoulder, combined with a removable clamping-collar adapted to wedge the winding-quill upon the said tapering shoulder, and engaging projections on the said collar to engage said quill, to operate, substantially as described.

15. In a machine of the class described, a fixed shaft, and a movable shaft and bearings therefor, toothed wheels on the respective shafts, an intermediate wheel in mesh with the said toothed wheels, levers journaled about the axes of said fixed and movable shafts, and jointed at and provided with a bearing for said intermediate wheel, and eccentric bearings for and movable relatively to the ends of said levers adjacent said fixed and movable shafts, whereby the adjustment of said intermediate wheel with relation to either of its engaging wheels may be varied, substantially as described.

16. A machine of the class described containing a swinging winding-spindle, means to rotate it, a traveling thread-guide normally resting on the cop or bobbin on said spindle, and means to vary the position of the line of travel of said thread-guide to meet the changing positions of said spindle to maintain the said guide uniformly in one and the same direct line opposite the middle of the body of thread, substantially as described.

17. A machine of the class described, containing a winding-spindle, a swinging support therefor, means to positively drive said spindle in any position into which it may be swung as the body of thread builds thereon, a thread-guide and means to maintain the latter normally resting against the said body of thread on said spindle as the cop or bobbin is being wound, substantially as described.

18. A machine of the class described, containing a thread-guide, a winding-spindle, a swinging support for said spindle and to swing the latter away from the said thread-guide as the body of thread builds upon said spindle, and means to positively rotate said spindle in any position into which it may be swung during the winding of said body of thread thereupon, substantially as described.

19. A machine of the class described containing a swinging winding-spindle, means to rotate it, a traveling thread-guide, and means to move it with its thread-eye always in substantially a single plane relatively to the said spindle, said plane embracing the axis of said spindle and the locus of said moving thread-eye, and means to vary the relative position of the line of travel in said plane of said thread-guide to meet the changing positions of said spindle, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALFRED B. MORSE.

Witnesses:
FREDERICK L. EMERY,
AUGUSTA E. DEAN.