No. 685,003. Patented Oct. 22, 1901.

J. O. McKEAN.

THREAD WINDING OR SPOOLING MACHINE.

(Application filed Feb. 7, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

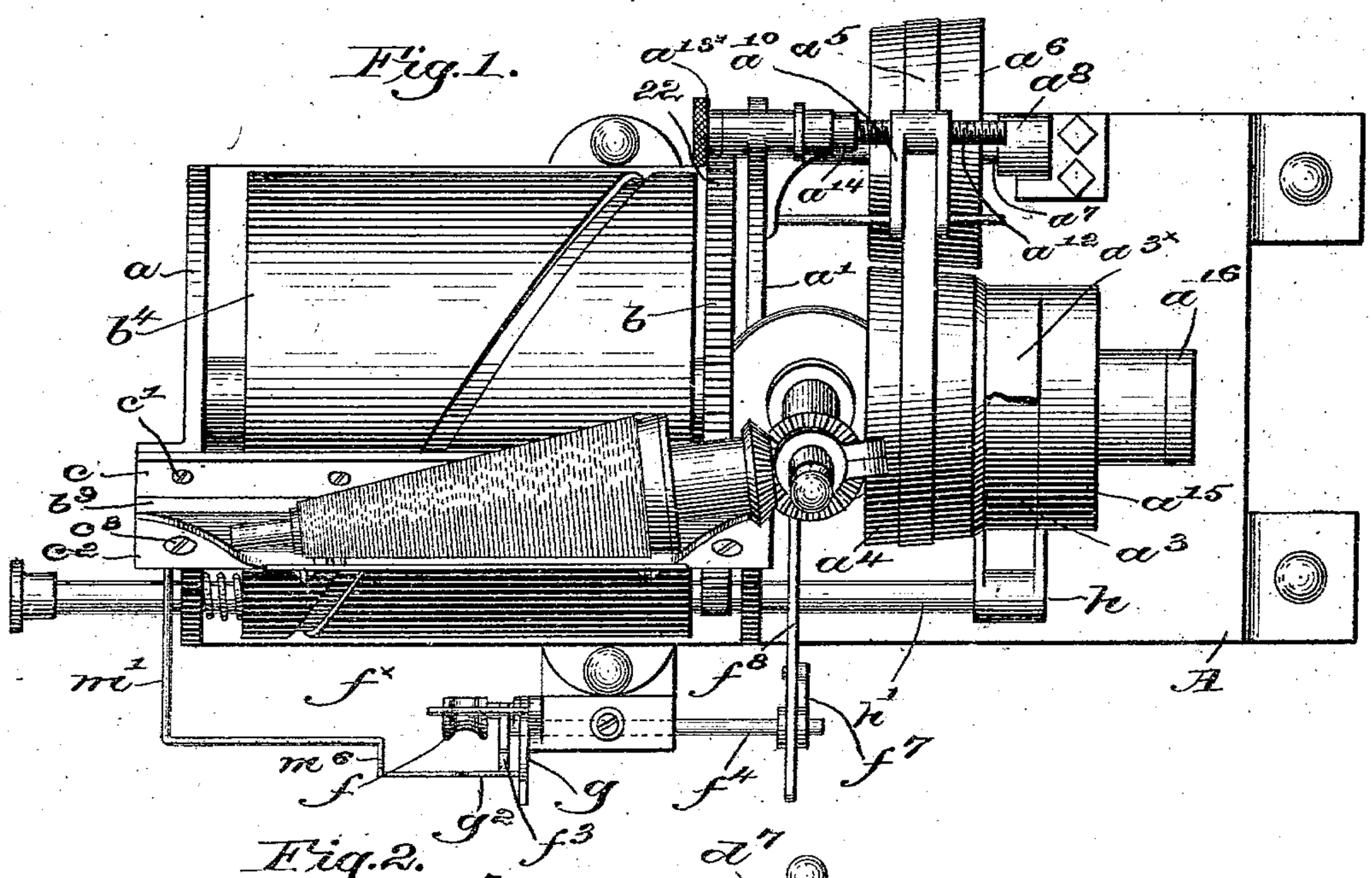

Fig. 2.

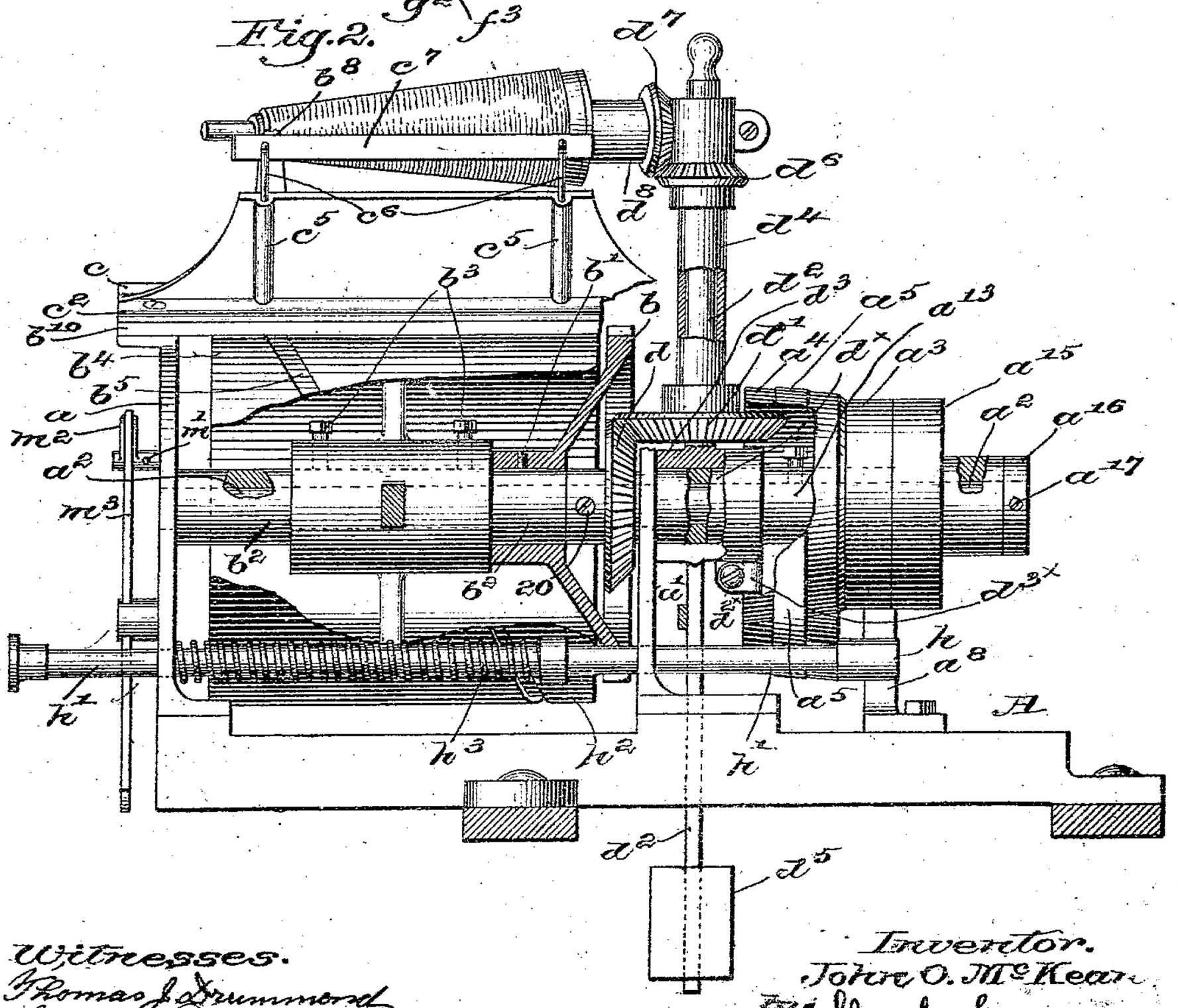

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Fig. 3.

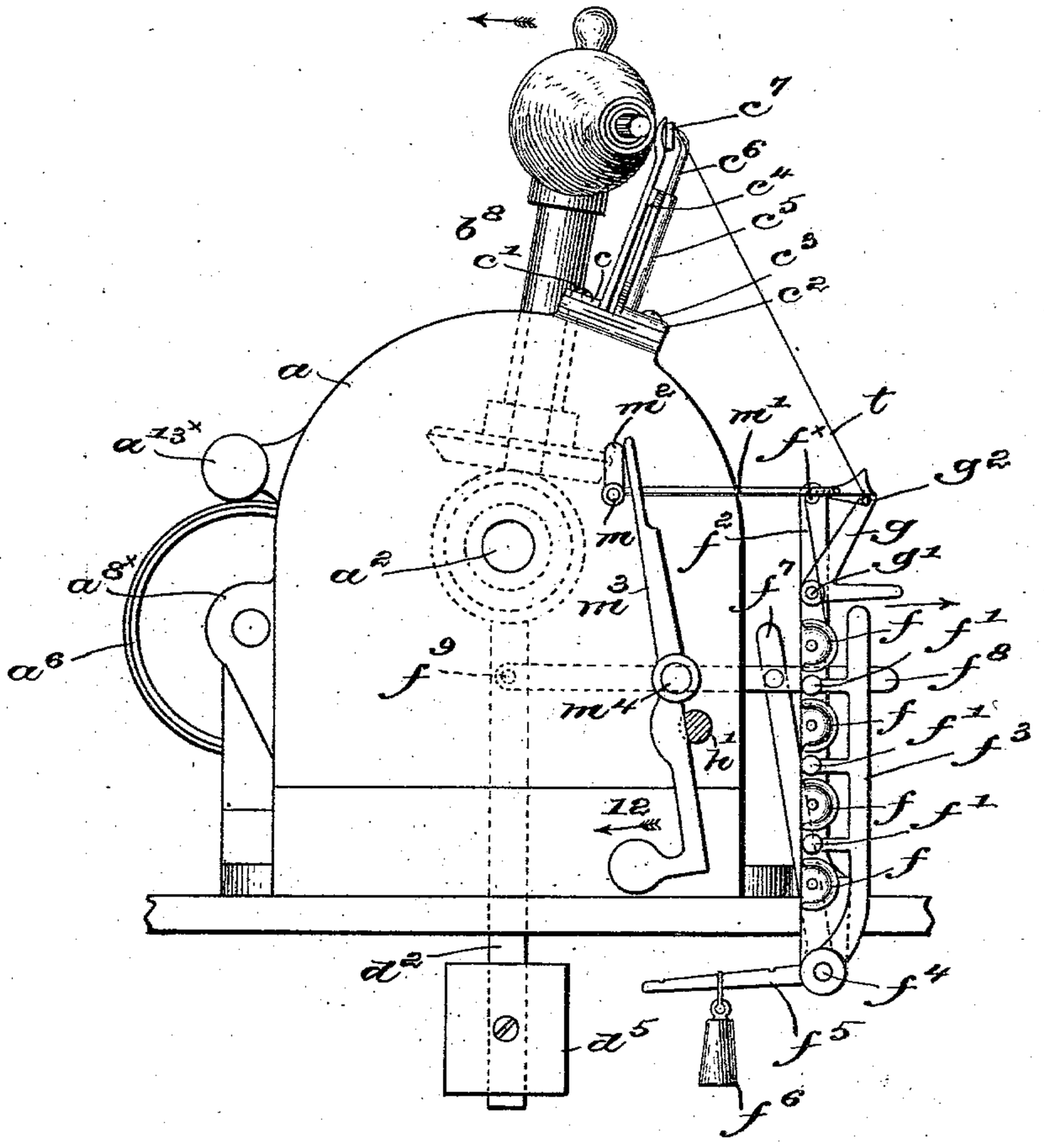

Fig. 3a.

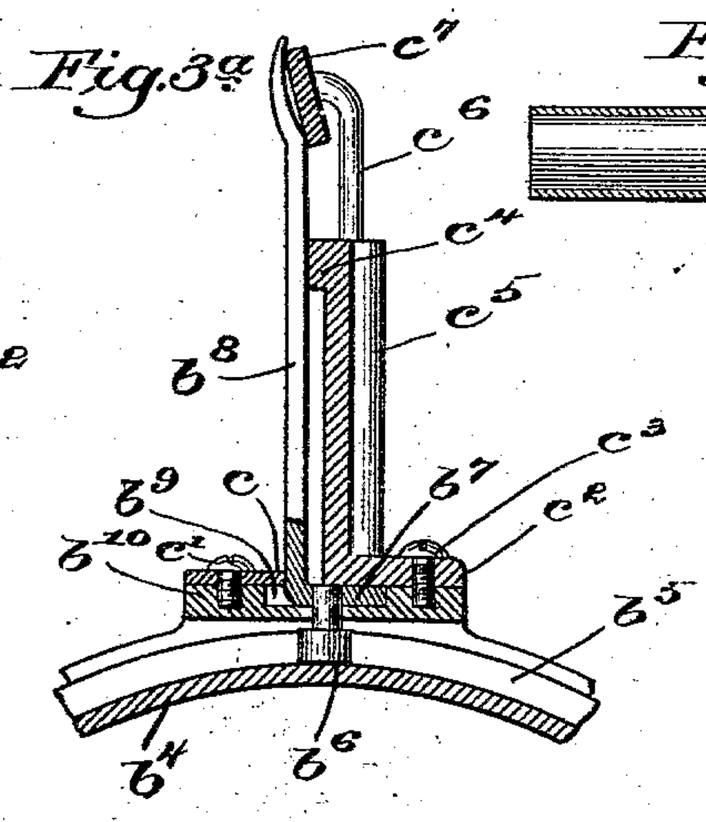

Fig. 3b.

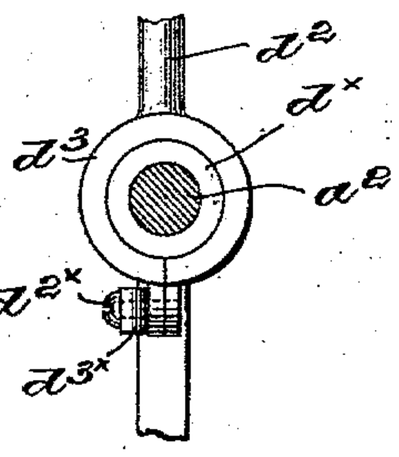

Fig. 3c.

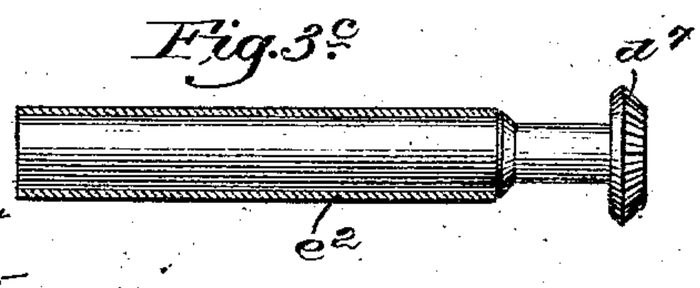

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Fig. 4.

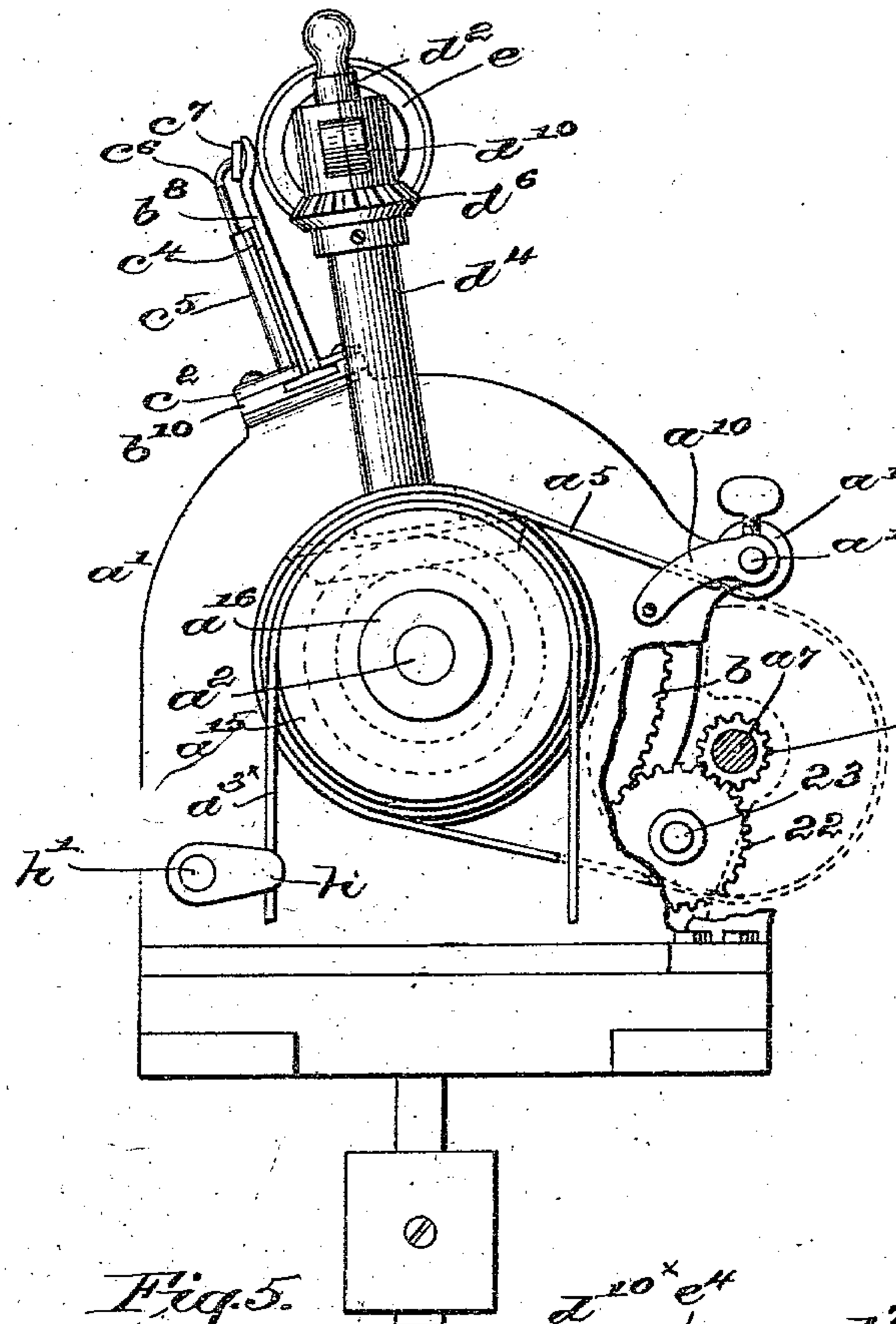


Fig. 5.

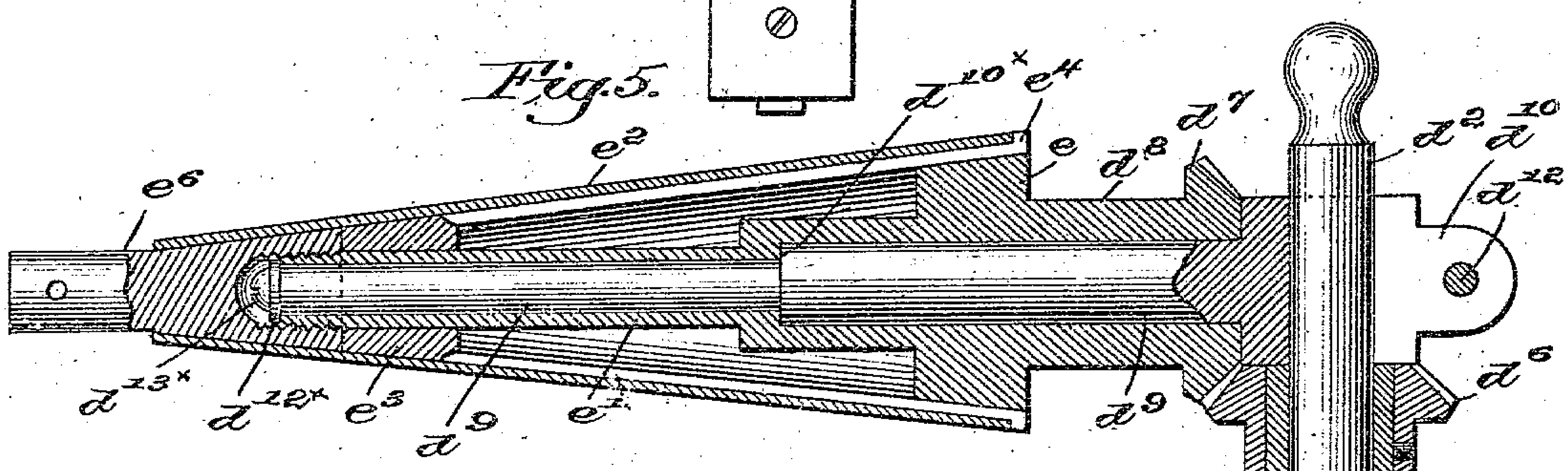
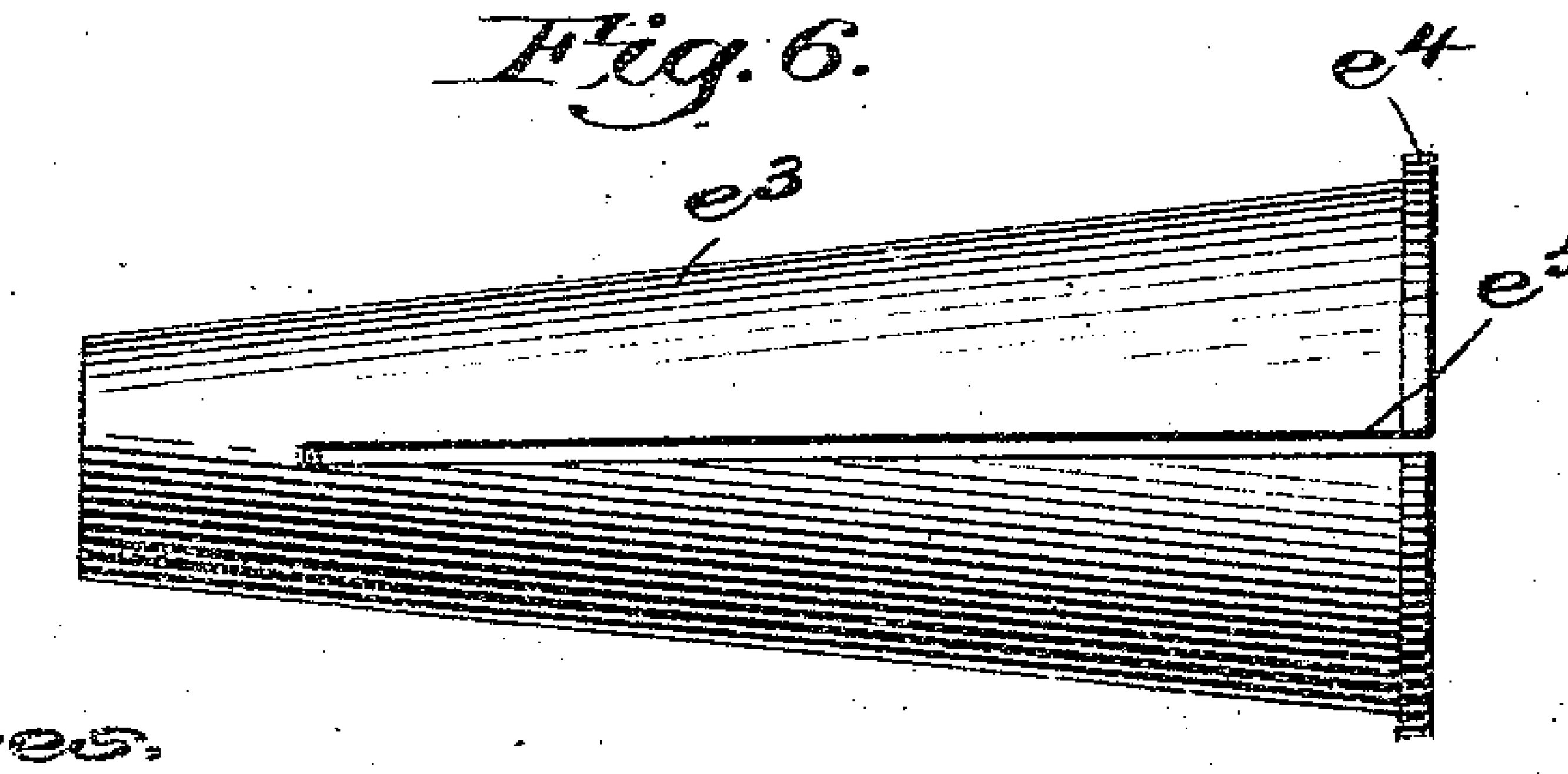


Fig. 6.



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Edward F. Allen.

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John O. McKean,
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UNITED STATES PATENT OFFICE.

JOHN O. McKEAN, OF WESTFIELD, MASSACHUSETTS.

THREAD WINDING OR SPOOLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 685,003, dated October 22, 1901.

Application filed February 7, 1900. Serial No. 4,331. (No model.)

To all whom it may concern:

Be it known that I, JOHN O. McKEAN, a citizen of the United States, residing at Westfield, in the county of Hampden and State of Massachusetts, have invented an Improvement in Thread Winding or Spooling Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention has for its object the production of a novel machine for winding or spooling thread upon shells, which may be of cone shape or tapered or be cylindrical or of uniform diameter from end to end, the invention being also applicable to wind thread upon cone-shaped bobbins or spindles, if desired.

In my invention I employ a stationary guideway in which is reciprocated a thread-guide, and in connection with this thread-guide I employ a spindle having a carrier or tube, upon which is applied the shell or other device which is to receive the thread or yarn, said spindle when the thread mass is to be conical occupying a position diagonal to the line in which the thread-guide works, said spindle being carried upon a swing-frame suitably counterbalanced to maintain the surface of the wound-thread mass in proper contact with the face of the reciprocating thread-guide, the spindle and thread mass being gradually forced away from the plane in which the thread-guide is reciprocated as the thread mass increases in diameter. The swing-frame is free to turn about the longitudinal axis of the cam device for actuating the thread-guide.

Figure 1 of the drawings represents a top or plan view of a machine containing my present improvements. Fig. 2 is a right-hand side elevation of the same, partially in section, to better show the construction of the operative parts. Fig. 3 is a front elevation of the machine shown in Fig. 1 looking at it from the left. Fig. 3^a is a sectional detail to be described. Fig. 3^b is a detail showing the split hub of the swing-frame, its clamping tension device, and the hub constituting the fulcrum for the swing-frame. Fig. 3^c is a detail in section showing a shell-holder adapted to carry a cylindrical shell. Fig. 4 is a rear elevation of the machine shown in Fig. 1, the framework being partially broken out. Fig. 5 is an enlarged sectional detail showing the rotatable carrier and shell-holder with the shell mounted thereon, and Fig. 6 shows the shell-holder removed.

In the drawings, A represents a suitable bed-plate or base which may be supported in any usual way, and in practice there will be several such bed-plates and parts carried thereby, mounted upon a bench or other support at a short distance apart, so that an operator may attend to a number of the machines, to be described. The bed-plate has suitable uprights $a\,a'$, bored to constitute bearings for a shaft a^2. (Shown chiefly by dotted lines in Fig. 2.) The shaft a^2 has mounted upon it loosely a sleeve b^2, which is surrounded by the hub of a thread-guide actuator b^4, represented as provided with a spiral groove b^5, the hub of the actuator being fixed to the sleeve by suitable set-screws b^3. The sleeve has fixed to it by a set-screw b' a toothed gear b. The shaft a^2 at the end of the sleeve b^2 has fixed to it by a set-screw 20 a hub carrying a gear d, The shaft a^2 is extended through a hub $d^\times$, fixed to the upright or end portion a' and receiving upon it loosely the hub d^3 of a swinging frame d^4. The hub d^3 is split, as represented in the detail, Fig. 3^b, to form two ears, one of which is threaded, the threaded ear receiving a screw $d^{2\times}$, which is also passed through a spring $d^{3\times}$, the rotation of said screw enabling the swing-frame to be mounted so that a greater or less amount of strain will be required to turn it about the hub $d^\times$. The shaft a^2 has fixed upon it a suitable pulley a^8, which may receive about it a suitable belt $a^{8\times}$, driven from any usual counter-shaft and by which the shaft a^2 may be rotated constantly. The pulley a^3, having a hub a^{13} to meet the end of the hub or sleeve $d^\times$, has extended from it a cone-shaped driver a^4, which receives and drives a belt a^5, extended about a second reverse cone a^6, fast on a shaft a^7, sustained in suitable bearings $a^8\,a^{8\times}$. The shaft a^7 has a pinion a^9, which engages an intermediate gear 22 on a stud 23, (see Fig. 4,) which gear engages the gear b. The belt a^5 is embraced by a shipper device a^{10}, (see Fig. 4,) the hub of which is screwed upon a threaded shaft a^{13}, having a head $a^{13\times}$; pro-

vided with an annular groove which is entered by part of a stand a^{14}, so that said shaft may be rotated whenever it is desired to adjust the belt a^5 on said pulleys a^4 a^6 to drive the shaft a^7 and the actuator b^4 at a proper rate of speed to insure the desired separation one from the other of each coil or wind of the thread or yarn during the winding operation and being presented to the thread mass by a thread-guide to be described.

The shaft a^2 has mounted upon it at one side the fast pulley a^3, a pulley a^{15}, the hub of which abuts a collar a^{16}, secured to the shaft a^2 by a set-screw a^{17}. The belt $a^{3\times}$ is under the control of a fork h, connected with a shipper-rod h', having an attached collar h^2, acted upon by a spring h^3, surrounding said rod, the opposite end of said spring contacting with the inner side of the upright a, the rod outside said upright being notched to be engaged by a lever m^3 or releasing device to be described, so that whenever the thread breaks and said releasing device is moved thereby it will free the rod h' and let the spring h^3 move the belt controller or shipper to put the belt upon the loose pulley a^{15} and stop the rotation of the actuator or drum having the groove b^5, and consequently arrest the movement of the thread-guide and the winding operation.

The spiral groove b^5 of the actuator referred to receives in it a shoe b^6, (see Fig. 3ª,) mounted loosely upon a stud extended from the base or foot b^7 of the thread-guide b^8, extended upwardly from said foot and having preferably its upper end notched (see Fig. 2) to receive the thread to be wound.

The foot h^7 of the thread-guide runs in a guideway b^9, made in a cross-bar b^{10}, fixed at its opposite ends to the end pieces a and a' of the framework, said foot being reciprocated in said fixed guideway as the thread is being wound from one to the other end of the thread mass. The foot is kept in the guideway by means of suitable shims or guard-plates c, (see Fig. 3,) held in position by suitable screws c', a coöperating flange c^2, held in position by a set-screw c^3, overriding the opposite edge of the foot, the flange c^2 having erected upon it a suitable guide-plate c^4, having at its back suitable hollow posts c^5, which receive the shanks c^6 of a rest c^7 for the thread or yarn as the latter in a notch in the upper end of the thread-guide is reciprocated to and fro in the winding operation.

The gear d, fast on shaft a^2, engages and rotates a bevel-gear d', fast on a tubular shaft d^4, surrounding loosely an upright circular part of the swing-frame d^2, having adjustably connected with its lower end a counterbalancing weight d^5, the adjustment of said weight vertically on said frame enabling the upper end thereof to be turned with greater or less force toward the rest c^7 as the thread-guide lays the thread in spiral coils upon the shell or receiver of whatever form.

The hollow shaft d^4 has at its upper end a bevel-gear d^6, which engages a bevel-gear d', fixed to the inner end of a carrier or tube d^8, surrounding loosely a stud d^9, having at one end a hub split and provided with ears d^{10}, which receive a clamp-screw d^{12}, by which to clamp the stud in any desired position upon the upper end of the swing-frame d^2, the stud being adjusted to occupy a position in a horizontal plane inclined with relation to the position occupied by the rest c^7 and the path of movement of the thread-guide, so that in case a conical shell is being wound with thread or yarn the surface of the yarn mass being wound upon said shell may always occupy a position parallel with the path of movement of the reciprocating thread-guide.

The carrier or tube d^8 is represented as provided with an enlargement or base e, tapered exteriorly, and with a sleeve portion e', threaded at its outer end, and to maintain in position the shell e^2, represented herein as conical and supposed to be made of paper or other light-weight material, I have provided a shell-holder e^3, represented as conical in shape and as having at its base end a flange e^4, the holder being split at opposite points, as at e^5, so that it may be expanded near the base end of the holder when the holder, having had applied to it a shell, is forced upon the base e of the carrier or tube. Before, however, applying the shell to the holder I insert in the shell from its base end a conical nut e^6, threaded internally to engage the screw-threads of the tubular part e' of the carrier, and thereafter I insert the holder in the shell until the smaller end of the cone meets the end of the nut, and then I apply the holder containing the shell to the carrier, securing the nut e^6 upon the sleeve of the carrier.

The carrier is maintained against longitudinal motion on the stud d^9, which is represented of two diameters, by means of a shoulder $d^{10\times}$ on the stud meeting a shoulder of the carrier and by means of a washer $d^{12\times}$ meeting the outer end of the sleeve, said washer being held in contact with the sleeve by a suitable set-screw $d^{13\times}$.

From the foregoing description it will be understood that the carrier is rotated about the stud d^9 by or through the gearing described from the shaft a^2, that the mass of thread being wound upon the shell e^2 will increase uniformly from end to end of said shell, and that as the thread is laid layer after layer upon the shell the periphery of the wound mass of thread acting against the rest c^7 and the thread-guide will be gradually moved to the left in the direction of the arrow, Fig. 3, the force necessary to be overcome to enable the stud and the carrier to move in the arc of a circle away from the fixed path in which the thread-guide reciprocates being measured by the adjustment of the counterbalancing-weight d^5 upon the lower end of said swing-frame, this weight being adjusted to occupy varying positions,

according to the strength of the thread or yarn and the hardness of the thread mass desired.

The thread to be wound on the shell comes from any suitable source through a tension device, herein represented as composed of two members, one member consisting of a series of curved bars or supports f, between which enter suitable opposed tension members f', which may be rolls, the supports f being stationary on or with relation to an upright f^2, having at its upper end a projection $f^\times$ to constitute a thread-rest, the opposed tension member f' being carried by a lever f^3, pivotally mounted on a rock-shaft f^4, said rock-shaft having connected with it an arm f^5, upon which is adjustably mounted a weight f^6 to control the tension of the yarn at starting, the adjustment of the weight being necessary in order to adapt the tension to different strengths of yarn. The rock-shaft f^4 has a connected stud which is in engagement with a second arm f^7, extended upwardly and connected with a link f^8, jointed at its inner end at f^9 to the swing-frame, so that as said swing-frame is moved by the increasing diameter of the yarn mass the periphery of said mass traveling at a faster surface speed as the yarn mass increases in diameter will move the lever f^3 in the direction of the arrow near its upper end in Fig. 3, thus relieving the tension on the thread, so that the thread may be delivered more freely to the more rapidly moving thread mass. The link f^8 is slotted to engage a stud 12 of the arm f^7, so that in case it is desired to release the tension entirely for any purpose the link may be engaged by hand and released from its engagement with the pin 12.

The machine to be operative in the best manner should have a stop-motion device, and such device is herein represented as composed, essentially, of a weighted lever g, pivoted at g' and having a finger g^2, which hangs by its weight upon the thread t, going to the thread-guide, said thread after leaving the upper post friction-surface f being passed over the projection $f^\times$ at the upper end of the upright f^2 and thence under the projection g^2, the thread then passing over the bar c^7 and entering the usual notch in the upper end of the thread-guide. The upright a of the framework has pivoted upon it at m a lever m', having at its inner end an upwardly-turned arm m^2, which when the thread is being delivered properly acts as a support for the upper end of a releasing lever or device m^3, pivoted at m^4, the lower arm of said releasing device engaging a suitable notch in the shipper-rod h' and when in the position, Fig. 3, holding said shipper-rod in such position as to keep the belt $a^{3\times}$ upon the fast pulley a^8 to drive the shaft a^7 and rotate the actuator-drum device carrying the spiral groove b^5. When the thread t is unbroken, a projection m^6, (see Fig. 1,) extended from the lever m', rests upon the outer end of the finger g^2 of lever g, which is held up by the thread keeping the lever m^3 in position to insure the retention of the driving-belt on the fast pulley a^3; but when the thread is broken the projection g^2 will retire from under the end of the lever m, letting said lever, which is heaviest at its outer end, turn, causing the projection m^2 thereof, acting against the upper end of the lever m^3, to turn that lever in the direction of the arrow 12, Fig. 3, releasing the rod h', letting the spring h^3 move the shipper to transfer the driving-belt $a^{3\times}$ onto the loose pulley a^{15}. By adjustably connecting the stud d^9, upon which is mounted the carrier or tube, with the upper end of the swing-frame it is possible to change the longitudinal axis of said carrier with relation to the plane occupied by the rest c^7 to the path of movement of the thread-guide to adapt the machine to use shells of any degree of taper or parallel shells, so that the same machine may be readily adapted to wind either cones or conical shells or tubular shells. Herein the center of motion of the tipping frame is coincident with the center of rotation of the actuator or drum for moving the thread-guide, and consequently any change of position of the stud upon which is mounted the carrier containing the shell receiving the thread or yarn, due to increasing diameter of the thread mass, always results in maintaining the longitudinal axis of the winding-thread mass at the same distance from the actuating-shaft a^2, and the winding action is just the same in all conditions of diameter of the thread mass.

It will be noticed that the actuator for moving the thread-guide is mounted loosely on the shaft a^2, which imparts motion to the shell-holder, and also that said actuator is rotated in the same direction as said shaft, it being possible thereby to greatly increase the effective speed of the machine, for the reason that the friction which would be exerted between the hollow sleeve carrying the actuator and the shaft if said sleeve and shaft ran in opposite directions would be excessive and would materially reduce the speed of the machine.

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

1. In a machine for winding thread or yarn, a thread-guide, a fixed guideway for it, a rotatable actuator for reciprocating said thread-guide, a swing-frame mounted to turn about the center of rotation of said actuator, a stud carried by and extended laterally from said frame, and a shell-carrier sustained revolubly on said stud, said swing-frame, its stud and shell-carrier being movable automatically about its pivot as the mass of thread being wound increases in diameter.

2. In a machine for winding thread or yarn, a fixed guideway, a thread-guide in said guideway, a rotatable actuator for reciprocating said thread-guide, a swing-frame having its

pivot coincident with the center of rotation of said actuator, and a stud connected with said swing-frame and occupying a position at an angle to the path of reciprocation of said thread-guide, a conical shell-carrier mounted on said stud and adapted to sustain a cone-shaped shell, said swing-frame, its stud and shell-carrier being movable automatically about its pivot as the mass of thread being wound increases in diameter.

3. In a machine for winding thread or yarn, a shaft, a spirally-grooved cam mounted on said shaft, a stationary guideway, a thread-guide adapted to be reciprocated in said guideway by said cam, a loosely-pivoted swing-frame, a tubular shaft or sleeve surrounding said swing-frame loosely and provided with a gear at or near each end, a gear carried by said shaft to rotate said sleeve, a stud extended from said frame, a shell-carrier mounted loosely on said stud and having an attached gear engaged and driven by a gear of said tubular shaft and means to rotate said shaft and said cam at any desired speed to provide for different windings as to steepness of spirality.

4. In a machine for winding thread or yarn, a thread-guide, means to reciprocate the same in a fixed line, a counterbalanced loosely-mounted swing-frame, a horizontal stud adjustable on said swing-frame, a shell-carrier having an attached gear and mounted loosely on said stud, gearing carried by said swing-frame to rotate said shell-carrier in any position assumed by said frame and shell-holder due to increasing diameter of thread wound on the shell, said frame, shell-holder and shell swinging automatically in the arc of a circle as the thread mass increases in diameter.

5. In a machine for winding thread or yarn, a thread-guide, means to reciprocate the same in a fixed position, a counterbalanced loosely-mounted swing-frame, a horizontal stud adjustable on said swing-frame, a shell-carrier having an attached gear and mounted loosely on said stud, gearing carried by said swing-frame to rotate said shell-carrier in any position assumed by said frame and shell-holder due to increasing diameter of thread wound on the shell, said frame, shell-holder and shell swinging automatically in the arc of a circle as the thread mass increases in diameter, a thread-tension device, and means connected with said swing-frame to automatically operate said tension device to lessen the tension on the thread as the diameter of the thread mass increases.

6. In a machine for winding thread or yarn, a thread-guide, means to reciprocate the same in a fixed position, a counterbalanced loosely-mounted swing-frame, a horizontal stud adjustable on said swing-frame, a shell-carrier having an attached gear and mounted loosely on said stud, gearing carried by said swing-frame to rotate said shell-carrier in any position assumed by said frame and shell-holder due to increasing diameter of thread wound on the shell, said frame, shell-holder and shell swinging automatically in the arc of a circle as the thread mass increases in diameter, and means to stop the rotation of the thread-guide-moving cam when the thread breaks.

7. In a machine for winding thread or yarn, a thread-guide, a fixed guideway therefor, an actuator for said thread-guide, means to rotate the said actuator, a swing-frame mounted to turn about the axis of rotation of said actuator, a stud mounted on said frame, a carrier or tube mounted on said stud and adapted to sustain a shell, means carried by said swing-frame to rotate said carrier or tube, and connections between the means for moving said actuator and the means for rotating the carrier or tube, to vary the relative speed of rotation of said actuator and said carrier or tube to provide for winding the thread in spirals more or less separated one from the other.

8. In a winding-machine, a thread-guide, a guideway for the same, means to carry a shell-holder to receive the material to be wound, a shaft, an intermediate device to rotate said shell-holder, an actuator mounted loosely on said shaft, and means to rotate said actuator at any desired speed about said shaft and in the direction of its rotation.

9. In a winding-machine, a swing-frame carrying a shell-holder, a thread-guide, a tension device acting directly on the thread to control the tension thereon as the thread goes to the thread-guide, and a connection between said swing-frame and tension device to automatically move the same and lessen the tension of the thread being wound as the thread mass on the shell-holder increases in diameter.

10. In a winding-machine, a swing-frame carrying a shell-holder, a thread-guide, a tension device to control the tension on the thread going to the thread-guide, and a slotted connection between said swing-frame and tension device, said slot permitting the tension device to be moved by hand to release the tension when desired.

11. In a winding-machine, a swing-frame carrying a shell-holder, a thread-guide, a tension device acting directly on the thread to control the tension thereon as the thread goes to the thread-guide, a connection between said swing-frame and tension device to automatically move the same and lessen the tension of the thread being wound as the thread mass on the shell-holder increases in diameter, and stop-motion devices set into operation by the breaking of the thread.

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

JOHN O. McKEAN.

Witnesses:
GEO. W. GREGORY,
M. A. DUNN.