(No Model.) 3 Sheets—Sheet 1.

# H. W. MORGAN.

## SILK SPINNING AND TWISTING MACHINE.

No. 577,195. Patented Feb. 16, 1897.

Fig. 1.

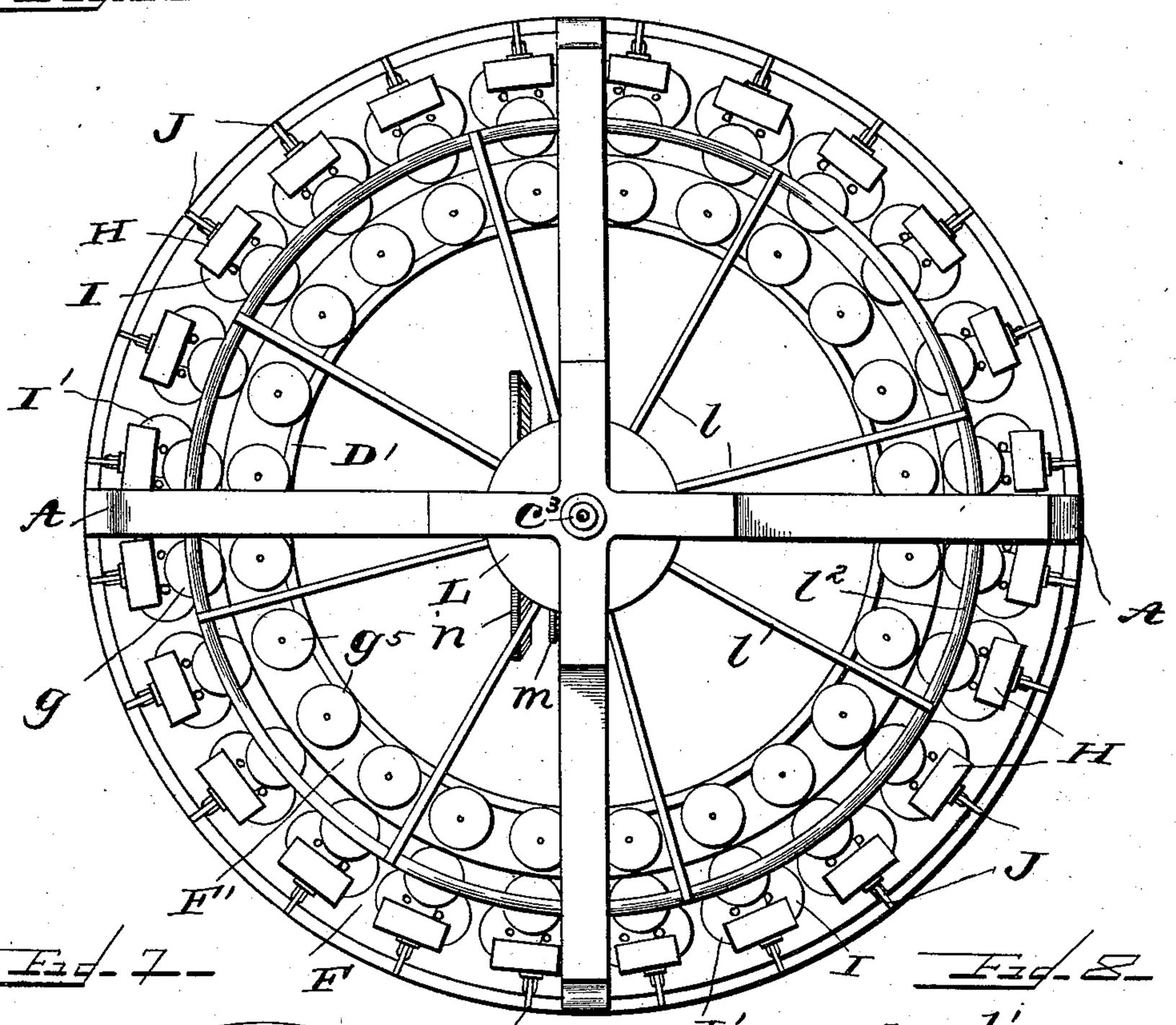



Fig. 7.

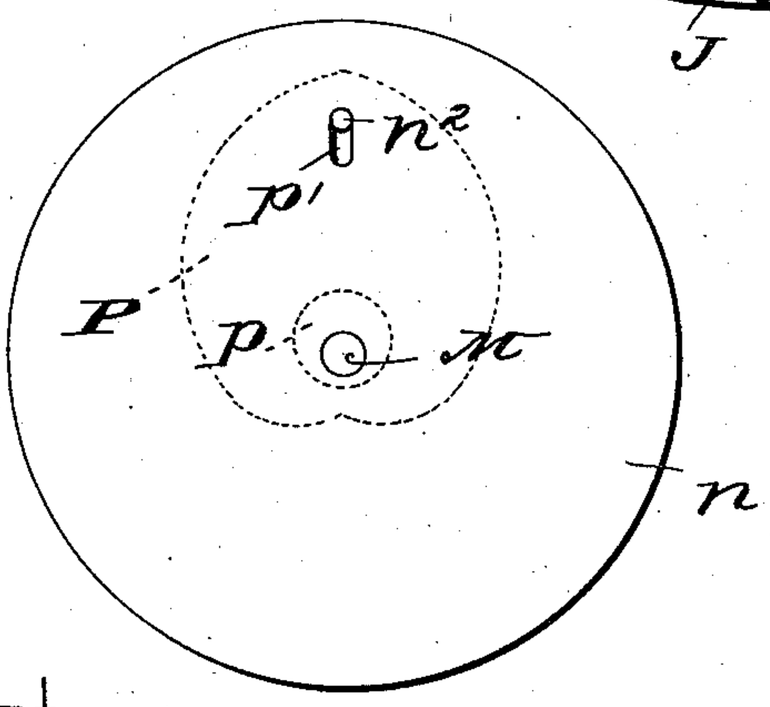
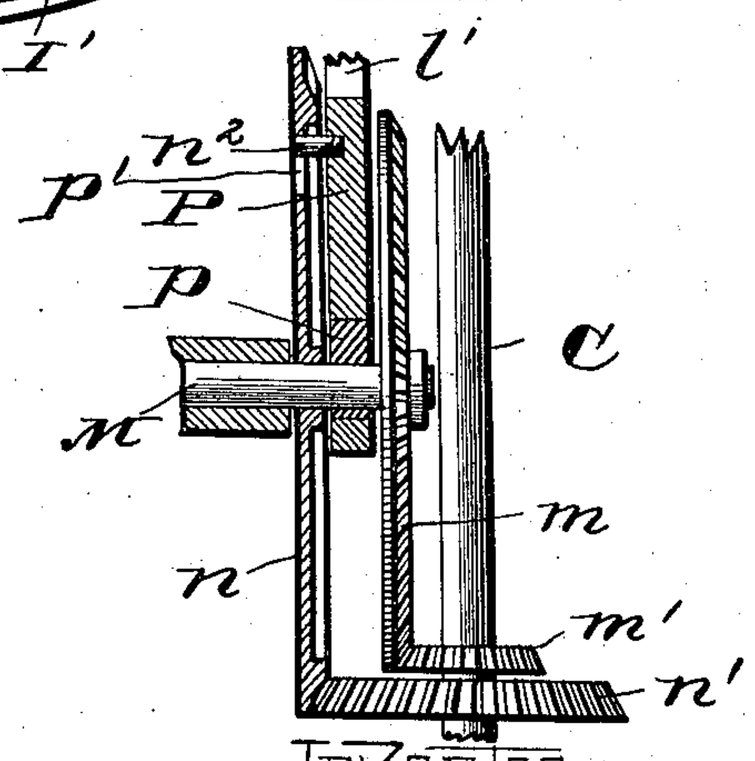



Fig. 8.




Witnesses.

G. A. Vanderschmidt,

J. D. Kingsbury.

Inventor.

Henry W. Morgan

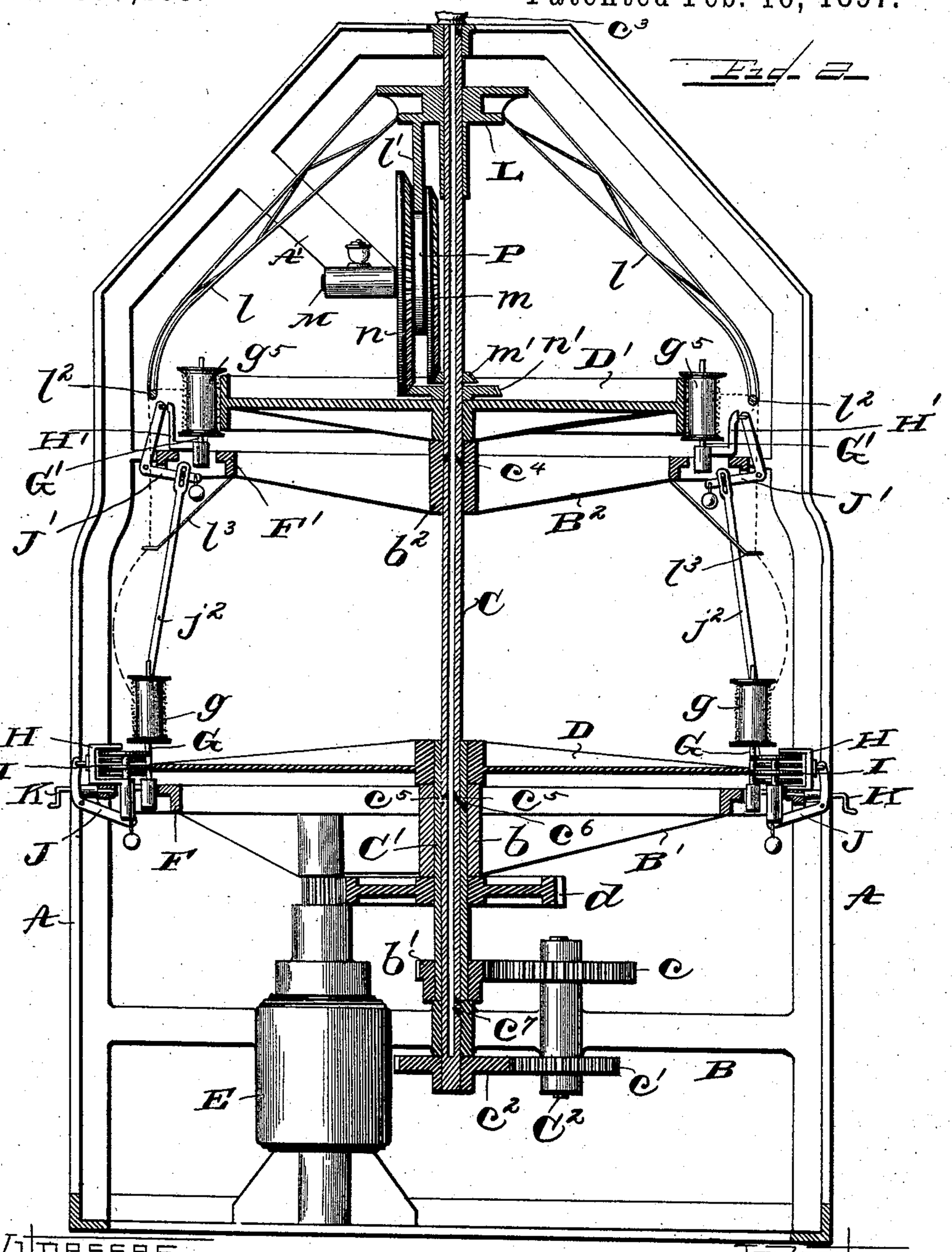
By Whitaker & Thwoot Attys.

(No Model.) 3 Sheets—Sheet 2.

# H. W. MORGAN.

## SILK SPINNING AND TWISTING MACHINE.

No. 577,195. Patented Feb. 16, 1897.




Witnesses—

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(No Model.) 3 Sheets—Sheet 3.

# H. W. MORGAN.

## SILK SPINNING AND TWISTING MACHINE.

No. 577,195. Patented Feb. 16, 1897.

Fig. 3.

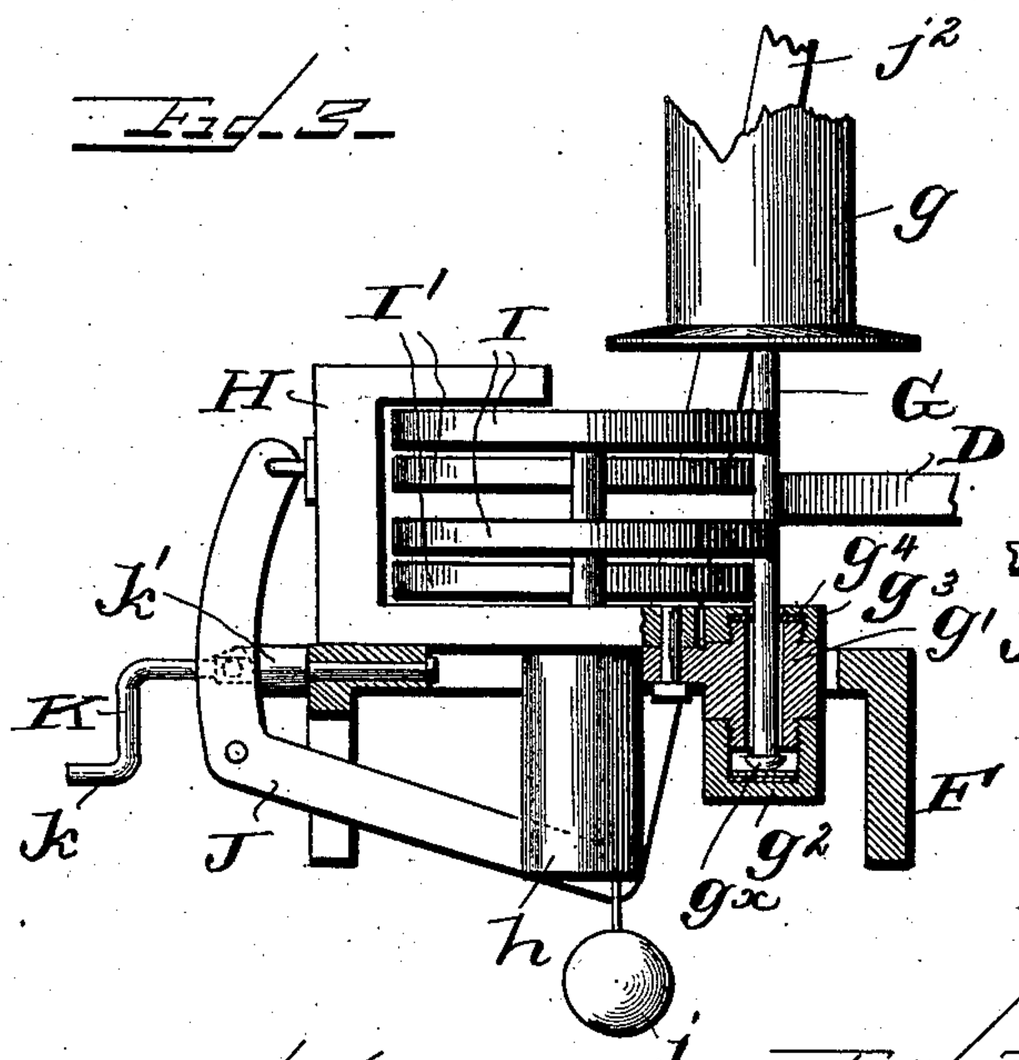



Fig. 5.

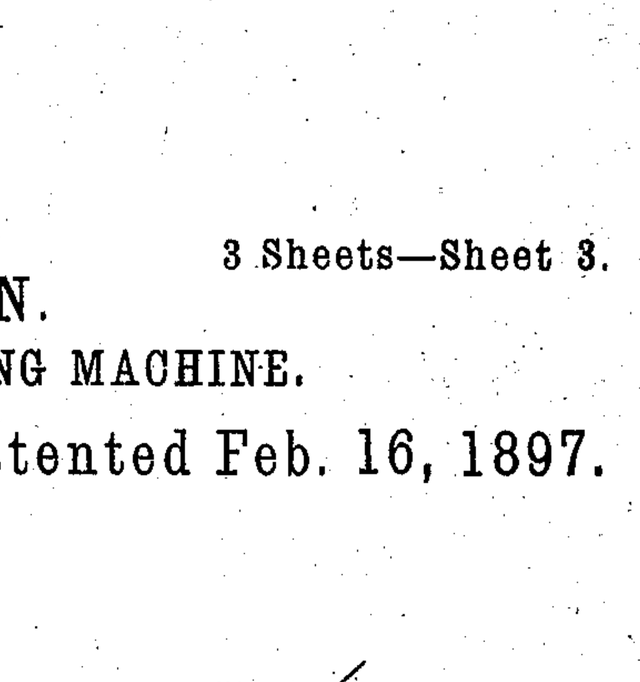



Fig. 4.

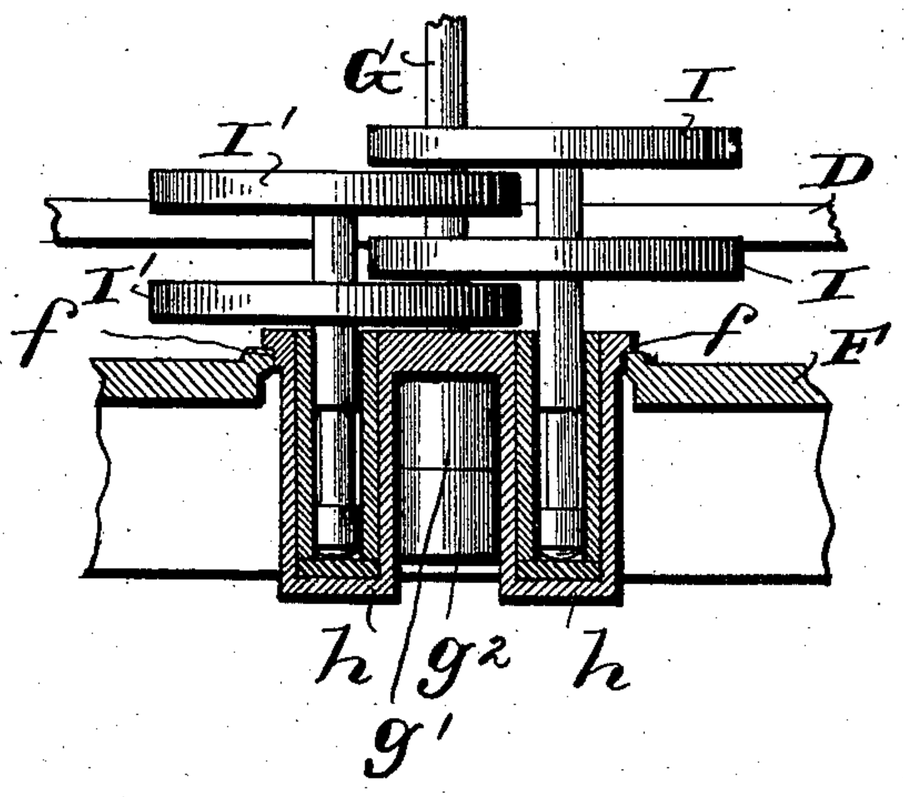



Fig. 3a.

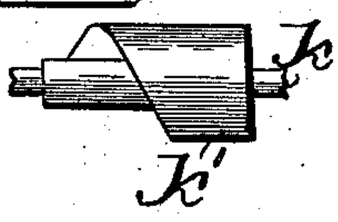
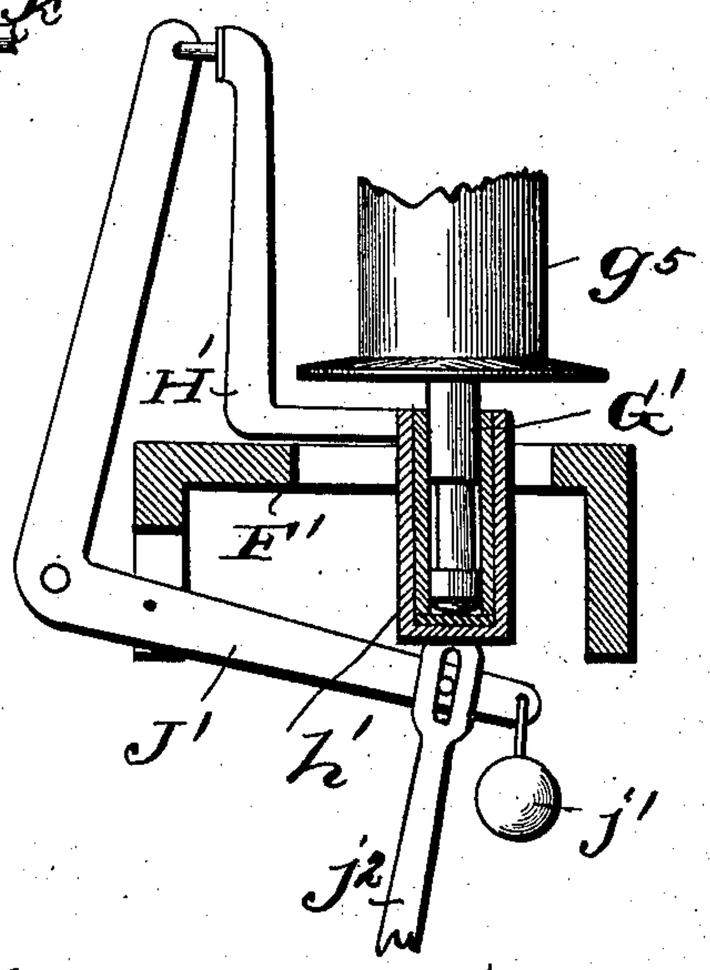



Fig. 6.




Witnesses—

G. A. Tauberschmidt,

J. D. Kingsbury.

Inventor—

Henry W. Morgan

By Whitaker & Prevost Attys.

# UNITED STATES PATENT OFFICE.

HENRY W. MORGAN, OF CARBONDALE, PENNSYLVANIA.

## SILK SPINNING AND TWISTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 577,195, dated February 16, 1897.

Application filed March 4, 1896. Serial No. 581,830. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY W. MORGAN, a citizen of the United States, residing at Carbondale, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Silk Spinning and Twisting Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to machines for spinning and twisting silk; and it consists in certain improved constructions and combinations of parts whereby increased efficiency and other desirable results are secured.

In the accompanying drawings I have illustrated one form in which I have contemplated embodying my invention, and the same is fully disclosed in the following description and claims.

In the drawings, Figure 1 is a top or plan view of one of my improved machines. Fig. 2 is a vertical sectional view. Figs. 3, 4, and 5 are views showing details of the devices for supporting the twisting spindle and bobbin. Fig. $3^a$ is a view showing the cam for withdrawing the spindle-carrying slide or frame. Fig. 6 is a detail view of the means employed to support the spindles carrying the take-up or receiving bobbins, and Figs. 7 and 8 are views showing details of the traverse-cam and its operative mechanism.

In the construction of my machine I employ a supporting structure, preferably of the form shown, consisting of uprights A and horizontal supports B B′ $B^2$, connected therewith, preferably of the spider form, with the arms secured to the standards. Centrally of the supporting structure is mounted a shaft C, which is journaled at the top and bottom of the frame and also at such intermediate points as may be preferred or found desirable. In this instance I have shown it as journaled in each of the horizontal supports and in the top of the frame.

Near the bottom of the shaft C, I place a sleeve C′, surrounding the shaft and capable of moving independently of it. This sleeve is journaled in the bearing *b* of the horizontal support B′, and above the said support B′ it is provided with the large friction-wheel D and below it with the gear-wheel or pulley *d*, by means of which motion is communicated to the wheel D. I have contemplated driving this wheel by an electric motor E, which is provided with means to communicate power to the wheel or pulley *d*, either by a gear-wheel meshing with wheel *d* or by a pulley and band, as may be found most desirable. It will, however, be understood that other motive power may be employed.

Outside of the wheel D, I place an annular table F, on which I mount the spindles G for carrying the twisting-bobbins *g*. These spindles and their supports and guiding devices are each carried by a small slide or sliding frame H, mounted in guides *f f*, so as to be capable of moving radially of the wheel D or of the annular table. The slide H is provided with a bearing *g′*, secured to or forming part of the slide. This bearing is provided with a vertical opening bored to a size a little in excess of the size of spindle G. To the bottom of this bearing the cup-shaped step $g^2$ is secured by a screw-threaded connection or in any other preferred manner. The top is closed by a cap $g^3$, and by preference I provide a felt washer $g^4$ between the cap and the bearing to engage or nearly engage the spindle to prevent the lubricant employed in the bearing from rising on the spindle through the cap.

The spindle G is provided with the head $g^\times$, which is rounded on the lower side, and this rounded surface rests upon flat bottom of the cupped step $g^2$. The spindle is rotated by frictional contact with the wheel D. In order to reduce the friction of the spindle-bearing to the minimum, the spindle is held against the periphery of the wheel D by two double antifriction-wheels I I′, as clearly shown in Figs. 3, 4, and 5. The shafts on which these wheels are mounted are journaled in the slide H or in bearings *h h*, secured to the slide. These bearings and the spindle-bearing *g′* project below the bottom of the slide, and openings are made in the annular table F to receive these bearings and to permit a certain amount of movement of the slide upon its guides or guideway.

A bell-crank lever J has one arm connected with the slide in any preferred manner, so that the lever can be operated to move the slide both inwardly and outwardly. To the other arm of the lever is attached a weight or spring *j*, which, when at liberty to act upon the slide, forces the slide inward and holds the spindle G in contact with the periphery of the wheel D. I preferably employ two antifriction-wheels I on one shaft, one engaging the spindle above and the other below the plane of the point at which the wheel D engages it. I also preferably employ two antifriction-wheels I′ on the other shaft, engaging the spindle at different points from the wheels I, and one of them engages the spindle above and the other below the plane of the point of engagement of the wheel D with the spindle. These antifriction-wheels are located in respect to each other as shown in Fig. 5, one on each side of the radius on which the spindle is located, so that an angle is formed for the reception of the spindle. The arrangement is such that the pressure of the antifriction-wheels tends to hold the spindle in a vertical position independently of the bearing *g′*, and the parts are so adjusted that when the antifriction-wheels bear on the spindle and force it in operative contact with the wheel D the portion of the spindle within the bearing *g′* will be held out of contact with the walls of the bearing. While the periphery of the wheel D will work effectively by friction on the spindles, I may provide the periphery with a covering of rubber or vegetable fiber to avoid noise and vibration.

It often becomes desirable to move the slides H and spindles outwardly to bring the spindles to a state of rest, so that the spool or bobbin thereon may be removed and another placed upon it, and for other purposes. This may be accomplished by various mechanisms. In this instance the mechanism I have shown for this purpose is illustrated most plainly in Fig. 3. It consists of the shaft K, provided with a crank *k*, and a circular cam *k′*, adapted to engage the inner side of the upright arms of the levers J or a pin extending therefrom. This cam is provided with the square shoulder which, when the shaft K has been turned to the proper position to withdraw the spindles G and throw them out of action, comes in contact with the side of the lever J or the pin engaging the arm, and prevents further movement.

To the support $B^2$ is secured the annular table F′, similar to F. In guides similar to those of the table F are mounted the slides or sliding frames H′, corresponding in number to the slides H of the table F. These slides or sliding frames are each provided with a step-bearing *h′* to receive the lower end of a spindle G′, which carries a receiving bobbin or spool $g^5$. The bobbin engages the spindle so as to rotate with it, and the requisite motion is imparted to all of the bobbins and spindles by the engagement of the bobbin or the silk thereon with a friction-wheel D′, rigidly secured to the shaft C. The bobbins are kept in proper engagement with the friction-wheel by the bell-crank levers J′, which are connected with the slides H′ in a manner similar to the connection of the levers J with the slides H, and the horizontally-extending arms of the levers J′ are provided with weights *j′* to effect the inward movement of the slides to secure this engagement at all times with the friction-wheel D′. I employ duplicates of the shafts K and cams *k′* to withdraw the slides H′ when this is desired.

In order that the thread shall be laid evenly and in the proper manner upon the take-up bobbins $g^5$, the same is delivered to such bobbins over a porcelain or glass bar or ring $l^2$, supported by the arms *l*, depending from a central head L, near the top of the machine. The head L loosely engages the shaft C and is free to rise and fall thereon, but is held from rotation with the shaft in any suitable manner.

A sprocket A′, secured to one of the standards A, extends downwardly and inwardly and is provided with a bearing in which is journaled a shaft M, (see Figs. 2, 7, and 8,) extending radially of the machine. On the inner end of the shaft M is the bevel gear-wheel *m*, rigidly secured thereto, which gears with the bevel-pinion *m′* on the shaft C. Rigidly secured to the gear-wheel *m* or to the shaft M is the eccentric *p*, on which is loosely mounted the heart shaped cam P. Loosely mounted on the shaft M is the bevel gear-wheel *n*, which meshes with the gear-wheel or bevel-pinion *n′* on the shaft C. The cam P is provided with a pin $n^2$, which engages the slot *p′* in the bevel-wheel *n*, so that the wheel *n* and cam P are caused to rotate together. The head L is provided with the downwardly-extending arm *l′*, which engages and rests upon the cam P. This cam is made of such size that on a single revolution of the same and wheel *n* the head L is caused to rise and fall a sufficient distance to move the bar or ring $l^2$, carried by the arms *l*, from one end of the bobbin $g^5$ to nearly the other end of the same and return, laying the thread upon the spool in a spiral course upon the bobbin in its downward movement and in a reverse spiral upon its return or upward traverse.

It is not desired that the thread shall be laid upon the bobbin in exactly the same path on the next revolution, but be laid parallel with it at a little distance therefrom, and this is effected by the eccentric *p*. It will be seen that the wheel *m* and shaft M move at a much slower rate than the wheel *n* and the cam P, so that on one revolution of the wheel *n* and the cam but a small amount of movement has been given to the eccentric *p*. This movement is, however, sufficient to move the cam

a slight distance toward or from the center about which it revolves, and this changes the position of the guide-bar $l^2$ in respect to the bobbins, so that on the next revolution of the wheel $n$ and the cam P the thread is laid at one side of the thread placed upon the bobbin by the former reciprocation of the guide-bar $l^2$, but parallel therewith. This is continued until the eccentric has made half of a revolution, when the cam begins a return movement, reversing the courses of the thread on the bobbin until a full revolution of the wheel $m$ has taken place, when the same operations will again take place, resulting in an even laying of the thread upon the bobbin. The periphery of the wheel D may be covered with rubber or cork or analogous substance to insure the rotation of the bobbins and avoid wear of the silk upon the same.

Motion is imparted to the shaft C from the sleeve C′ by means of gearing, the lower end of the sleeve C′ being provided with a gear-wheel $b'$, which meshes with a gear-wheel $c$ on the shaft $C^2$. This shaft is also provided with a gear-wheel $c'$, meshing with a gear $c^2$, rigidly secured to the shaft C. As it is desired that the shaft C shall rotate at a much less rate of speed than the sleeve C′, the gear $b'$ is made smaller than the gear $c$ and the gear $c'$ is made of less size than the gear $c^2$. It is not intended to show the exact proportions of these wheels, but the same are proportioned to secure the desired relative movements of the shaft and the sleeve.

If found desirable, one or more guide-eyes $l^3$ for the thread may be interposed between the bobbins $g$ and the guide bar or ring $l^2$.

The twisting of the silk is effected by the rotation of the bobbin $g$ and the spindles G, and by my arrangement I am enabled to attain a maximum degree of speed with a reduction of friction, and therefore at less expense than heretofore. This lessening of friction in the machine enables me to run the spindles at a high rate of speed—higher, I believe, than has ever before been obtained in this class of devices.

The take-up bobbins are driven in the manner indicated to secure an even wind upon such bobbins, whether empty or nearly or quite full, in a manner well known. When a take-up bobbin has become full, it is necessary to remove the same and replace it with an empty bobbin. In doing this the winding up of the thread is for the moment stopped, and if the rotation of its corresponding twisting-spindle were permitted to continue an undue amount of twist would be put into the thread extending from the twisting to the take-up bobbin. In order to prevent this, I provide a connection between the slides H′ and H or the levers J′ and J, whereby the outward movement of the slide H′ to permit of the substitution of an empty for a full bobbin automatically withdraws the corresponding twisting spindle and bobbin from the action of the friction-wheel D. This is accomplished by means of the links $j^2$, connecting the levers J′ and J. The upper end of this link is provided with a slot, as shown, (see Figs. 2 and 6,) through which the pin connecting it with the lever J′ passes. This slot is for the purpose of permitting the slide H′ to move outward from the position of the same when the bobbin $g^5$ is empty until it has been filled, without affecting the lever J and slide H, with which it is connected. When the bobbin $g^5$ on the spindle G′ is empty, the pin in the slot in the upper end of the link $j^2$ is near the bottom of said slot, the link $j^2$ being supported by the lever J. When, however, the bobbin $g^5$ has been filled, the slide H′ and the upwardly-extending arm of the lever J will have been moved outward and the pin brought to the upper end of the slot. Any further movement of the slide H′ will cause the lever J′ to raise the link and thereby draw the slide H outward, disengaging its spindle G from the friction-wheel D and throwing the spindle out of action. This effect is also produced when the operator withdraws the slide H′ outward to change a full for an empty bobbin, or for any other purpose.

In order that the shaft C and its bearings may be automatically and constantly lubricated, I make the said shaft hollow and supply oil therethrough. The upper end of the shaft is provided with an oil-receptacle $c^3$, which communicates with the interior of the shaft C by a fine aperture, permitting the oil to pass by drops to the interior of the shaft. Near the upper end of the bearing $b^2$, carried by the support $B^2$, the shaft is provided with small perforations $c^4$, preferably inclining downwardly from the interior of the shaft, and through these perforations a part of the oil passing down within the shaft will pass to the bearing, lubricating the same. Like perforations $c^5$ will lubricate the bearing of the sleeve C′ on the shaft C, and perforations $c^6$ through the sleeve will lubricate the bearing in which the sleeve is journaled. Perforations $c^7$ will also lubricate the lower bearing of the shaft.

It will be seen that this machine can be used for the spinning and twisting of silk, as may be desired.

It will also be seen that the spindles G are supported from below and, as they have no frictional engagement at any other point, they can be run at a high rate of speed with but little power.

While I have shown the specific constructions which I at present deem best adapted to the construction here shown for carrying out my invention, the details of many parts can be considerably modified or changed without departing from the principle of my invention.

What I claim, and desire to secure by Letters Patent, is—

1. In a silk spinning and twisting machine,

the combination with a friction-wheel, of a series of slides set radially of said wheel, spindles mounted upon said slides and means for moving said slides toward the said wheel, each of said slides having a bearing for the spindle, and means independent of said bearing to hold the spindle in contact with said wheel, substantially as described.

2. In a silk spinning and twisting machine the combination with a friction-wheel, of an annular table surrounding said wheel, a series of slides movably mounted on said table radially of said wheel, spindles mounted in said slides, said slides being each provided with an antifriction device supporting a spindle on the side opposite its point of engagement with the friction-wheel, substantially as described.

3. In a silk spinning and twisting machine the combination with the friction-wheel, of a spindle engaging said wheel and antifriction-wheels engaging said spindle and holding it in contact with said friction-wheel, substantially as described.

4. In a silk spinning and twisting machine, the combination with the friction-wheel for driving the spindles, of a spindle engaging said wheel, double antifriction-wheels engaging the spindle above and below the plane of their contact with the driving-wheel, whereby the spindle is held in a vertical position, substantially as described.

5. In a silk spinning and twisting machine, the combination with the friction-wheel, a slide movable radially of said wheel, a spindle mounted in said slide, antifriction-wheels engaging the spindle to hold it in contact with said friction-wheel and mounted on said slide and means for forcing said slide inwardly to bring the spindle in contact with said friction-wheel, substantially as described.

6. In a silk spinning and twisting machine, the combination with the twisting-spindles, of a series of take-up bobbins, a single friction-wheel for operating the take-up bobbins by contact with the body of the bobbin or the silk thereon, each of said bobbins being movable radially to and from the said friction-wheel, a lever and weight for moving each of the bobbins toward the friction-wheel and a device operating upon the said lever to move it away from the wheel, substantially as described.

7. In a silk spinning and twisting machine the combination with the take-up bobbins, of the devices for delivering thread to said bobbins and the traverse-cam for moving the delivery devices a certain distance along the body of the said bobbins and its eccentric to cause the traverse of the delivery devices to cover different portions of the body of the bobbins and means for actuating the same, substantially as described.

8. The combination with the thread-delivery device, of the traverse-cam, the wheel for rotating the same, the connection between them permitting a movement of the cam toward and from the center of its rotation and means for moving said cam radially at each revolution of the same substantially as described.

9. The combination with the thread-delivery device, of the traverse-cam, the gear for rotating said cam, connected therewith to permit a radial motion of the cam, of the gear-wheel for giving a radial movement to said cam, and operative means for said gear-wheels, substantially as described.

10. In a silk spinning and twisting machine, the combination with two annular tables, of a series of twisting-spindles on one table, a series of take-up bobbins on the other table, frictional driving devices for said spindles and bobbins and operative connections between each take-up bobbin and its twisting-spindle whereby the moving of such take-up bobbin out of operative relation with its driving-wheel withdraws its twisting-spindle for its frictional driver, substantially as described.

11. In a silk spinning and twisting machine, the combination of two annular tables, of two friction-wheels, a series of take-up bobbins movably mounted on one table, a series of twisting-spindles movably mounted on the other table, means to maintain each spindle and bobbin in operative relations with its friction-driver, and connections between each take-up bobbin and its twisting-spindle whereby the withdrawal of one from its operative position effects a corresponding movement of the other, substantially as described.

12. In a silk spinning and twisting machine, the combination with a friction-wheel for actuating the twisting-spindle, of the spindle and the slide for carrying the same, of a weighted lever for acting on said slide, of a take-up bobbin, a friction device for rotating said bobbin a slide carrying said bobbin, a weighted lever for maintaining the frictional engagement of said bobbin and means connecting the controlling-lever of the take-up bobbin with the lever controlling the twisting-spindle whereby the withdrawal of one effects the stopping of the other, substantially as described.

13. In a silk spinning and twisting machine the combination with the frictionally-driven twisting-spindle of a frictionally-driven take-up bobbin, levers for maintaining the frictional engagement of these devices and a link connecting said levers having provision for lost motion, between them, substantially as described.

14. In a silk spinning and twisting machine, the combination with the vertical shaft and friction-wheel mounted thereon, of an annular table surrounding said friction-wheel, twisting-spindles mounted on said table for operation by the friction-wheel, an annular table in a different plane from the spindle-table, take-up bobbins mounted thereon and a friction-wheel for operating the take-up bobbins, substantially as described.

15. In a silk spinning and twisting machine

the combination with a friction-wheel, of an annular table surrounding the said wheel, twisting-spindles mounted on said table to slide radially of the same, an annular table in a different plane from the spindle-table, take-up bobbins mounted to slide radially of said table and weighted levers for pressing said spindles and bobbins into engagement with their operating-wheels, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY W. MORGAN.

Witnesses:

L. P. WHITAKER,

J. D. KINGSBERY.