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C. F. BOSWORTH.

MACHINE FOR WINDING THREAD UPON SPOOLS.

No. 270,376. Patented Jan. 9, 1883.

Fig. 1

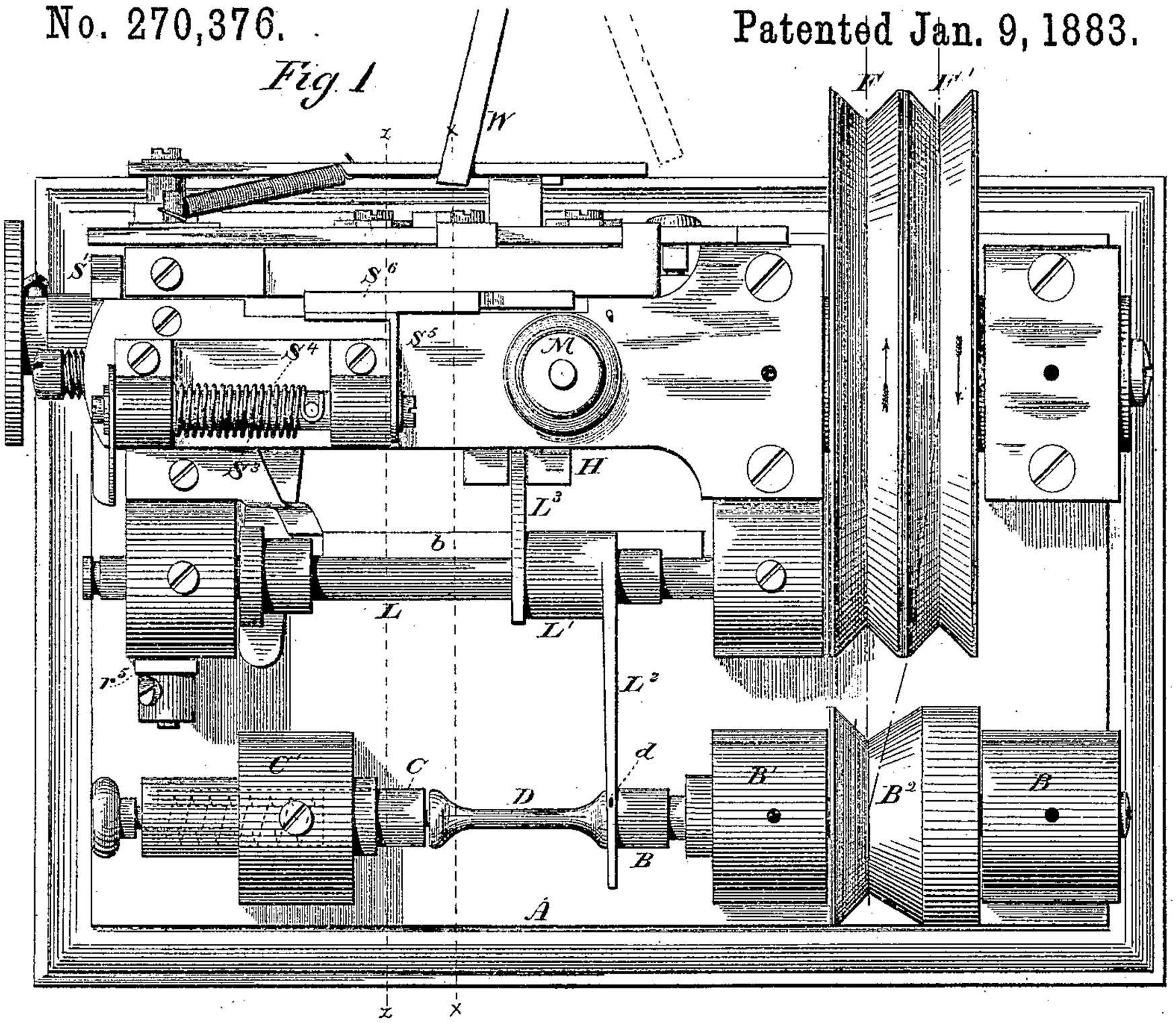

Fig. 1a

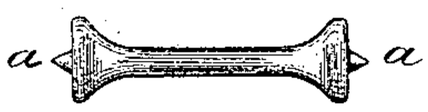

Fig. 2

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Fig. 3.

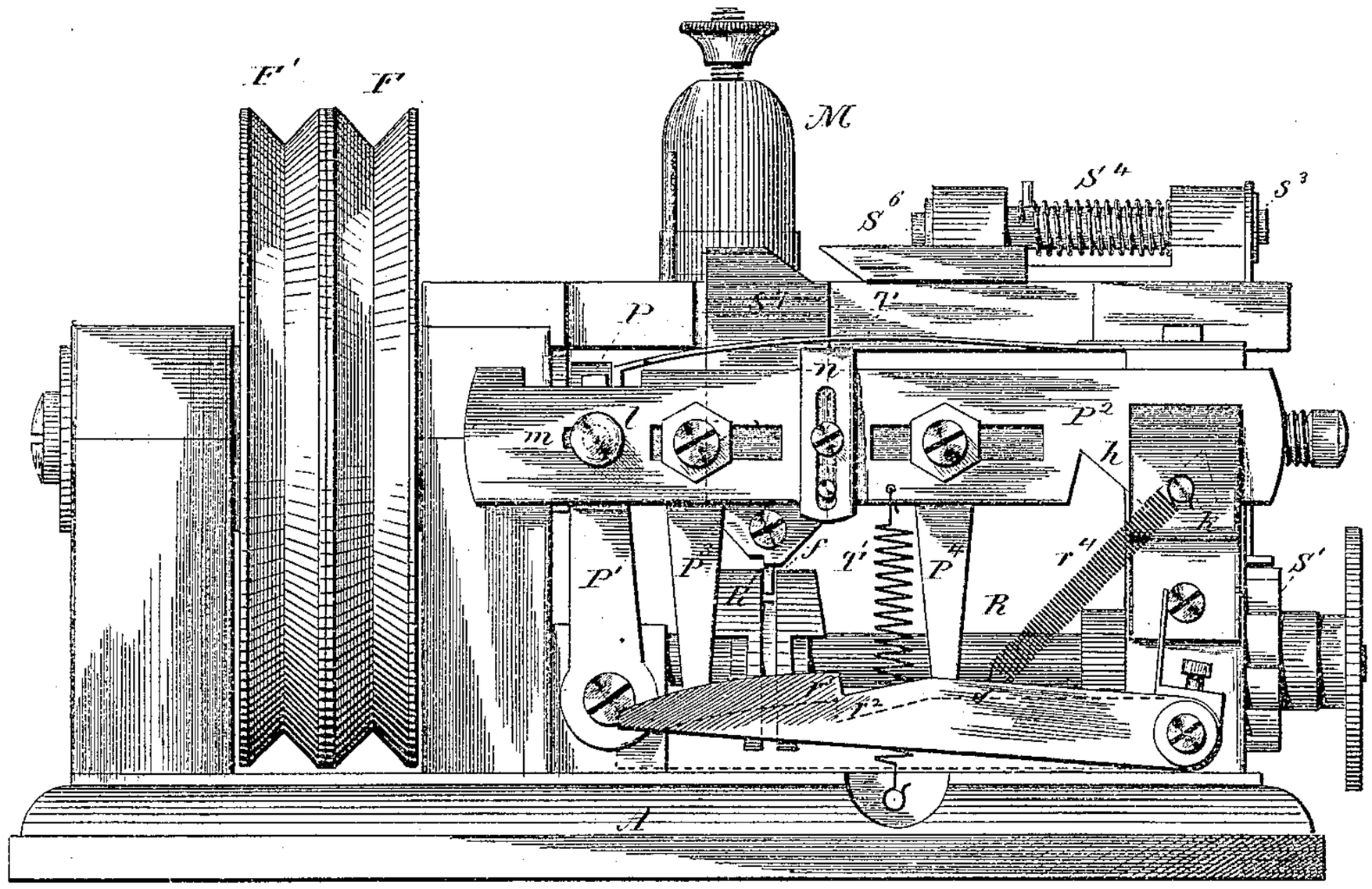

Fig. 4.

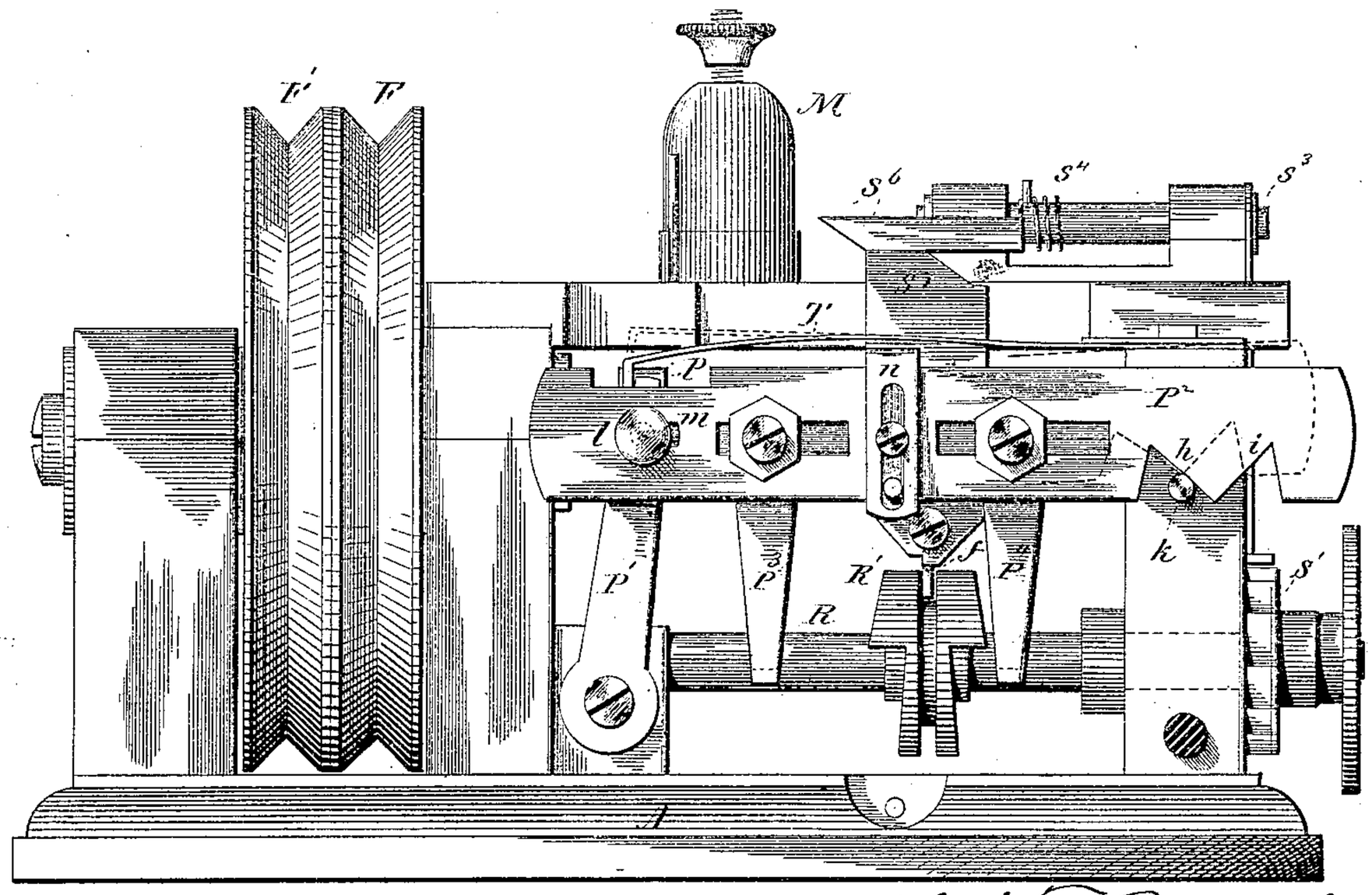

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Fig. 5

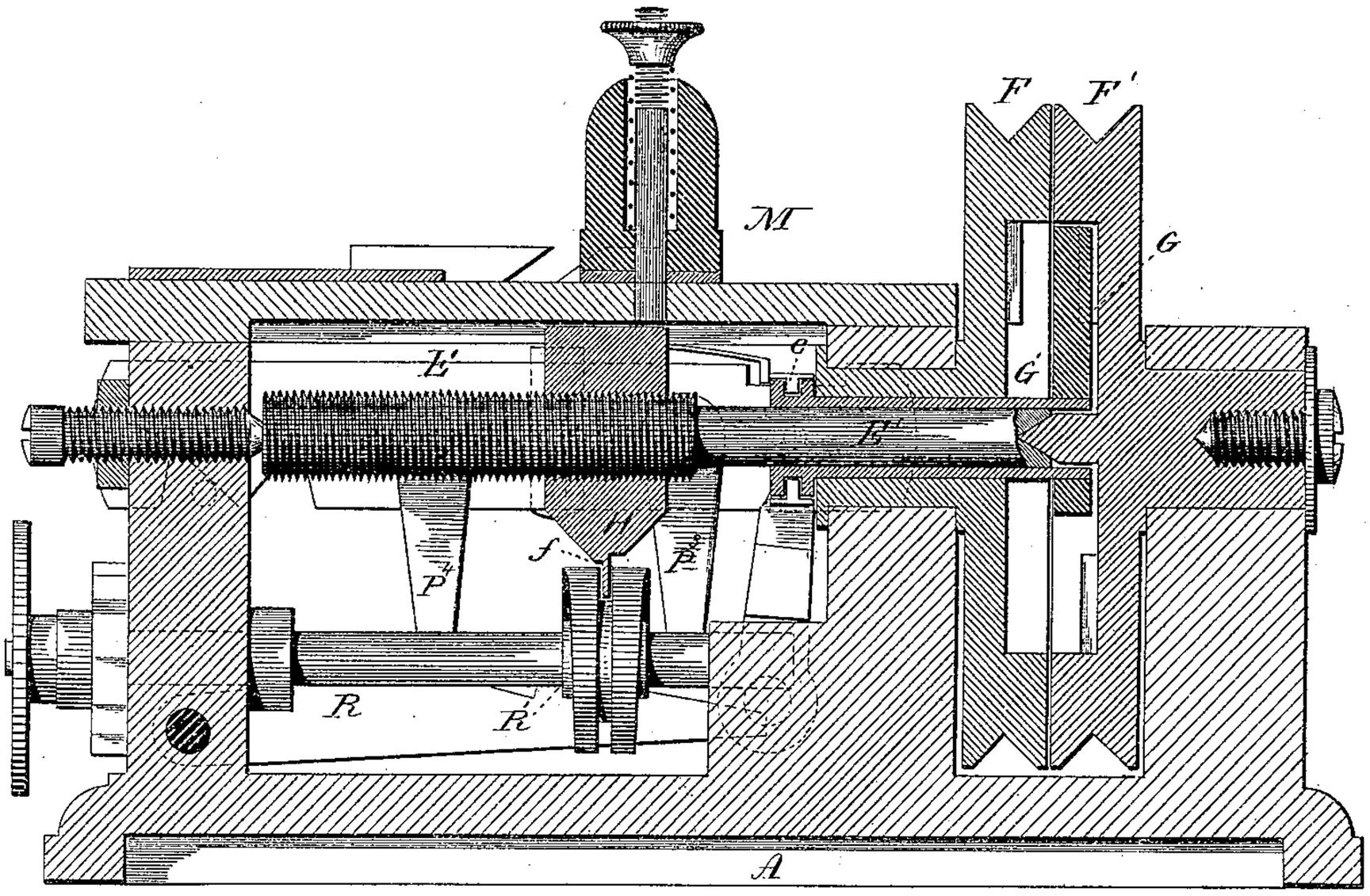
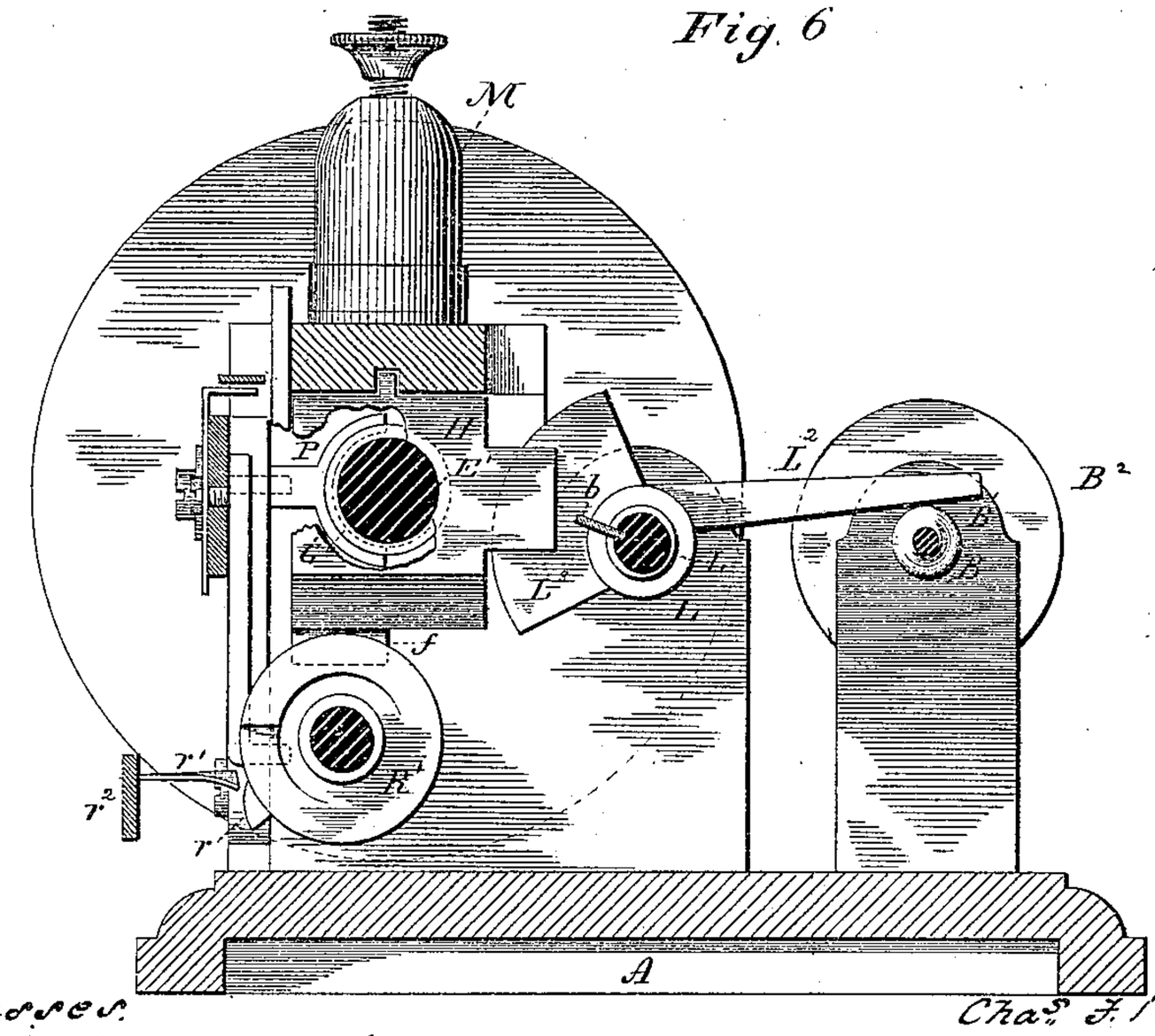


Fig. 6



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(No Model.) C. F. BOSWORTH. 4 Sheets—Sheet 4.

MACHINE FOR WINDING THREAD UPON SPOOLS.

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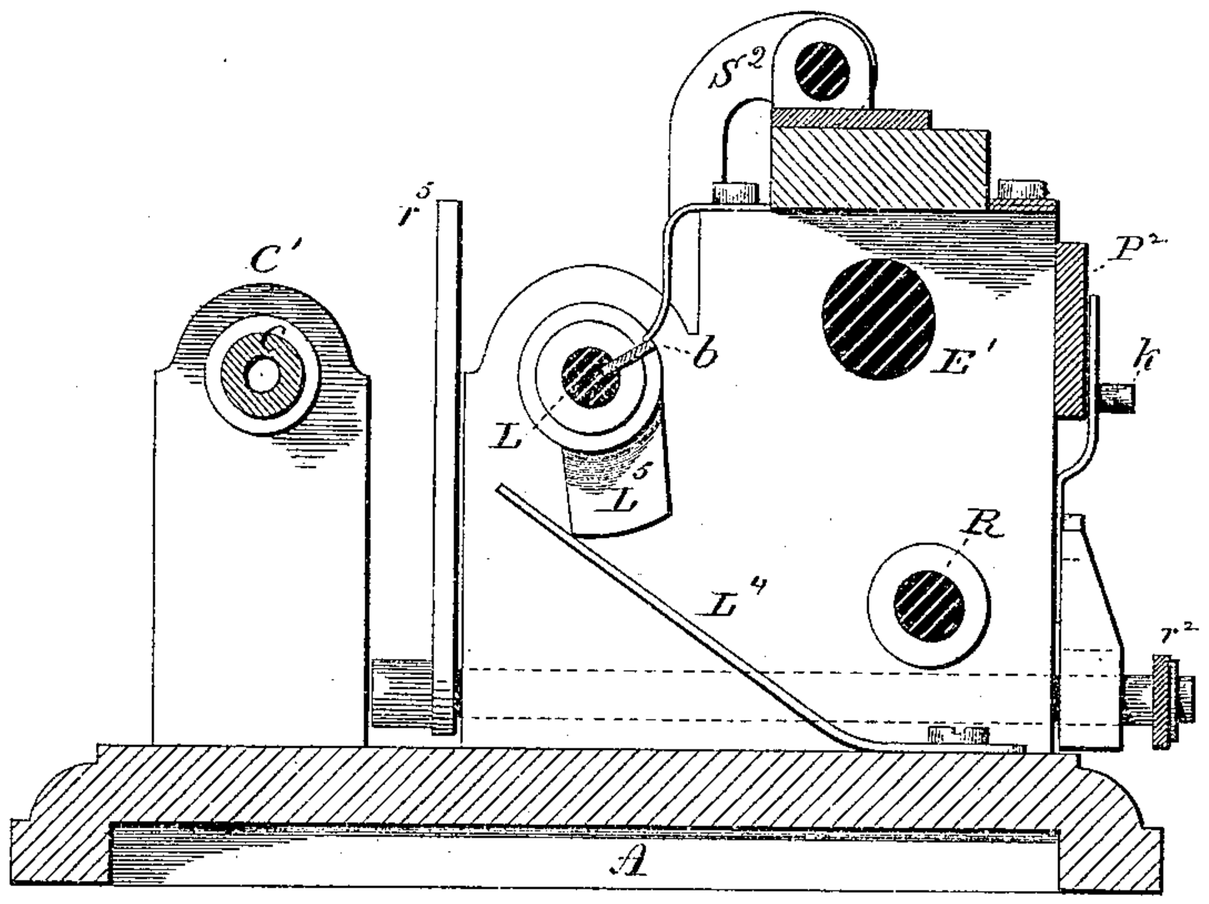
Fig. 7



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UNITED STATES PATENT OFFICE.

CHARLES F. BOSWORTH, OF MILFORD, CONNECTICUT.

MACHINE FOR WINDING THREAD UPON SPOOLS.

SPECIFICATION forming part of Letters Patent No. 270,376, dated January 9, 1883.

Application filed May 1, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. BOSWORTH, of Milford, in the county of New Haven and State of Connecticut, have invented a new Improvement in Machines for Winding Thread upon Spools; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a top or plan view of the machine; Fig. 1ª, the spool; Fig. 2, an end view of the machine; Figs. 3 and 4, rear views of the machine, illustrating different positions of the parts in shifting the clutch on the leading-screw, the shipper-latch being removed from Fig. 4; Fig. 5, a longitudinal section of the machine through the leading-screw; Fig. 6, a transverse section of the machine on line *x x*, indicated in Fig. 1; Fig. 7, a transverse section of the machine on line *z z*, indicated in Fig. 1.

This invention relates to an improvement in machines for winding thread upon spools, commonly called "spooling-machines," the invention being particularly adapted to winding spools or bobbins for sewing-machine shuttles, but applicable to winding other spools, and parts of the invention applicable to other purposes than spooling-machines, the object of the invention being the construction of a simple and automatic machine which will regularly and evenly lay the thread upon the spool, and in a positive and predetermined quantity; and it consists in the construction of the machine and combination of elements, as hereinafter described, and more particularly recited in the claims.

A is the bed-plate on which the mechanism is arranged.

B is the driven mandrel, arranged in suitable bearings, B′, and so as to revolve freely therein; B², the pulley through which revolution is imparted to the mandrel by the application of power thereto through a band running on the pulley in the usual manner of communicating power.

In axial line with the mandrel B is an adjustable spindle, C, arranged in a bearing, C′, and constructed to center one end of the spool D while the other is engaged in the mandrel B, and so that the rotation of the mandrel B will be imparted to the spool D. The spindle C is made adjustable by a spring-pressure, as seen in Fig. 1, broken lines, for the introduction or removal of the spool. As here represented, the spool is constructed, as seen in Fig. 1ª, with a central projection, *a*, at each end to enter a corresponding center in the mandrel and spindle, so as to insure the proper centering of the spool.

E is a leading-screw formed on a shaft, E′, arranged parallel to the axis of the mandrel and spindle B C, and supported in suitable bearings, preferably on centers, as seen in Fig. 5. The leading-screw E moves the guide for carrying the thread, as hereinafter described. For this purpose it is necessary to impart to the leading-screw a revolution in one direction while the guide is traveling from one end of the spool, and to reverse that revolution when the guide is returning. To impart this rotation to the leading-screw I arrange two pulleys, F F′, on the shaft, or so as to revolve concentric with it, and preferably grooved and in the relation to the pulley B² as shown, so that the same band which drives the pulley B² shall drive the two pulleys F F′—that is to say, one run of the belt passes, say, over the top of the pulley F, down around the pulley B², up and over the other pulley, F′—or so that the two runs of the belt come upon the same side of the two pulleys F and F′, as indicated in broken lines, Fig. 2. Thus one pulley, F, will be driven in one direction, as indicated by the arrow, Fig. 1, and the other pulley, F′, in the opposite direction, as also indicated by an arrow. On the shaft between these two pulleys is a clutch-disk, G, as seen in Fig. 5. It is attached or made a part of a sleeve, G′, on the shaft E′, and so as to be moved within the recess in the two pulleys to engage either one or the other of the pulleys, the face of the disk being constructed with recesses to engage corresponding projections on the respective pulleys, so as to engage one or the other, according to which it is brought into connection with. It may be a disk or any suitable clutching mechanism, whereby either of the pulleys may be engaged with the sleeve G′. The sleeve G′ is splined to the shaft E′ in the usual manner for splining such clutch-sleeves, so that the shaft will revolve with the sleeve. Hence the revolution of the

shaft E′ will be in one direction when engaged with one pulley and in the opposite direction when engaged with the other.

On the leading-screw is a nut, H, which is guided so as to be moved by the screw in one direction when the screw revolves one way, and in the opposite direction when the revolution of the screw is reversed.

Between the leading-screw and the spool is a shaft, L, on which is a sleeve, L′, arranged to move longitudinally thereon, and prevented from rotation by a spline, *b*, or otherwise. This sleeve L′ carries an arm, L^2, which extends forward over the spool, as seen in Figs. 1, 2, and 6, and on the reverse side the sleeve is constructed with a segment-shaped arm, L^3, which extends into a slot in the nut H, as seen in Figs. 1 and 6, and so that as the nut traverses the leading-screw it moves the arm L^2 accordingly.

The thread to be wound is brought to the machine from the spool through a tension device, M, thence led through an eye, *d*, in the arm L^2 to the spool, and made fast to the spool. The revolution of the spool, as before described, will draw the thread through the arm onto the spool. The thread of the leading-screw corresponds to the thread to be wound upon the spool—that is to say, so that the revolution of the leading-screw will cause the arm L^2 to travel over the surface of the spool as fast as the thread is laid upon the spool. The arm rides upon the thread, as it lays it upon the spool, with a spring-pressure. This spring-pressure is produced by means of a spring, L^4, bearing upon the arm L^5 on the shaft L, as seen in Fig. 7, and so that while it operates the arm upon the thread being laid it will permit the arm to rise after one layer has been wound upon the spool to wind the second layer, and so on until the spool is full or the requisite quantity wound thereon.

To operate the clutch to reverse the direction of the leading-screw at the termination of each layer of thread, a fork, P, (see Fig. 6,) is arranged in a groove, *e*, in the sleeve G′, the said fork pivoted in a lever, P′, (see Figs. 3 and 4,) and the said lever in connection with a horizontal slide-bar, P^2, from which adjustable arms P^3 P^4 extend downward.

Below the leading-screw is a shaft, R, on which a double side cam, R′, is arranged free for longitudinal movement. This cam is grooved on its periphery, and from the nut a flange or lug, *f*, extends into the groove, as seen in Figs. 4, 5, and 6, so that this cam traverses its shaft with the nut and between the two stops P^3 P^4, so that as it strikes the said stops it will move the bar P^2 accordingly—that is, moving toward the stop P^3 it will move the bar in that direction, and toward the stop P^4 will move the bar in the opposite direction—the stops being set relatively to the cam R′, so that as the thread-guide arm L^2 approaches one end of the spool—say toward the arm P^3—it will force that arm from the position seen in Fig. 4 to the position seen in Fig. 3, which will correspondingly move the bar P^2, and with it the clutch, which will throw the clutch from the pulley F into the pulley F′ and reverse the leading-screw, which will cause the nut to move in the opposite direction and carry with it the cam R′ until it strikes the stop P^4, when it will move the bar P^2 in the opposite direction, and correspondingly move the clutch from the pulley F′ into engagement with the pulley F, and so continuing will reverse the leading-screw at each end of the spool.

In order to give to the clutch a movement to throw it into one pulley after it has been moved from the other, I construct the bar P^2 with a double incline, *h i*, which works over a stud, *k*, on the frame of the machine. These inclines are at one end, the other end hung to the lever P′, so as to permit the vibration of the lever as it passes over the said stud. At the pivot *h*, between the lever P′ and the bar P^2, a slight over motion is permitted by a slot, *m*, in the bar. A spring, T, is arranged with its nose turned down to form a shoulder, against which the lever P′ will stand in one direction, as seen in Fig. 4, and while the bar is at the extreme position to the right. When the bar is moved, as before described, first to the left, the incline *h* rides upon the stud *k*, bringing the angle of the inclines upon the stud, as seen in broken lines, before the bar will have come to a bearing upon the lever P′. So soon as the angle of the two inclines has passed the center of the stud a spring, T, acts upon the bar, tending to draw it downward, and cause the other incline, *i*, to ride down the stud and throw the bar to the extreme left, as seen in Fig. 3. As the bar rises over the stud *k* a trip, *n*, on the bar P^2 strikes the spring T and raises it from its engagement with the lever P′, so as to permit the action of the spring on the bar P^2 to force the lever P′ over to the left, as seen in Fig. 3, and as the bar drops on the other incline the trip *n* falls and permits the nose of the spring T to drop upon the opposite side of the lever P′, as seen in Fig. 3. The throw of the bar P^2, by the action of the spring T and the inclines upon the stud *k*, serves to throw the clutch from one pulley to the other, according to the direction in which the bar P^2 is moved.

As here represented, and as usually constructed, the heads of the spools are inclined outward, so that the layers gradually increase in extent from the body of the spool outward. To adapt the machine for these gradually-increasing layers, the two sides of the cam R^2 present a correspondingly-inclined surface, as seen in Figs. 4 and 5, and these surfaces run between the two stops P^3 P^4, as seen in Figs. 3 and 4.

To the shaft R, on which the cam R′ is fixed, an intermittent rotation is imparted by means of a pawl, S, working into a ratchet, S′, on the shaft R, as seen in Fig. 2. This pawl is hung to one end of a lever, S^2, the other end of the said lever fixed to a rock-shaft, S^3, to which a spring, S^4, is applied, the tendency of

which is to draw the pawl rearward and hold it in the position seen in Fig. 2.

From the rock-shaft an arm, S^5, extends to the rear, where it is provided with a cross-piece, S^6, which stands in the path of a projection, S^7, extending up from the nut, as seen in Fig. 3, so that as the nut travels in one direction an incline on the upper side of the projection S^5 passes beneath the cross-piece S^6, as seen in Fig. 4, raising that cross-piece, and through its connection with the shaft S^3 turns that shaft, so as to impart to the pawl S an advance movement, as indicated in broken lines, Fig. 2. This advance of the pawl correspondingly turns the ratchet S′ and the shaft R, and with it the cam R′. Starting therefore with the stops P^3 P^4 adjusted so that the broader or projecting part of the cam will strike the stops, respectively, at each end when the thread-guide has traversed the length of the barrel of the spool, and thereby move the shifting-bar P^2 to throw the clutch from one pulley to the other as the work continues, the cam will be turned, bringing narrower parts or less projections into line with the stops P^3 P^4, so that the shifting of the bar will occur later, until the spool is completely filled. The pitch of the cam R usually corresponds to the incline of the two heads of the spool. As here represented, the turning of the cam is produced only at one extreme, and this is all that is practically required, yet it may be done at both ends by causing the projection S^7 to operate upon the rock-shaft at both extremes of its movement.

The teeth on the ratchet should correspond to half the number of layers of thread, so that when the spool is completely filled or the required quantity thereon the cam will have made a complete revolution and come into position to begin the winding of the next spool. If, however, the turning of the cam be made at both extremes, then the teeth on the ratchet should correspond to the number of layers of thread. When the required quantity of thread has been wound upon the spool a projection or shoulder, r, on the cam (see Fig. 6) will strike an arm, r', which projects from the latch r^2 and depresses that latch, as seen in broken lines, Fig. 3. The shipper-lever W (see Fig. 1) is caught by the shoulder r^3 in the usual manner for holding belt-shippers. A spring, r^4, holds the latch up and permits it to yield for the shipper to be thrown into engagement with it. So soon, then, as the requisite number of layers has been wound upon the spool the shipper is released to disengage the power which drives the machine, then the spool is removed, another introduced, the power again applied, and so the work goes on.

It will be understood that the shipper W is the common shipper-lever by which the driving-belt is thrown from the tight or loose pulley, or vice versa, position in broken lines indicating the disengaged or loose pulley position.

If at any time it is desired to stop the machine, the latch is disengaged from the shipper W, by depressing it either directly or through a hand-lever, r^5, (see Figs. 2 and 7,) which is connected to the latch r^2 by a rock-shaft, as seen in Figs. 2 and 7.

It will be understood that parts of the machine are made adjustable to adapt it to different sizes or lengths of spools or quantity of thread.

If a great quantity of thread is to be wound upon the spool, so that numerous layers will be required, the ratchet S′ should be made with fine teeth, and the movement of the pawl which actuates it made so as to turn that wheel according to the number of layers, and so that a full revolution of the cam will be made in the winding of the spool, so that when one spool is completed the machine may be in position to begin the winding of the next.

In cases of spools in which the inner sides of the head are at right angles to the axis of the spool, so that each layer is of the same extent, then the cam will be made with its two faces in parallel planes and rotate so as to bring the projection or shoulder r into engagement with the shipper mechanism, when the winding is completed.

While I prefer the arrangement of the two pulleys F F′ to be operated by the same band which drives the mandrel, it will be understood by those skilled in the art that the two pulleys F F′ may be driven each by an independent band to impart opposite rotation to the said two pulleys, and the mandrel driven by its own independent belt.

Instead of reversing the leading-screw, it may be made a double-threaded screw—that is, one thread to the right and the other to the left—with a double nut applied thereto, in connection with the thread-guide, so that at one end one part of the nut will engage one thread and travel to the opposite end, where that part of the nut will be thrown out and the other part thrown in to return the guide. This is a well-known mechanical equivalent for the single-threaded screw, arranged for reversing the revolution.

The finger may be attached directly to the nut which traverses on the screw instead of upon an independent shaft, as shown.

I claim—

1. In a spooling-machine, the combination, with the mandrel to hold and revolve the spool, a pulley on said mandrel, a leading-screw parallel with said mandrel, and a nut working on said leading-screw, of two pulleys loose on the leading-screw shaft, arranged relatively to the pulley on the mandrel, so that the two runs of the band which drives the mandrel will pass respectively over the same side of the two pulleys and cause the said two pulleys to revolve in opposite directions, a clutch between the leading-screw shaft and said two pulleys to engage either one or the other with the screw-shaft, and a guide connected with said nut to lead the thread to the spool to be wound, substantially as described.

2. In a spooling-machine, the combination, with the mandrel to hold and revolve the spool, a pulley on said mandrel, a leading-screw parallel with said mandrel, and a nut working on said leading-screw, of two pulleys loose on the leading-screw shaft, arranged relatively to the pulley on the mandrel, so that the two runs of the band which drives the mandrel will pass respectively over the same side of the two pulleys and cause the said two pulleys to revolve in opposite directions, a clutch between the leading-screw shaft and said two pulleys to engage either one or the other with the screw-shaft, a guide connected with said nut to lead the thread to the spool, and mechanism, substantially such as described, between said nut and clutch, whereby the clutch is thrown from one pulley to the other at each extreme of winding, substantially as specified.

3. In a spooling-machine, the combination, with the mandrel to hold and revolve the spool, a pulley on said mandrel, a leading-screw parallel with said mandrel, and a nut working on said leading-screw, of two pulleys loose on the leading-screw shaft, arranged relatively to the pulley on the mandrel, so that the two runs of the band which drives the mandrel will pass respectively over the same side of the two pulleys and cause the said two pulleys to revolve in opposite directions, a clutch between the leading-screw shaft and said two pulleys to engage either one or the other with the screw-shaft, a guide to lay the thread upon the spool, the sliding bar P^2, provided with stops P^3 P^4, a shaft arranged parallel to the leading-screw, a cam on said shaft, and mechanism, substantially such as described, for imparting intermittent rotation to said cam, substantially as described.

4. In a spooling-machine, the combination, with the mandrel to hold and revolve the spool, a pulley on said mandrel, a leading-screw parallel with said mandrel, and a nut working on said leading-screw, of two pulleys loose on the leading-screw shaft, arranged relatively to the pulley on the mandrel, so that the two runs of the band which drives the mandrel will pass respectively over the same side of the two pulleys and cause the said two pulleys to revolve in opposite directions, a clutch between the leading-screw shaft and said two pulleys to engage either one or the other with the screw-shaft, a guide to lay the thread upon the spool, the sliding bar P^2, and provided with stops P^3 P^4, a shaft arranged parallel to the leading-screw, a cam on said shaft, said cam constructed with correspondingly-inclined faces, and mechanism, substantially such as described, for imparting intermittent rotation to said cam, substantially as described.

5. In a spooling-machine, the combination, with the mandrel to hold and revolve the spool, a pulley on said mandrel, a leading-screw parallel with said mandrel, and a nut working on said screw, of two pulleys loose on the leading-screw shaft, arranged relatively to the pulley on the mandrel, so that the two runs of the band which drives the mandrel will pass respectively over the same side of the two pulleys and cause the said two pulleys to revolve in opposite directions, a clutch between the leading-screw shaft and said two pulleys to engage either one or the other with the screw-shaft, a guide connected with said nut to lead the thread to the spool, a clutch-lever, P', sliding bar P^2, carrying the stops P^3 P^4, and constructed with inclines *h i*, the spring-stop T, and the cam R', working between said stops P^3 P^4 and the nut on the leading-screw, all substantially as described.

6. In a spooling-machine, the combination, with the mandrel to hold and revolve the spool, a pulley on said mandrel, a leading-screw parallel with said mandrel, and a nut working on said screw, of two pulleys loose on the leading-screw shaft, arranged relatively to the pulley on the mandrel, so that the two runs of the band which drives the mandrel will pass respectively over the same side of the two pulleys and cause the said two pulleys to revolve in opposite directions, a clutch between the leading-screw shaft and said two pulleys to engage either one or the other with the screw-shaft, a guide connected with said nut to lead the thread to the spool, the clutch-lever P', sliding bar P^2, carrying the stops P^3 P^4, the cam R', the shaft R, the ratchet S', the pawl S, with mechanism, substantially such as described, between said pawl S and the nut on the leading-screw, substantially as and for the purpose described.

7. In a spooling-machine, the combination, with the mandrel to hold and revolve the spool, a pulley on said mandrel, a leading-screw parallel with said mandrel, and a nut working on said screw, of mechanism, substantially such as described, to impart revolution to the said screw alternately in opposite directions, a guide connected with said nut to lay the thread upon the spool, the sliding bar P^2, provided with stops P^3 P^4, a shaft arranged parallel with the leading-screw, a cam on said shaft, and mechanism, substantially such as described, for imparting intermittent rotation to the said cam, substantially as described.

8. In a spooling-machine, the combination, with the mandrel to hold and revolve the spool, a leading-screw parallel with said mandrel, and a nut working on said screw, of mechanism, substantially such as described, to impart revolution to the said screw in opposite directions, a guide connected with said nut to lay the thread upon the spool, the sliding bar P^2, provided with stops P^3 P^4, a shaft parallel to the leading-screw, and a cam on said shaft, said cam constructed with correspondingly-inclined faces, substantially as described.

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