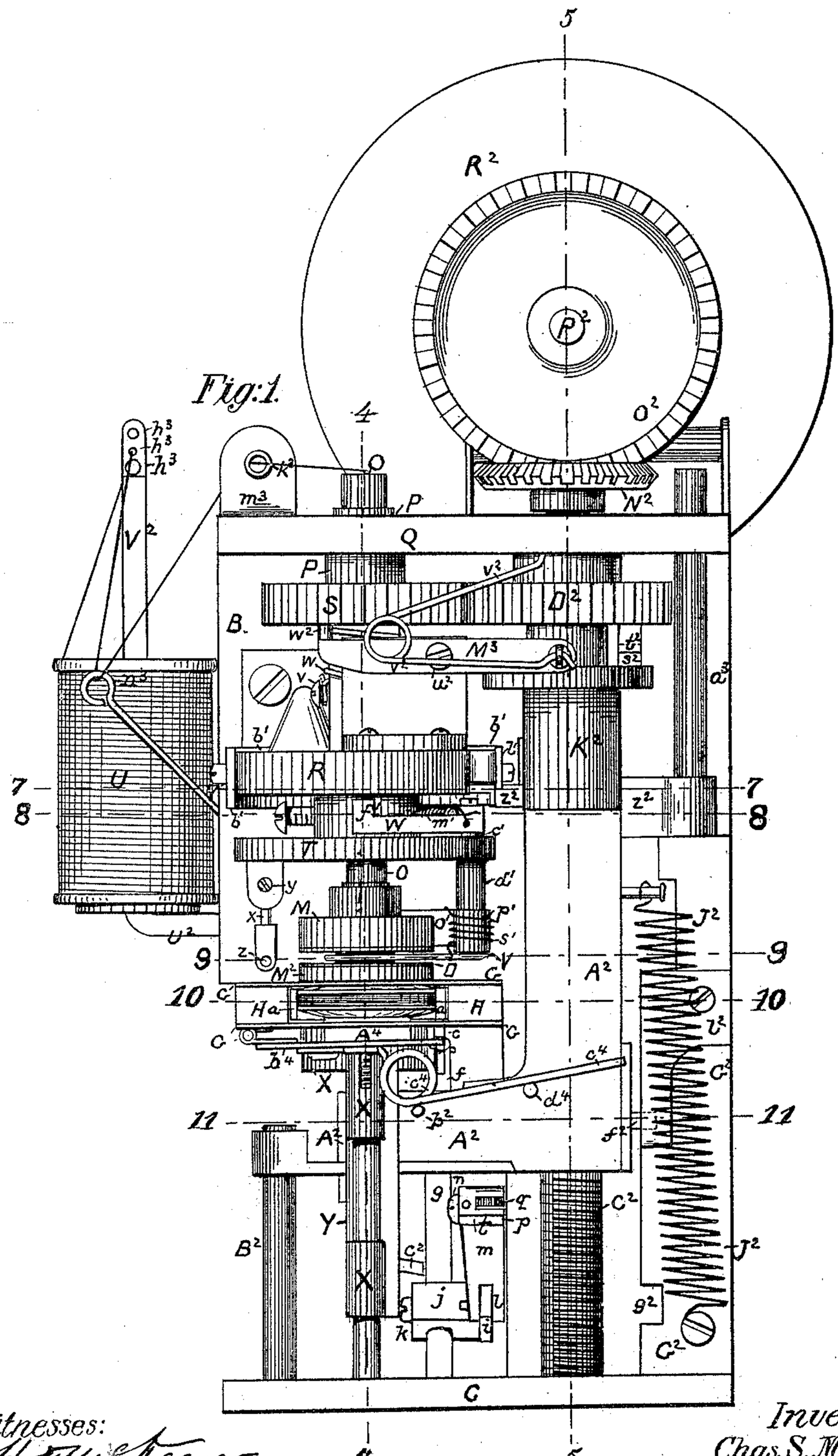
(Model.) 8 Sheets—Sheet 1.

C. S. MARSHALL.

MACHINE FOR WINDING BOBBINS.

No. 491,434. Patented Feb. 7, 1893.

Fig: 1.



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(Model.)

8 Sheets—Sheet 2.

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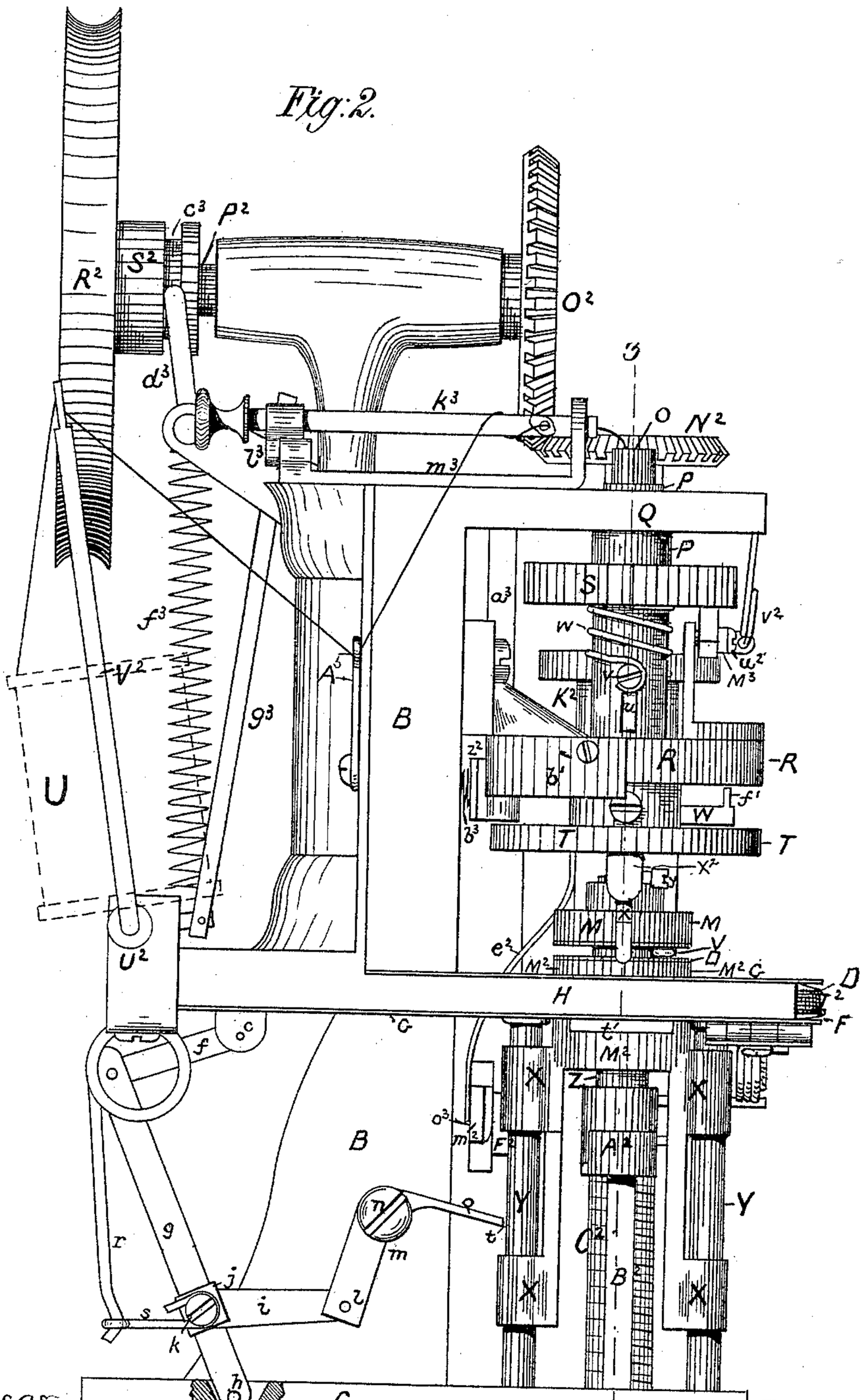
Fig: 2.



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8 Sheets—Sheet 3.

C. S. MARSHALL.

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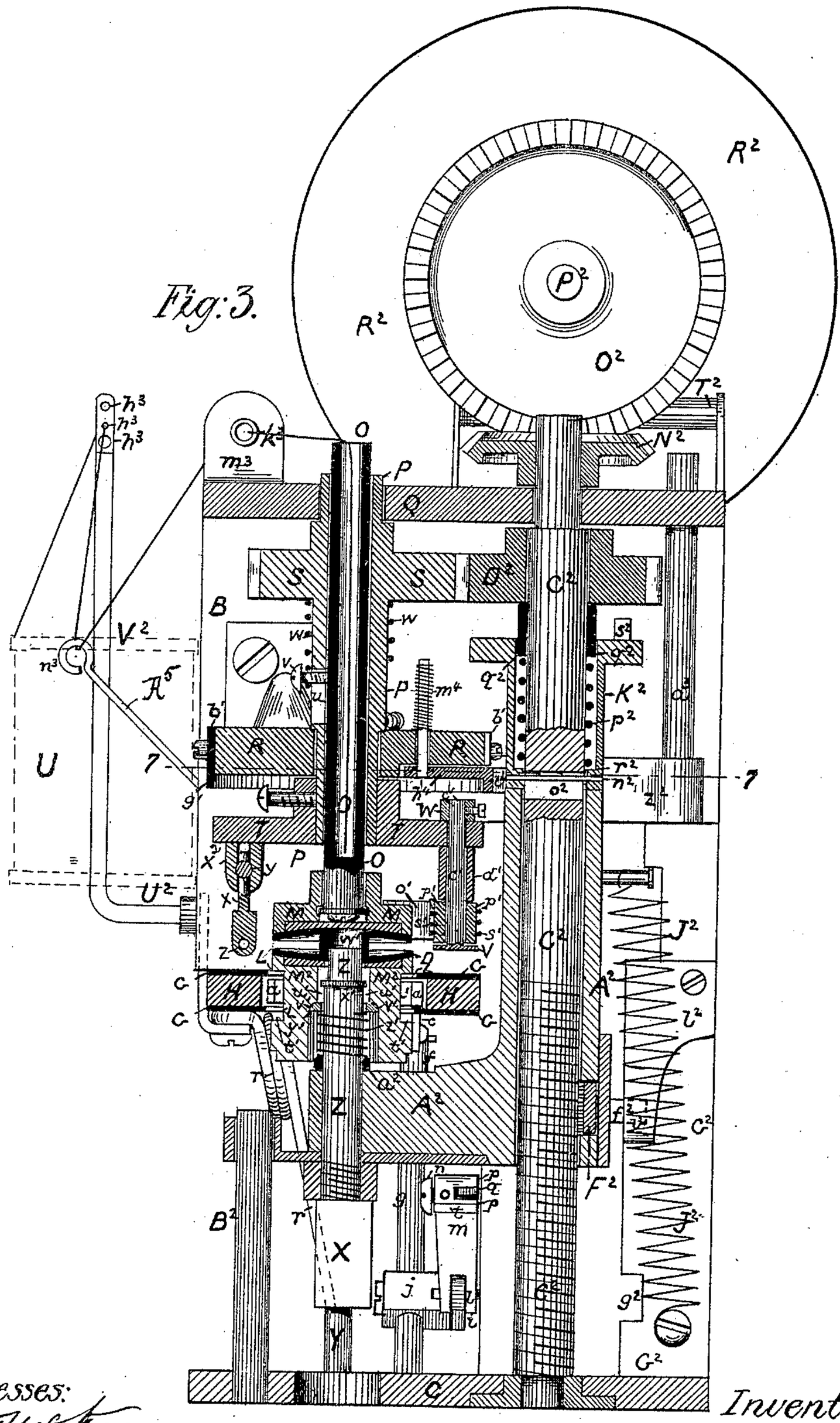
Fig: 3.



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8 Sheets—Sheet 4.

C. S. MARSHALL.

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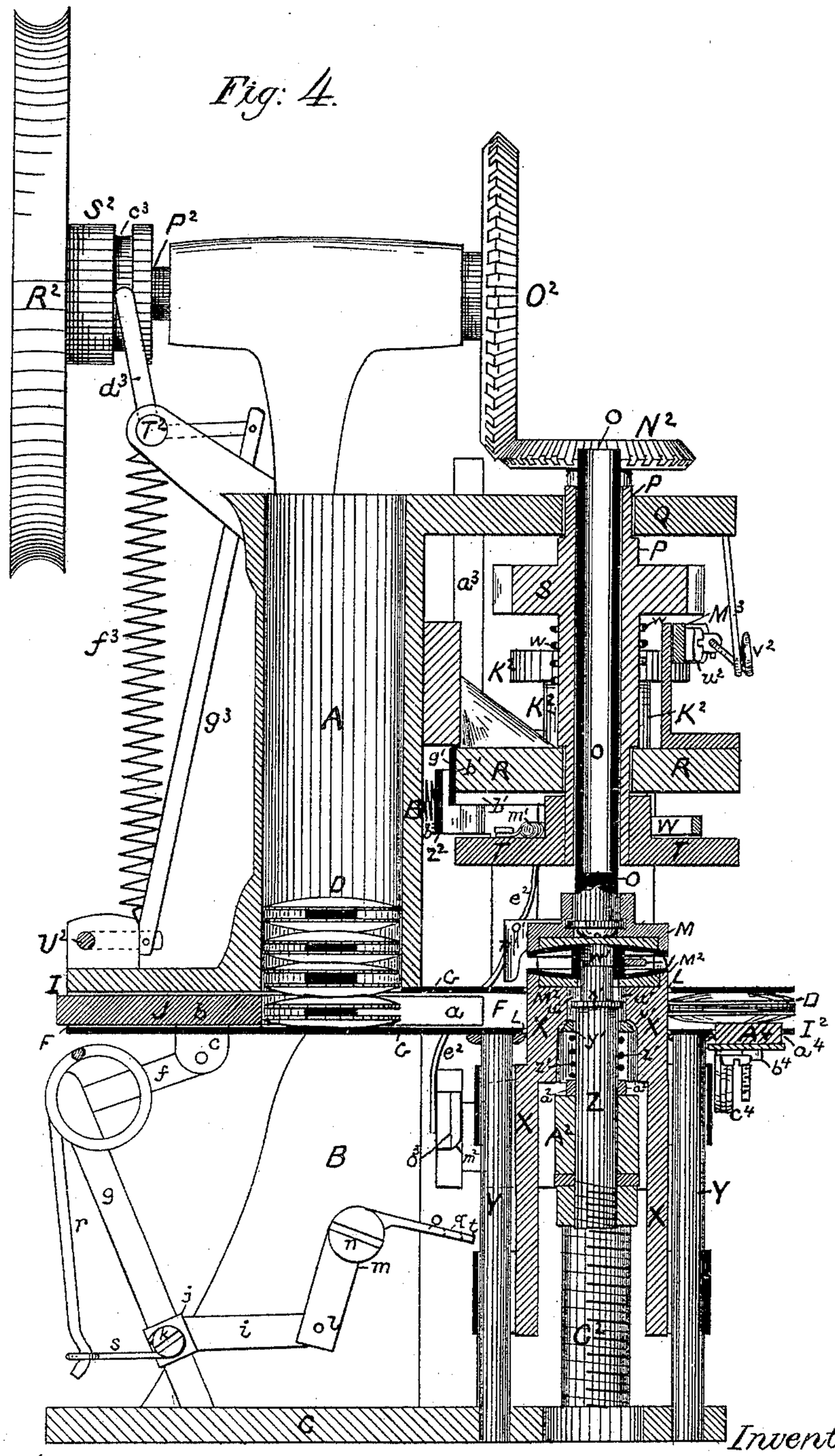
No. 491,434. Patented Feb. 7, 1893.

Fig. 4.



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8 Sheets—Sheet 5.

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MACHINE FOR WINDING BOBBINS.

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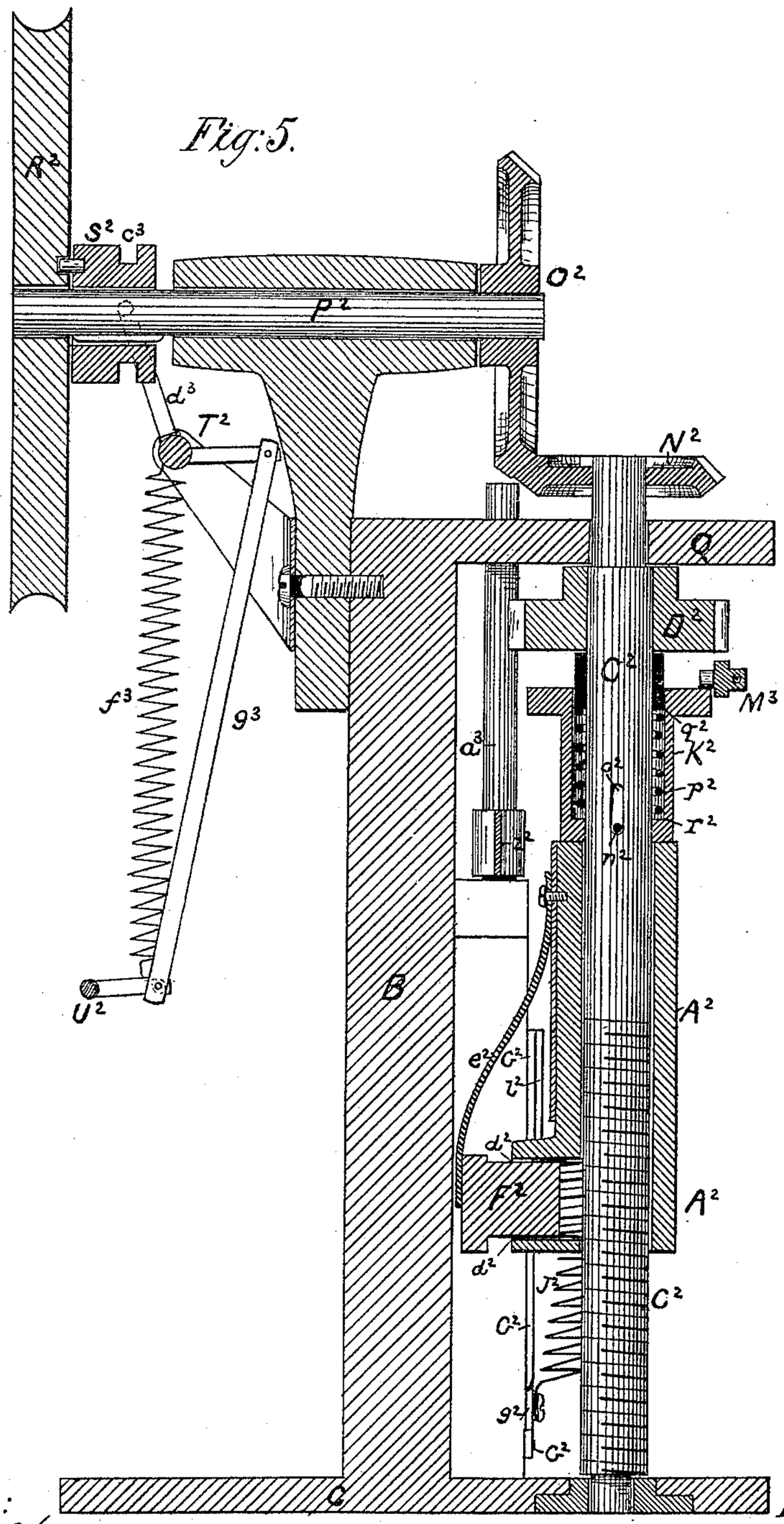
Fig: 5.



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(Model.) 8 Sheets—Sheet 6.

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MACHINE FOR WINDING BOBBINS.

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Fig: 7.

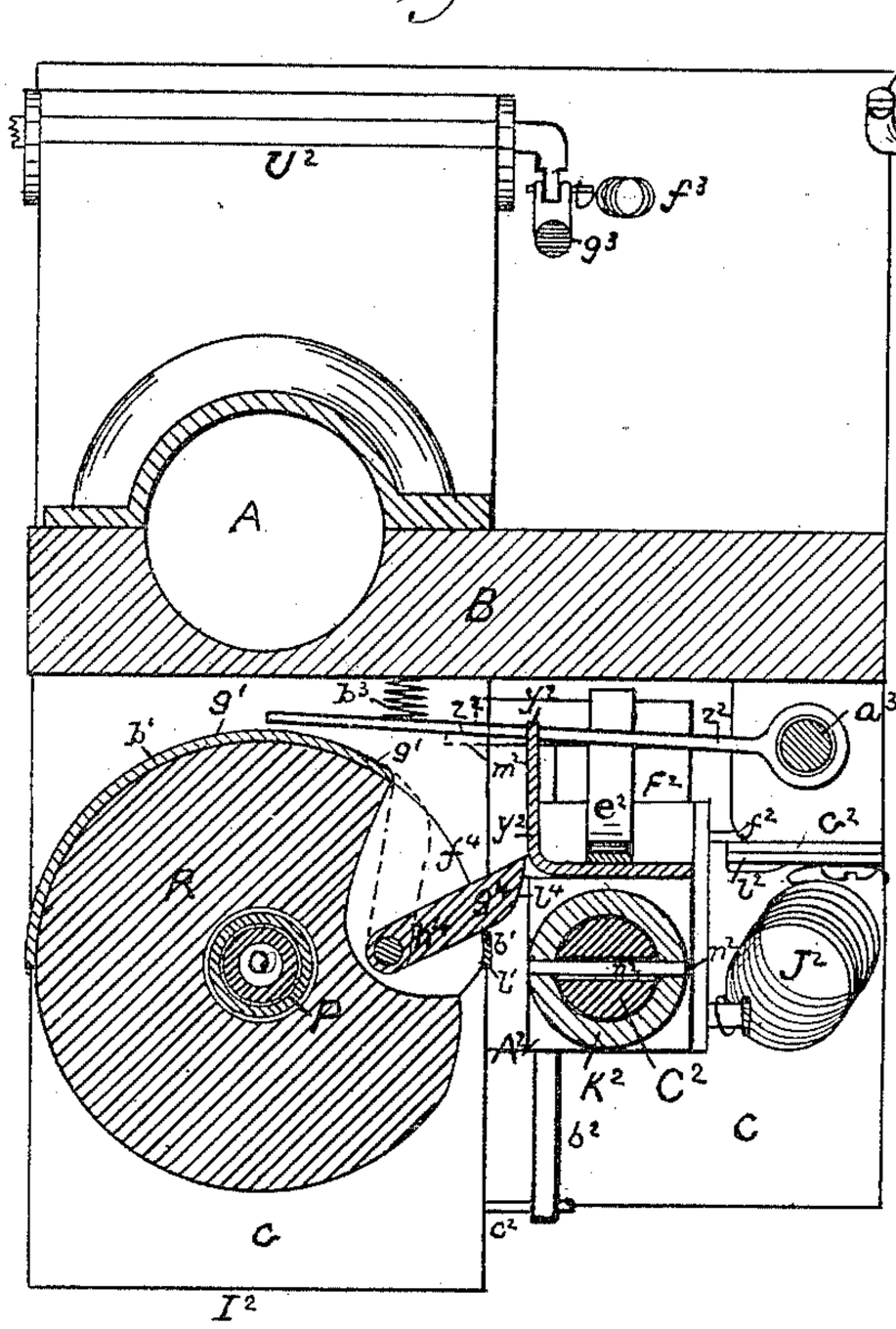


Fig: 6.

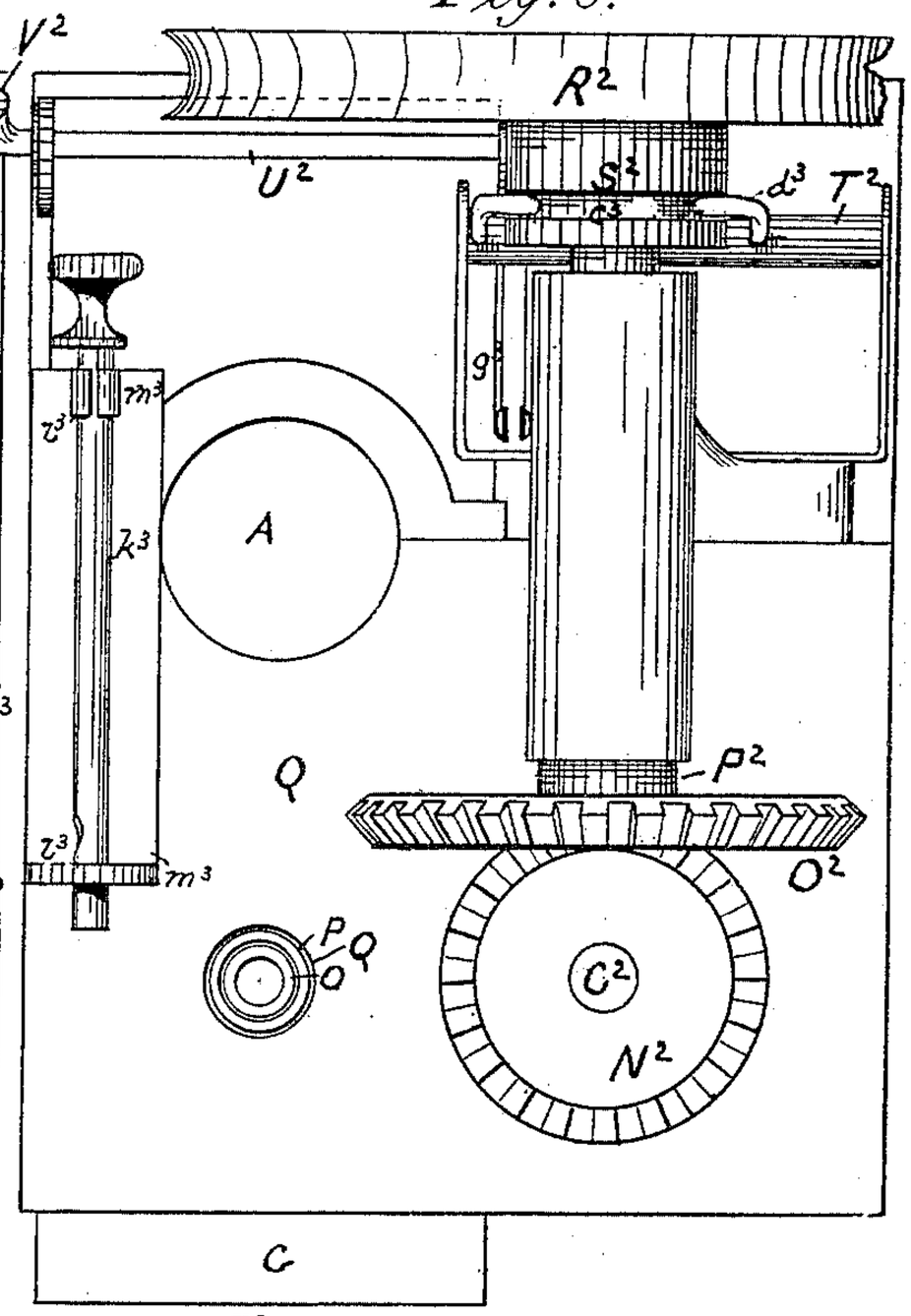


Fig: 8.

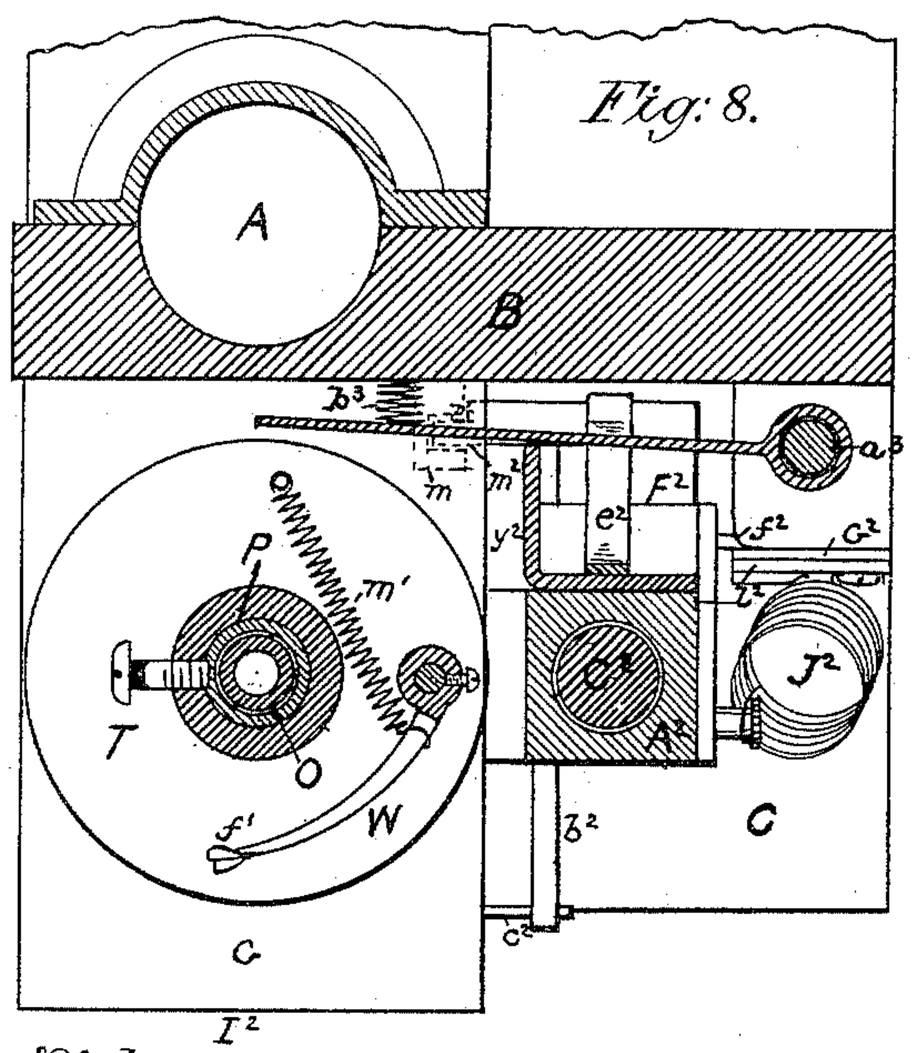
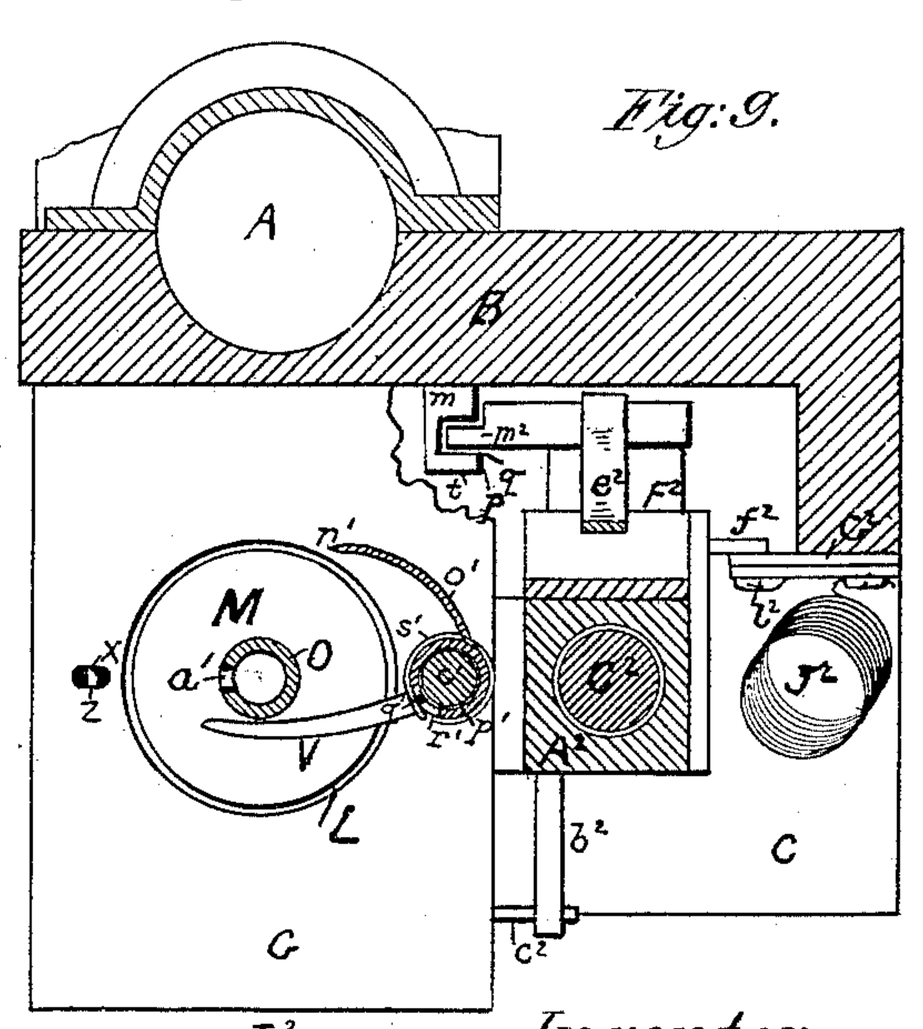


Fig: 9.



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C. S. MARSHALL.

MACHINE FOR WINDING BOBBINS.

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Fig. 10.

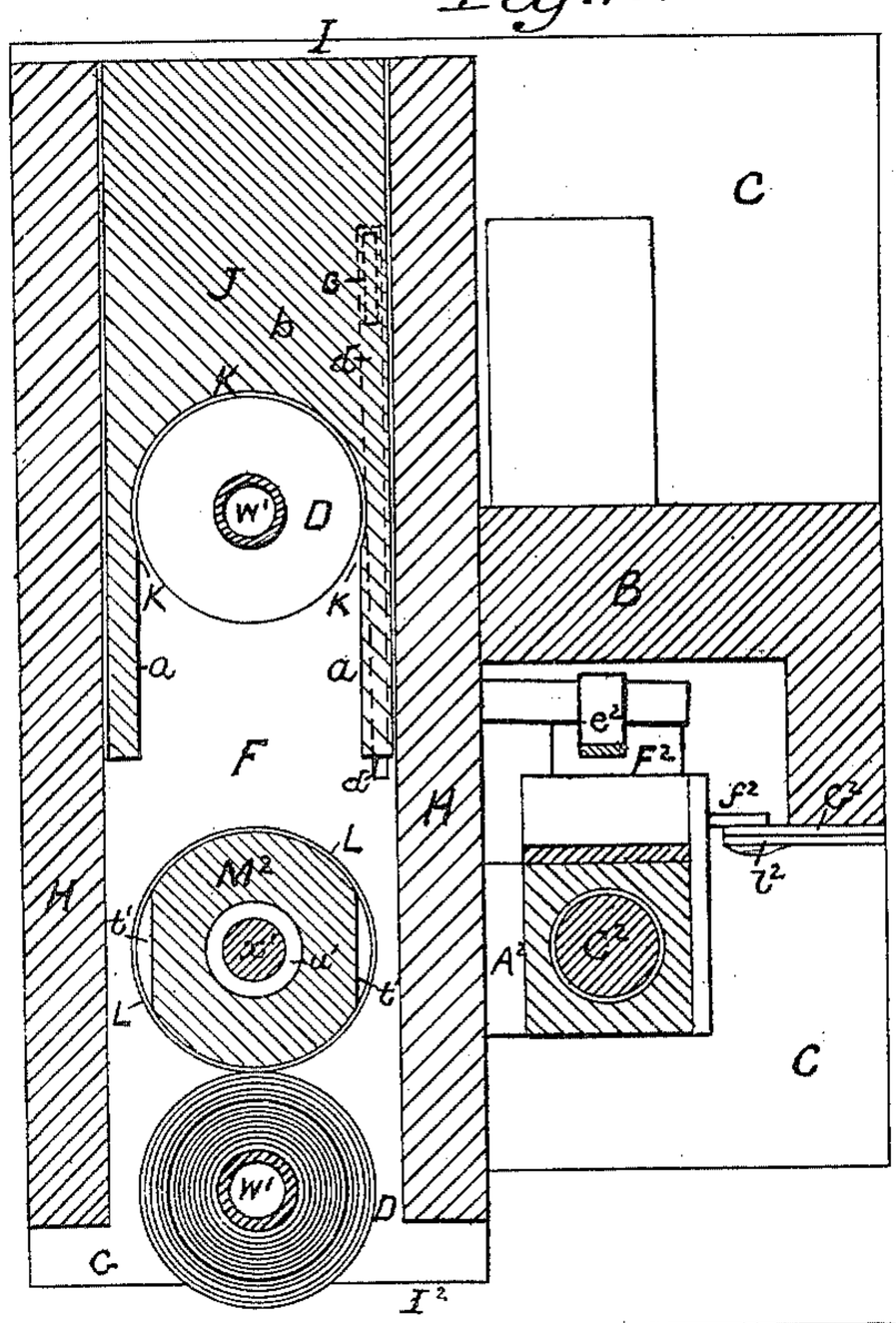
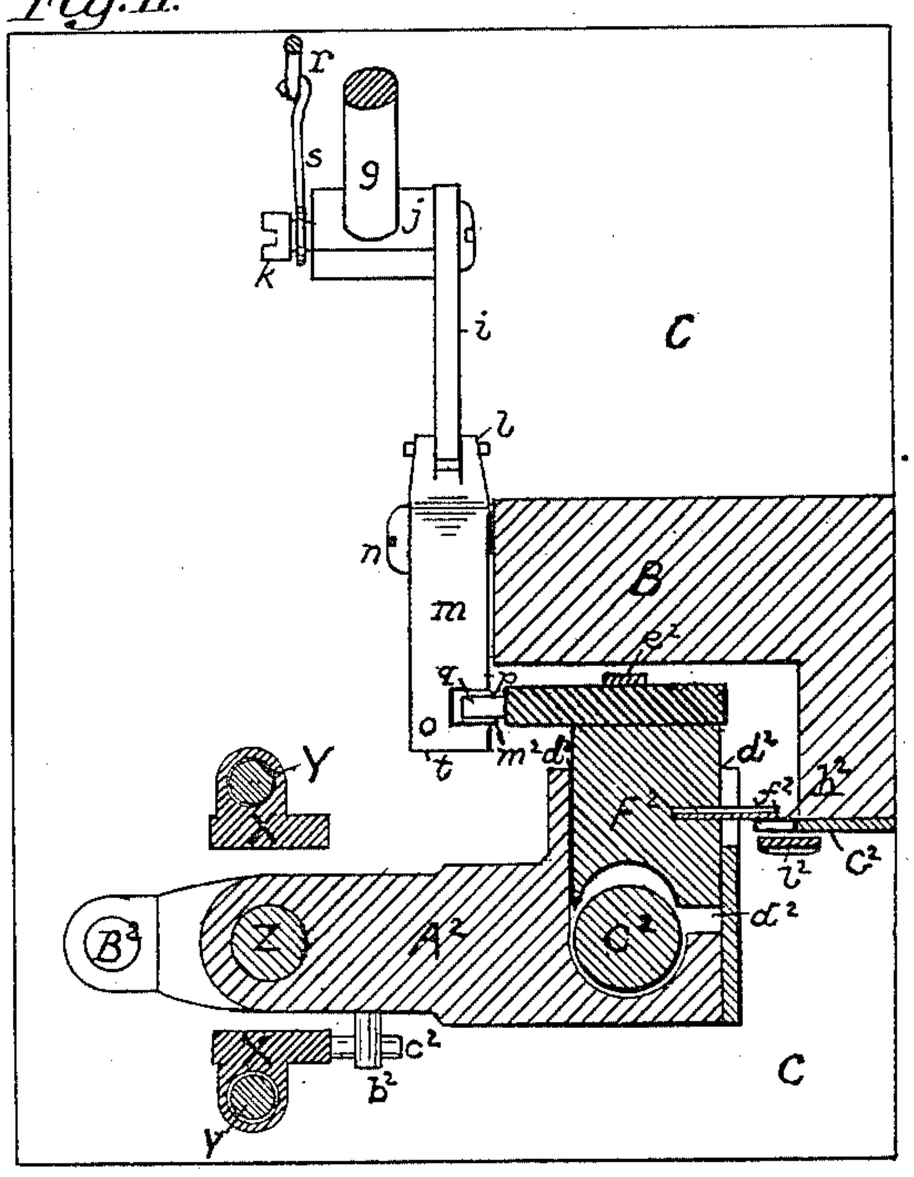


Fig. 11.



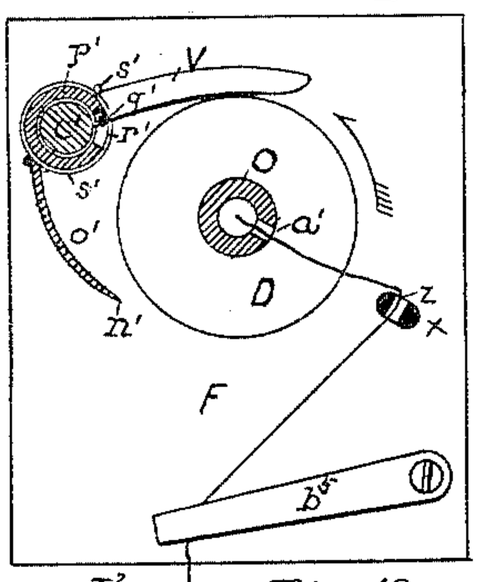


Fig. 12.

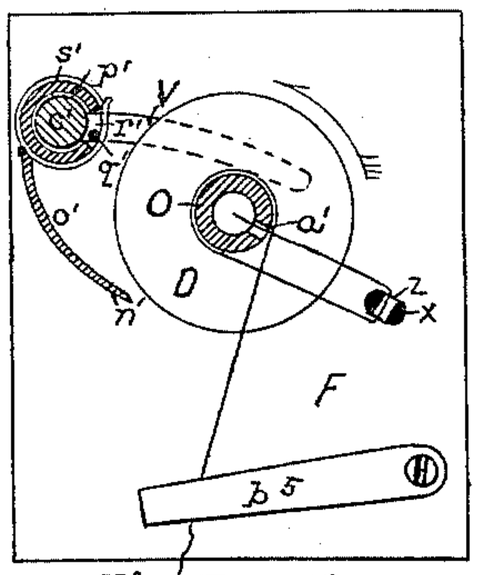


Fig. 13.

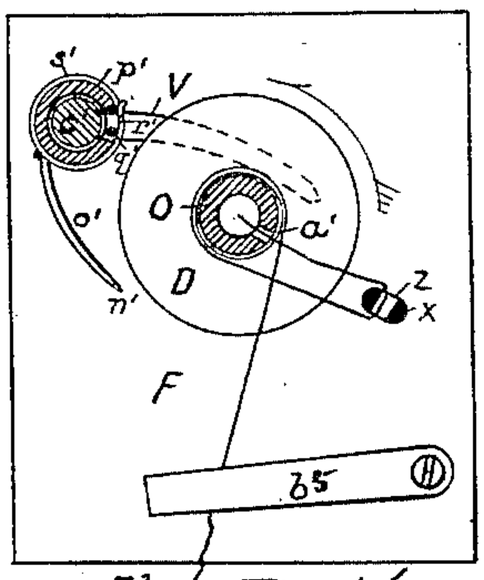
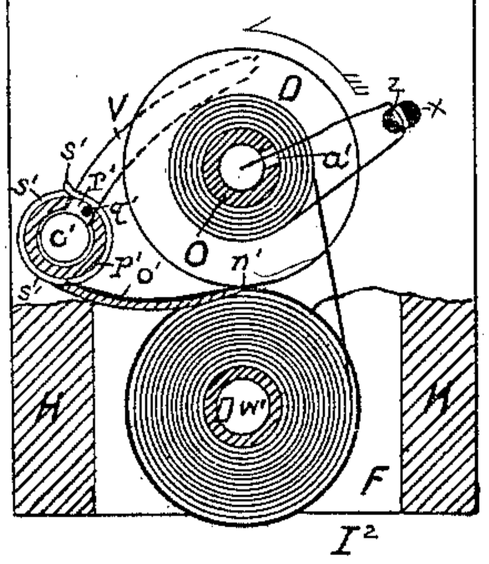


Fig. 14.

Fig. 15.



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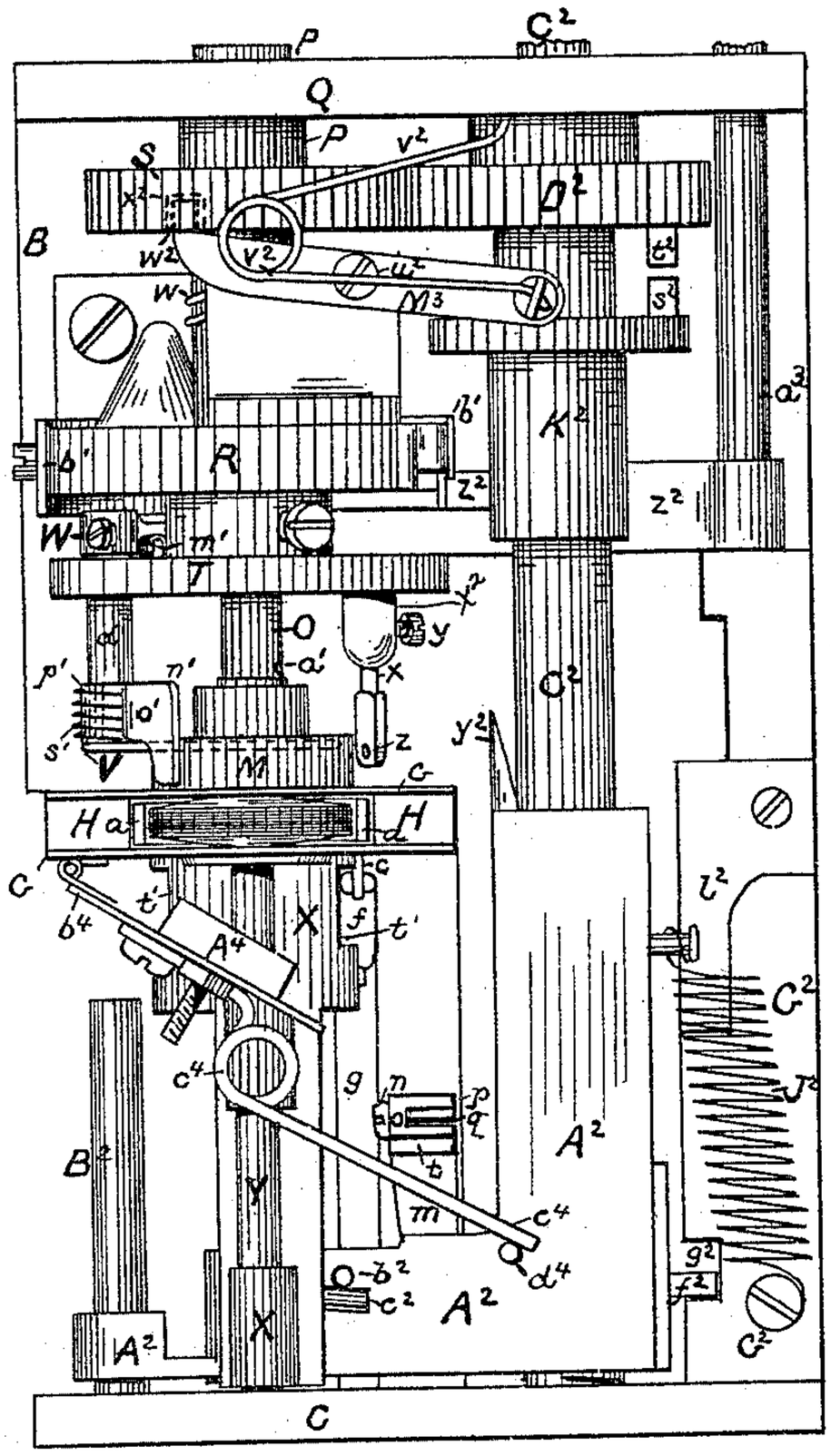

Fig: 16.

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UNITED STATES PATENT OFFICE.

CHARLES S. MARSHALL, OF BROCKTON, MASSACHUSETTS.

MACHINE FOR WINDING BOBBINS.

SPECIFICATION forming part of Letters Patent No. 491,434, dated February 7, 1893.

Application filed January 26, 1881. Serial No. 24,737. (Model.)

To all whom it may concern:

Be it known that I, CHARLES S. MARSHALL, of Brockton, in the county of Plymouth and State of Massachusetts, have invented certain new and useful Improvements in Machines for Winding Bobbins, of which the following is a full, clear, and exact description.

This machine is especially designed for winding the bobbins used in the Wheeler & Wilson sewing machine. In this machine, in substance, the bobbins to be wound are placed in a hopper and from this hopper they are carried, one at a time and at regular intervals, to a given place in the machine, and at that place, each bobbin, in turn, is taken from its carrier and firmly clamped and secured against movement, but with its open edge exposed, and while so clamped it is wound with thread, from a thread-carrier, which receives the thread from a suitably located supply, and is made to travel around the said open edge of the so confined bobbin, when having completed the winding of the bobbin, the bobbin so wound is released or unclamped and is discharged and into its place another bobbin is delivered by the bobbin-carrier and that bobbin clamped and wound and so on as before.

The general elements of my improved machine, consist, in substance, First, of a carrier for the bobbins to be wound, which is constructed to receive and carry a bobbin and is arranged in a suitable guide-way to be moved forward and backward therein, resting at the end of each of its forward movements, and also in each of said forward movements to deliver the bobbin carried by it to a clamp of suitable construction and arrangement in relation to the rest of said carrier at the end of its forward movement, to receive the bobbin from said bobbin-carrier and, removing it therefrom, to clamp it, holding it stationary with its open edge exposed, for being then wound with thread, by thread-winding mechanism properly arranged therefor, and after being so wound to release it for removal on the next forward movement of the bobbin-carrier to deliver another bobbin to said clamp, the said carrier meantime having been moved backward or returned to its original position, and again provided with a bobbin. Second, of a hopper for containing the bobbins to be wound, which is constructed to discharge the bobbins placed in it, in regular order, and one at a time, into a carrier therefor, of a suitable construction and arrangement to receive each bobbin as it is so discharged and after so receiving it to carry it forward, closing said discharge of the hopper, as it so moves forward to, and to deposit it on, a clamp of suitable construction and arrangement to so receive it and then to remove it from said carrier, which then is at rest, and to clamp and hold it stationary for being wound with thread, by any suitable thread winding mechanism properly arranged therefor, and after being so wound to release it, for removal, on the next forward movement of the bobbin carrier to deliver the next bobbin discharged from the hopper into the bobbin carrier to said clamp; the said carrier during the meantime having been moved backward or returned to its normal position and resting at the end and closing the hopper to the escape or discharge of a bobbin therefrom for the whole of its said return movement. Third, of a clamp, for clamping a bobbin, to be wound with thread, which is constructed and arranged to open to receive a bobbin and to close upon and hold it stationary with its open edge exposed in combination with a carrier for the thread with which the bobbin is to be wound constructed and arranged to be moved around said open edge of the bobbin as the bobbin is so clamped to wind the same with thread. Fourth, of a clamp for clamping a bobbin to be wound with thread, which is constructed and arranged to open to receive a bobbin and to close upon and hold it stationary with its open edge exposed, in combination with a carrier for the thread with which the bobbin is to be wound, constructed and arranged to be moved around said open edge of the bobbin, as the bobbin is so clamped, to wind the same with thread, and with a follower to rest upon the thread as it is so wound upon the bobbin, and which is constructed and arranged to move outwardly as the bobbin fills with thread and when the bobbin is full to operate to release the mechanism holding the clamp closed upon the bobbin. Fifth, of a clamp for clamping a bobbin to be wound with thread, which is constructed and arranged to open to receive a bobbin and to close upon and to hold

it stationary with its open edge exposed, in combination with a carrier for the thread, with which the bobbin is to be wound, constructed and arranged to be moved around said open edge of the bobbin as the bobbin is so clamped, to wind the same with thread, and with a knife for severing the line of thread extending or running from the bobbin clamped and being wound, to the bobbin previously wound, and which is constructed and arranged to move inwardly as the bobbin fills with thread and finally coming to a rest upon the edge of the bobbin-clamp and crossing the open edge of the bobbin clamped therein, to then act to sever the said line of thread.

In addition to the elements of constructions above set forth as forming parts of the present improved machine for winding bobbins with thread, the machine also comprises many improvements in the details all as hereinafter fully explained.

In the accompanying drawings the present invention is illustrated.

Figures 1 and 2 are respectively elevations, from different sides of the machine with the several parts in position for a bobbin to be wound; Fig. 2 showing the spool in dotted lines and a part of the base-plate broken out. Fig. 3 is a vertical section on line 3—3 Fig. 2. Fig. 4 is a vertical section on line 4—4 Fig. 1. Fig. 5 is a vertical section on line 5—5 Fig. 1; the shafts P^2 and C^2 being in elevation. Fig. 6 is a plan view. Fig. 7 is a horizontal section on line 7—7 Fig. 3. Fig. 8 is a horizontal section on line 8—8 Fig. 1, but with some parts of the mechanism in line of section, omitted. Fig. 9 is a horizontal section on line 9—9 Fig. 1. Fig. 10 is a horizontal section on line 10, 10, Fig. 1, and with some parts of the mechanism, on line of section omitted. Fig. 11 is a horizontal section on line 11—11, Fig. 1, but with some parts of the mechanism, in line of section, omitted. Figs. 12, 13, 14 and 15, are diagrams in detail illustrative of the winding of a bobbin in this machine at the commencement and until partially filled with thread, and of the position of the thread-carrier, thread-follower and thread-cutter at such respective stages, all as will be apparent from the detail description hereinafter given and from an inspection of said views. Fig. 16 is an elevation similar to Fig. 1, but with the several parts in the position they occupy at the time the winding of a bobbin is completed and before starting to clamp and wind another, as will hereinafter fully appear.

In the drawings A represents a vertical tube or hopper supported from one side of a post B rising from a base-plate C. This hopper A, is open at its upper, and, its internal periphery is a little larger than the periphery of the bobbins D, which are to be wound and which are placed therein, one upon another. The bobbin D, in the present instance, is such as is used in the well known Wheeler & Wilson sewing machine. This hopper A, at the lower end, opens into a stationary horizontal channel or way F, between two parallel horizontal plates G, G, which are closed at each edge by side-bars, H, and open at both ends I, I^2, one of which I^2, is the discharging end of the channel. This horizontal channel F, crosses the lower open end of the bobbin-hopper, A, and projects at each side thereof, and its height exceeds slightly the thickness of the bobbin and its width is such as to allow a pronged or forked plate J, to be freely moved forward and backward in it from end to end. This forked plate J, at and between the inner ends K, of its tines *a*, *a*, is of sufficient width and of suitable rounded shape to receive a bobbin and to surround more than one half of its periphery, (Fig. 10.) This forked plate J, or bobbin carrier (as it will be hereinafter called for convenience in designation) in the operation of the machine, is moved, from time to time, forward from the bobbin-hopper A, toward the discharging end I^2, of the channel F, and from that end backward to the bobbin-hopper, and this backward movement is to be such as to bring the internal portion K, of the tines—where they join the part *b*, directly in line with the bobbin-hopper, in order that a bobbin may drop from the hopper into and between such tines.

The part *b*, of the bobbin-carrier J, (Fig. 4,) is a flat plate and, during the forward and backward movement of the bobbin-carrier, it passes under the lower open end of the bobbin-hopper, A, and by its length, which is suitable therefor, it keeps said hopper closed to the drop or escape of a bobbin-therefrom, into the bobbin-channel or guide-way F, during the whole length of said forward and backward movement of the bobbin-carrier.

To move the bobbin-carrier as above described, mechanism, (Fig. 2,) as follows, is provided. *c* is an ear-piece attached to the bobbin-carrier and projecting downwardly through a slot *d*, running lengthwise in the lower horizontal plate of the bobbin-channel. *f*, is a rod pivoted at one end to the ear-piece *c*, and at the other end to the upper end of a vertical lever *g*, which, at its lower end, turns upon a fulcrum *h*, in the bed-plate C; *i*, is a rod which is pivoted, at one end, to a collar *j*, adapted by set-screw *k*, to be adjusted upon the vertical lever *g*, and, at the other end, to the outer end of one arm *l*, of a bell-crank or angular-lever *m* which is arranged to turn upon a fixed horizontal fulcrum-pin *n*. The other arm *o*, of this bell-crank lever is free and is provided in one edge *p*, with a notch *q*. *r*, is a spring fixed, at its upper, end to the lower plate of the bobbin-channel F, and connected, at its lower end, to the lever *g*, by a link-piece *s*. A lift of the free end *t*, of the angular-lever *m*, acts through the parts connecting such lever with the bobbin-carrier, to move the bobbin-carrier forward in the bobbin-channel and this movement is against the vertical spring arm *r*, which on a release of the lift upon the angular-lever *m*, by its reaction, moves the bobbin-carrier backward,

and it is thus that the two movements of the bobbin-carrier are obtained.

The lift and the release of the angular-lever *m*, by and at its end *t*, just above referred to, is secured from and during the movement in an upward direction, of an upwardly and downwardly moving screw-nut F^2, (Figs. 2, 3, 5, 8, 9, 10 and 11,) hereinafter particularly and fully described. This screw-nut F^2, in its upward movement, not only lifts the end of the lever *m*, but also, holds it so lifted, for a certain portion of its upward travel, when finally escaping therefrom it leaves said lever free to return to its original or normal position, (Fig. 2) under the reaction of the bent spring *r*, applied thereto and to the bobbin-carrier J, as described. The bell-crank or lever *m*, and bobbin-carrier so returned, then remain at rest, for the balance of the upward travel of said screw-nut, and also for the whole length of the downward travel thereof, all as will be hereinafter fully described.

L, Figs. 3, 4 and 10, is a circular opening through the upper and lower plates of the channel F. These circular openings are a little larger in diameter than the diameter of the bobbins and they are between the bobbin-hopper and the discharging end of the bobbin-channel.

M, M^2, (Figs. 1, 2, 3, 4, 10 and 16) are two circular horizontal blocks arranged one above the other and in the same axial line with the opening L. These blocks are both of the same diameter and this diameter corresponds to the diameter of a bobbin. The adjacent faces of these blocks are concave, corresponding in each case to the convexity of the sides of the bobbin, and it is by and between the concave faces of these blocks that a bobbin is to be clamped and held against turning while it is wound with thread in the operation of this machine, and therefore, for convenience of description, they will be designated together as the bobbin-clamp, and, as to each separately, as the lower and the upper clamp-jaw. The upper clamp-jaw M, is swiveled upon the lower end of a vertical shaft O, the axis of which is coincident with the vertical axis of the bobbin-clamp. The lower clamp-jaw M^2, as hereinafter fully described, is arranged for an up and down movement in relation to the upper-jaw M, passing through the openings L of the upper and lower walls of, and across the bobbin-channel, to the upper and outer side thereof, all for the purpose of lifting the bobbin which has been previously deposited upon it by the bobbin-carrier as before described, from the bobbin-channel and so carrying it through the upper opening L, and to the outside thereof, and of there clamping it tightly between the two jaws M, M^2, with its open edge exposed, to be wound with thread and after the winding is completed, of returning it, so wound, into the bobbin-channel, to be removed from the lower jaw, and finally from the bobbin-channel by the forward movement of the bobbin-carrier, as before described. The shaft, O, carrying the upper clamp-jaw, M, is surrounded by a vertical sleeve P, arranged to turn at its upper end in stationary bearings Q, of the post B, and to turn, intermediate of its length in bearings of a concentric horizontal circular disk R, rigidly fastened to the stationary post B. The shaft-sleeve P, above the stationary disk R, has a vertical slot *u*, into which enters a horizontal pin, *v*, of the vertical shaft O, and to this pin one end of a coiled spring *w*, is hung, which spring surrounds the said sleeve above said pin and at its upper end rests against the under face of a horizontal gear-wheel S, that is secured to the said sleeve. The pressure of this coiled spring *w*, acts downwardly upon the pin *v*, of the vertical shaft O, and through said pin, in the same direction upon said shaft and this connection of shaft and its sleeve by slot and pin as described while allowing the shaft a vertical movement within the sleeve, also secures the turning of it with the sleeve when the sleeve is revolved. This vertical play of the shaft is limited by the length of the sleeve-slot *u*, and this length is such that with the pin *v*, of the shaft at the lower end of the slot, the concave surface of the upper bobbin-clamp jaw is flush with the inside upper face of the bobbin-channel and with the pin *v* of the shaft at the upper end of the slot, said concave face will be above and outside of the bobbin-channel and at a sufficient height for the operation of the winding devices, as will hereinafter appear.

T, is a horizontal disk attached to and concentric with the shaft-sleeve P, below the stationary horizontal disk R, between such fixed disk R, and the upper clamp jaw M.

x, is a vertical post projecting downwardly from the under side of the revolving disk T. This post *x* is secured to a lug x^2 cast or fixed on said disk T by means of a set-screw *y*, and it has an eye *z* which is in the same horizontal plane, during the process of winding, as the open edge of the bobbin held in the bobbin-clamp, and in a vertical plane outside of and beyond the periphery of the so clamped bobbin. This post *x*, is the thread carrier of the machine and the thread issues from its eye *z*, to be wound upon the clamped-bobbin. The thread passes from its spool U, supported, as will be hereinafter described, to the eye of the thread-carrier *x*, through the length of the vertical shaft O, which is made hollow for such purpose and has an aperture *a'*, in proper position, for the thread to pass from its interior to the eye of the thread-carrier and in commencing the winding operation the free or loose end of the thread is placed under a spring finger-piece b^5 secured to the top of the bobbin-channel.

The revolving disk T, carries a vertical spindle *c'*, arranged to turn in it and within a stud *d'*, which projects downwardly from the under side of the disk. This spindle, at its lower end, carries a horizontal finger-piece

V, (Figs. 1, 2, 3, 9, 12, 13, 14, 15, and 16,) curved in its length and situated, during the process of winding, in the horizontal plane of the clamped bobbin and this finger-piece enters the bobbin at its open edge and lies and rests, by its outer end, upon and follows up the thread, as it, the thread, is wound upon the bobbin. This winding of the thread upon the bobbin is secured from the travel of the thread-carrier x, around the open edge of the bobbin clamp between the jaws M, M², caused by the rotation of the sleeve P, and its disk T, directly carrying said thread-carrier, from the rotation of the gear-wheel S, attached to said sleeve and connected and driven as hereinafter described; and again, the finger-piece V, in its rest and bearing upon the thread as it is wound upon the bobbin as above stated, travels with the thread-carrier x, around the bobbin and moving outward, as the bobbin fills with thread, finally, that is, when the bobbin has been fully wound with thread, as will hereinafter fully appear, effecting the automatic stopping of the winding operation and release of the clamp and clamped bobbin.

The spindle c', carrying the finger-piece V, also carries at its upper end and above the revolving disk, T, another horizontal finger-piece W, (Figs. 1, 2, 3, 4, 8 and 16,) which is curved in its length and projects from the spindle in the same general direction as the lower-finger-piece or thread-follower V, as it may be termed, before described. The finger-piece W, travels with the thread-follower V around the axis of rotation of and with the disk T, and at its outer end, it has a raised lip f', which, when the finger-piece W, is swung outwardly from the center of rotation of the revolving disk to a sufficient extent, is in position to pass to the back of and to travel around and against the outer face g', of a stationary flange b', which is concentric with and covers in length about one half of the length of the revolving disk, T, and is secured to and projects downwardly from the stationary horizontal disk R. As the finger-piece, or thread-follower V, which bears on the wound thread of the bobbin, moves outwardly, it carries with it, in a similar direction, the other finger-piece, W, and these outward movements are such, that, when the bobbin is wound or filled with thread, the thread-follower V, will be outside of the bobbin edge, and the upper finger piece W, will then have been swung sufficiently from the axis of rotation of the revolving disk T, to place its raised edge or lip f', in the proper plane to pass to the back of the stationary flange b', when, in the rotation of the revolving disk such raised lip comes to and is passing by the end l', (Fig. 7,) of such flange. This placing of the lip f', of the moving finger-piece W, at the outside of the stationary flange b', is for the purpose of securing the then continued travel of the finger-piece and its lip around said flange and, from the then action of said lip on a horizontal and supporting arm z^2, Figs. 2, 7, and 8, hereinafter described, to effect a release of said supporting arm z^2, from its connection with and hold of certain mechanism, to be hereinafter described, provided for operating the clamp to clamp a bobbin and for operating the thread-carrier x, thread-follower V, and finger-piece W, as has been described. Such release leaves said mechanism free for operation to open the clamp from the bobbin, to place the bobbin within the bobbin-channel and to stop the movement of the thread-carrier, thread-follower and finger-piece W, all as will hereinafter fully appear. The outward movements of the thread-follower V, and of the finger-piece W, above described, are against the tension of a spiral spring m', which is secured at one end to the upper finger-piece W, and at the other end to the revolving disk, T, and their inward movement is from the reaction of said spring.

n', (Figs. 3, 9, 12, 13, 14, 15, and 16,) is a knife or cutting-edge, at the outer end of a horizontal arm o', arranged to swing by its sleeve p', upon and about the disk-stud c', which carries the thread-follower V. This sleeve p', rests upon the thread-follower which has a vertical stud q', that enters into a notch r', in the end of the sleeve and the sleeve is surrounded by a spiral spring s', secured at one end to it and at the other end to the thread-follower and all in such manner that, in the outward movement of the thread-follower, the knife will be moved inwardly—(receiving its motion by and through the spring s',)—and that the outward movement of the thread-follower may then continue even after the inward movement of the knife has been arrested; this latter result being due to the notch r', in the knife-sleeve which allows the stud q', of the thread-follower to move in the continued outward movement of the thread-follower. The knife-edge n', is vertical and it is of sufficient length and in a position when swung inwardly, as above described to have a bearing against and across the circular edge of the bobbin-clamp and its bobbin. This knife is for severing the thread which runs between a bobbin being wound and the bobbin previously wound, which will hereinafter appear when the operation of the machine as a whole is described, and it thus severs the thread when it comes to a bearing upon the bobbin-clamp and its adjustment, as well as that of the operating part, should be such that its said bearing and its said cut of the thread will not be made until the bobbin has been partially wound and sufficiently to insure a hold of the thread upon the bobbin-barrel against unwinding, in the further continuance of the winding operation.

The lower clamp-jaw M², of the bobbin-clamp, M, M², hereinbefore referred to, is attached to a vertical frame or carrier X, arranged to travel up and down upon fixed vertical guide-posts Y, below the bobbin chan-

nel. This lower jaw-carrier X, in its lowermost position, rests upon the base-plate C, and in such position the concave face of its clamp-jaw is flush with the lower inner side of the bobbin-channel and, in its upper most position the concave face of the clamp-jaw is above and upon the outside of the bobbin-channel, and in close and firm contact with the under side of the bobbin, which bobbin, upon its upper side, is in close contact with the upper clamp-jaw, that at such time is in its uppermost position, as hereinbefore described, and the position of the whole is such that the open edge of the bobbin is in the horizontal plane hereinbefore described relative to the thread-carrier and the thread follower. When the lower clamp-jaw, M^2, is in its uppermost position the block which constitutes said jaw, is across the bobbin-channel, and it has a notch *t*, in its opposite sides (Fig. 10), both of a shape and in a position to receive the tines *a*, *a*, of the bobbin-carrier J, and allow them to freely pass alongside of said lower clamp-jaw M^2, in the return or backward movement of the bobbin-carrier through its channel, when said lower jaw is across the bobbin-channel, as it is while the bobbin is clamped and being wound and until it, the bobbin, is returned to the bobbin-channel, (Figs. 1, 3 and 4.)

In the operation of this machine, the lower-clamp-jaw M^2 is raised toward and lowered from the upper clamp-jaw M, in the first instance clamping a bobbin between the two-jaws, in position to be wound and so holding it while it is wound, and in the second instance, after the winding of the bobbin is completed and the winding mechanism stopped, releasing the bobbin, so wound and placing it, resting upon said jaw, within the bobbin-channel, for its then removal from said jaw and deposit in front thereof upon the floor of the bobbin-channel, on a forward movement of the bobbin-carrier which then next follows; the lower clamp jaw remaining stationary during such movement of the bobbin-carrier.

For clamping and holding a bobbin between and releasing it from the bobbin-clamp, and for placing said bobbin, after being so released, within the bobbin-channel, to be then removed from the lower-clamp-jaw, and otherwise, all just as above stated, said lower clamp-jaw is constructed and mechanism is provided to operate thereon, all as will be now described.

u', (Figs. 3 and 4,) is a vertical opening or bore concentric with and extending entirely through the lower clamp-jaw, M^2, from top to bottom thereof. The lower portion of said bore *u'*, is made of larger diameter than the upper portion thereof, so as to leave a shoulder *v'*, shown as rounding, between the upper and lower sides of the jaw. Z, (Figs. 2, 3, and 4,) is a vertical pintle, rigidly fastened to and projecting above, but adjustable on, a horizontal bar or carrier A^2, that is located below the clamp-jaw, M^2, and bobbin channel F, and is arranged at right angles to the latter and projects beyond one side thereof and at such projection, of itself and by its upright tubular extension, similarly lettered A^2, (Figs. 2, 5, 8, and 16,) and making a part thereof, it loosely fits a vertical rotating shaft C^2, screw threaded at its lower portion and turning, at its lower end, in a suitable bearing of the bed-plate C and at its upper end, in a suitable bearing of the upper fixed horizontal platform Q, projecting from the support or post B. This rotating shaft C^2, continuously driven, as will be hereinafter described, acts, as one guide to the up and down movement of the pintle-carrier A^2, and also, when a half screw-nut F^2, herein before referred to carried by said pintle-carrier (Figs. 3, 5 and 11), is engaged therewith, as will hereinafter fully appear, it acts to lift said pintle carrier A^2,—(said half screw-nut being disengaged from said shaft in the downward movement of said carrier),—and a fixed vertical post B^2 of the bed-plate C acts as another guide to said vertical movement of the pintle-carrier. This guide-post B^2 passes loosely through the end of the pintle-carrier, opposite to that having the rotating shaft C^2, as a guide. The pintle Z is so located on its carrier A^2, and its upward projection therefrom is of such a length that, with the lower clamp-jaw lifted, clamping a bobbin between it and the upper clamp-jaw, said pintle, can, on being lifted into the bore *u'* of the lower jaw, passing through said bore, be also entered into, (closely fitting,) the central bore or opening *w'*, through the barrel of the bobbin, clamped as aforesaid. The pintle Z has a fixed collar, making a shoulder *x'*, and a loose ring *y'*, which is located below said shoulder *x'*, and is made rounding on its upper side corresponding to the round of the shoulder *v'* of the bore *u'* of the lower clamp-jaw, and rests or is supported upon the upper end of a coiled spring *z'* surrounding, and, at its lower end, resting or supported upon, a shoulder a^2 of the pintle. The pintle-carrier A^2, in its lowest position, (Fig. 16,) rests upon the bed-plate C and in its highest position, (Figs. 1, 2, 3 and 4,) the loose collar *y'* of its pintle Z is at a close and practically firm bearing against the rounded shoulder *v'* within the bore of the lower clamp-jaw, which is then clamping a bobbin between it and the upper clamp-jaw, and the lift of the pintle-carrier acting through the pintle thereof, and also through the shoulder a^2, spring *z'*, and lower collar *y'* of the pintle and the shoulder *v'* of the lower jaw, secures the lift of the lower jaw, carrying a bobbin with it, toward the upper clamp-jaw, when having clamped the bobbin with sufficient firmness, the upward movement of the pintle, and consequently that of the lower clamp-jaw is stopped, and said pintle, through its carrier, and said lower clamp-jaw are secured in such position, as will be hereinafter described, after which, the winding of the bobbin is be-

gun and continued until finished. When the winding of the bobbin is finished, as will hereinafter appear, the pintle, Z and its carrier are released to the action of their gravity, preferably assisted by the reaction of a spiral spring J^2, (against the tension of which the carrier was lifted,) that at one end is connected to said carrier and at the other end to a suitable fixed support, and thus the pintle is withdrawn from the lower clamp-jaw and, with its carrier, returned to its lowest position, and a position of rest by the pintle-carrier, upon the bed-plate C. The return of the pintle-carrier and of the pintle above referred to, sets free the lower clamp-jaw for a return to its lowest position, from which the bobbin previously clamped by it and while so clamped wound as described, is placed within the bobbin-channel, for its discharge from said jaw and finally also from the bobbin-channel and machine, by the forward movement of the bobbin-carrier, as has been before described. This return of the lower clamp-jaw, which, in its lowest position, rests through its carrier X, upon the bed-plate C, is secured by the action of its own gravity, preferably assisted by the fall of the pintle carrier A^2, acting, by its projecting pin b^2, against the upper side of a projecting pin c^2 of the carrier X of said jaw. In the fall or return of the pintle-carrier A^2, as above described, the shoulder x' of the pintle Z insures, by its abutment against the loose collar y' of said pintle, the drop or fall of said loose collar practically, with the fall of the pintle, and said loose collar y', spring z', and supporting shoulder a^2, for said spring, and the inner shoulder v' of the lower clamp-jaw, together with the arrangement of the pintle on its carrier and of the lower jaw on its carrier, all are such, that, at the beginning of the upward movement of the pintle, and for a certain portion thereof next following, no contact shall be made between the loose collar y' of the pintle and the inner shoulder v' of the lower clamp-jaw, and consequently no lift of said jaw, during such movement of the pintle is produced. The object of such construction and arrangement is to allow for the operation of the bobbin-carrier to remove the wound bobbin from the lower clamp-jaw and to place another one therein to be, afterward lifted out of and above the bobbin-channel and secured against the upper clamp-jaw, which latter result is produced by the further upward movement of the pintle Z and its carrier A^2, acting through the shoulder a^2, coiled spring z', and loose collar y' of the pintle Z upon the inner shoulder v' of the bore u' of the lower clamp-jaw.

N^2, (Figs. 1 to 6 both inclusive,) is a horizontal bevel gear-wheel, fixed to the upper end of the vertical shaft C^2 and engaged with a fixed vertical bevel gear-wheel O^2, at one end of the horizontal driving shaft P^2, hereinafter more particularly referred to, and thus said shaft C^2 is driven, the rotation being continuous with the rotation of the driving shaft P^2. The vertical shaft C^2, below the platform Q, making its upper bearings, is provided with a loose horizontal gear-wheel D^2, meshing with the horizontal gear-wheel S, herein before referred to, of the sleeve P, through the rotation of which, the thread-carrier X of the machine is revolved about the clamped bobbin, to wind it with thread, as has been described.

The half-screw nut F^2, herein before referred to, as engaging with the screw threaded portion of the continuously rotating vertical shaft C^2, and as carried by the pintle-carrier A^2, (Figs. 3, 5 and 11,) and by which, when engaged with said screw-shaft, the pintle-carrier is lifted and through it and its pintle, the lower clamp-jaw lifted, as has been described, is arranged in a horizontal guide-way d^2 of said pintle-carrier, and projects to the outside thereof and is provided at such projecting part with a bent-spring e^2 arranged to press it inwardly, and with a side horizontal pin f^2, overlapping an upright stationary plate G^2, the vertical plane of which, is at right angles to the length of the bobbin channel.

g^2, h^2, are notches in upright plate G^2 and in the same vertical line as the overlap of the pin f^2, which is attached to the screw-nut F^2 upon said plate. The lower notch g^2 is opposite to the pin f^2 when the pintle-carrier or bar A^2 is in its lowermost position, and the upper notch h^2 is opposite to such pin, when the pintle-carrier is in its uppermost position.

l^2, is a bent or plate spring which covers the upper notch, h^2, and is there arranged to permit the pin f^2 of the screw-nut as the screw-nut travels upward to pass under it and by its pressure to force the pin through the upper notch h^2, and place it upon the back side of the vertical plate G^2. When the screw-nut pin f^2, is in line with the front face, of the vertical plate G^2, the nut is engaged with the screw-threaded shaft G^2, and when in line with the back face of the plate, the nut is out of such engagement.

The half screw-nut F^2, engaged with the screw-shaft C^2, secures by the rotation of said shaft, the lift of the pintle-carrier A^2, and through it, of the lower clamp-jaw, and disengaged from the said screw-shaft, it permits of the drop or fall, of the pintle-carrier and, through it, of the lower clamp-jaw, all as before described, and on the fall of the pintle-carrier, said half screw-nut is then again put into engagement or mesh with said screw-shaft, by the reaction of the bent spring e^2, against the force of which, it is put out of said engagement or mesh, as its pin f^2, passes under the bent spring l^2, and over the upper notch h^2, of the vertical guide plate G^2 and is thereby forced through said notch and placed upon the back-side of said guide-plate. This screw-nut F^2, also has a side projection m^2, (Figs. 2, 4, 8, 9 and 10) in a position to strike by its upper end against and lift the free end of the crank lever m, (through and by which the bobbin carrier is moved as hereinbefore described) when the screw-nut is moving up-

wardly which is when it is engaged with the screw-threaded shaft C^2. The said side-projection m^2, of said screw-nut F^2, has an upright face o^3, in suitable position after the escape of the upper edge of said projection from the free arm o of the crank-lever m, which escape occurs during the upward travel of the screw-nut and before it and the pintle-carrier have reached their highest position, to make and maintain a bearing or rest, for the extreme end t, of the lever, and thereby hold said lever, and also the bobbin-carrier J, from returning under the action of the spring r, of said carrier, to their normal positions. This bearing, between the vertical face o^3, of the projection m^2 of the screw-nut F^2, and the extreme end t, of the bell crank or lever m, is broken by the continued upward travel of the screw-nut, but before it and the pintle A^2, in which it is located as described, have reached their highest position, and by the so breaking of said bearing, said lever and also said bobbin-carrier are set free, for their return, under the action of the spring r, applied to the bobbin-carrier, as has been described, to their normal positions.

q, is a notch, located in one side of the free end o, of the crank-lever m, and of a shape and position to allow, after the return of said lever to its normal position, as before described, and on the downward travel of the screw-nut with the pintle-carrier as herein before explained of the free an unobstructed passage through it, of the side projection m^2, of said screw-nut F^2.

K^2, (Figs. 1, 2, 3, 4, 5 and 16) is a sleeve loosely surrounding screw-threaded shaft C^2, at its upper part and located under the loose gear wheel D^2, of said shaft C^2, hereinbefore referred to. This sleeve has a horizontal pin n^2, which enters a vertical slot o^2, in the shaft C^2, and interiorly, it is provided with a coiled spring p^2, which surrounds the shaft and is confined at its upper end, by a shoulder q^2, of the shaft and at its lower end, by a shoulder r^2, of the sleeve in a manner to press the sleeve in a downward direction. The sleeve, thus arranged, is susceptible of moving up and down upon, and of turning with the shaft, its vertical movement being limited by the length of the slot o^2. This sleeve at its upper end, has a vertical tooth or projection s^2, and this tooth and a downwardly projecting tooth t^2, upon the under-side of the loose-gear-wheel D^2 of the shaft C^2 are situated in such relation to each other, that, when the two teeth are within the same horizontal plane the upright edge of the one will strike against the upright edge of the other, thus interlocking the sleeve and the gear-wheel so that the latter will turn with the former, when the former is turned by revolving the shaft C^2. This sleeve K^2, to interlock it with the horizontal gear-wheel D^2 as above described, is raised through the abutment against its lower end of the upright tubular extension, and herein before referred to, of the pintle-carrier A^2, when the said carrier is traveling upward under the action of the rotation of the screw-threaded shaft C^2, upon its screw-nut F^2. The sleeve K^2, which, from its described connection with the continuous rotating shaft C^2, is also under a similar continuous rotation, being lifted, by the rise of the pintle-carrier A^2, into engagement through its tooth s^2 with the tooth t^2 of the loose gear-wheel D^2, on said shaft, C^2, plainly, said loose gear-wheel D^2, will then be rotated with said shaft C^2, rotating in its turn, the meshing gear-wheel S, and its disk T, carrying the thread-carrier x, as before described, and thus the thread-carrier is caused to travel around the open edge of the bobbin, clamped in the bobbin-clamp M, M^2, for the purpose of winding the thread on said bobbin. Again, said sleeve K^2, although of itself, under continuous rotation, because of its slot and pin connected with the rotating shaft C^2, being lowered sufficiently to disengage its tooth s^2, from the tooth t^2, of the loose-gear-wheel D^2, on said shaft, the rotation of said loose gear-wheel is arrested, arresting in its turn, the rotation of said gear-wheel S, and the travel of the thread-carrier around the open edge of the clamped bobbin or, in other words, the winding operation of the machine.

M^3 is a lever turning upon a stationary horizontal fulcrum-pin u^2, and at one end, resting or bearing upon the upper end of the sleeve K^2, of the rotating shaft C^2, and confined to such bearing, by a bent spring v^2, properly applied to it therefor, and, at the other end, provided with a tooth w^2, in position to be, by the depression of the end of the lever, resting upon the rotating sleeve K^2, engaged with a notch or recess x^2, in the under side of the horizontal wheel S, operating the thread-carrier x, when said gear wheel S, by being turned, has had its said notch brought opposite to, or in line with, said tooth of said lever. The engagement of the tooth w^2, of the lever, with the recess x^2, in the gear-wheeel S, holds said gear-wheel, firmly against movement, and with said lever disengaged from said gear-wheel, it, said gear-wheel, is free for rotation.

The locking of the gear-wheel S, by the lever M^3, as above described, is secured by the downward movement of the sleeve K^2 of the rotating shaft C^2, and the action of the spring v^2 when said sleeve is disengaged from the loose gear-wheel D^2, of said shaft. The unlocking of the gear-wheel S, is secured by the upward movement of the sleeve K^2 upon the rotating shaft C^2, and as said sleeve engages with the loose gear-wheel D^2, of said shaft, as hereinbefore described.

It is intended that the locking of the gear-wheel S, as has been described, shall take place the instant the rotating sleeve K^2, of the rotating shaft C^2, breaks connection, as explained, with the loose gear-wheel D^2, of said shaft, for the purpose of thus immediately arresting the travel of the thread-carrier x, about the clamped bobbin and consequently the

winding operation of the machine; and again, it is intended that the unlocking of the gear-wheel S, as has been described, shall take place the instant the rotating sleeve K^2, of the rotating shaft C^2, makes connection as explained with the loose-gear-wheel D^2, of said shaft, for the purpose of thus immediately starting the thread-carrier x, in its travel about the clamped bobbin, to wind the same with thread.

The pintle-carrier A^2, (Figs. 7 and 8,) when in its uppermost position, is supported by its horizontal arm y^2, upon the upper edge of a horizontal arm z^2, which is arranged for a swing upon a stationary center a^3, into and out of the vertical plane of the said pintle-carrier arm y^2, and has a spring b^3, properly applied to force and maintain it except, when overcome by pressure, in its position of support for the pintle-carrier. This rest of the pintle-carrier, retains the pintle-carrier, its fixtures, attachments and connections, in their uppermost position and in this position the half screw-nut F^2, is out of engagement with the screw-threaded shaft C^2; the shaft-sleeve K^2, and loose gear-wheel D^2, are interlocked; the lever M^3, is disconnected from the gear-wheel S, and the bobbin is firmly and tightly clamped between the upper and lower clamping-jaws.

The release of the pintle-carrier, its fixtures attachments and connections from the support above described, is obtained, by a simple swing of the horizontal arm z^2, out from under the arm y^2, of the pintle-carrier or bar A^2, and this swing is secured through the raised lip f', of the horizontal revolving finger-piece W, which, as it travels upon the outer side of a fixed flange b', as has been hereinbefore described, presses against said horizontal arm, z^2, with sufficient force to overcome its spring b^3, and thus to place it out of its said position of support to the pintle-carrier or bar A^2. With this support removed the pintle-carrier or bar A', under the action of its spring J^2, drops instantly, with all its fixtures, to its lowermost position and by the abutment of its pin b^2, against, the pin c^2 of the jaw-carrier X, it also drops the lower clamp-jaw to its lower-most position.

The horizontal shaft P^2, which is the driving-shaft of the machine, has a loose grooved pulley R^2, to be connected with the driving-power, and a sliding spline jointed collar S^2, adapted to be interlocked with the face of the pulley so as to put the driving-pulley and driving shaft into connection, for the pulley to turn the shaft.

c^3, (Figs. 1 to 6, both inclusive,) in a groove surrounding the clutch collar S^2, and receiving the vertical arms d^3, of a transverse horizontal shaft T^2, which is arranged to rock in suitable fixed bearings.

f^3, is a vertical spiral spring, at its upper end fastened to the rocker-shaft T^2, and at its lower end, to the outer end of a fixed or radial or crank-arm U^{21}, projecting from a horizontal rocker-shaft U^2, located below said shaft T^2, and turning in suitable fixed bearings. The tension of the spring f^3, acts to rock each of said shafts T^2, and U^2, in the same direction and to put the clutch-collar S^2, into interlock with the pulley-wheel R^2, and so hold it.

g^3, is a vertical rod connecting radial arms T^{21} and U^{21} of the two rocker-shafts T^2 and U^2. When the lower rocker shaft U^2, is rocked in the one direction, against its spring f^3, the upper rocker-shaft T^2, through the connecting-rod g^3, is rocked in a direction to slide the clutch-collar S^2, out of its interlock with the pulley-wheel R^2, and thus the driving-power and driving shaft P^2, are disconnected. The lower rocker-shaft U^2, has an upright arm V^2, which carries the spool of thread hereinbefore referred to. The thread passes from this spool through an eye h^3, at the upper end of the spool arm or holder V^2, and in such a direction, that if the run of the thread through the eye is obstructed by a knot or other cause the spool holder V, will be swung in a proper direction to disconnect the clutch S^2, from the pulley R^2, and thus arrest the running of the machine. From this eye h^3, the thread passes through an eye n^3, of a spring arm A^5, thence through the center of a portion of a horizontal spindle k^3, arranged to be turned in ear-pieces l^3, of a frame m^3, attached by a set-screw to a stationary support, and it issues therefrom, at one end, and thence it passes to and through the vertical shaft O, to the thread carrier of the machine as has been hereinbefore described.

The spindle k^3, and the spring arm A^5, constitute, in substance, the tension device of the machine.

To understand the operation of the machine and the better to explain it in such respects as have not already been examined, I will start with the bobbin-clamp M, M^2, opened and its concave faces flush with the upper and lower sides of the bobbin-clamp; with the bobbin-hopper A, supplied with empty bobbins; with the thread-carrier x, supplied with thread from a spool of the spool-holder V^2, and with the free end of the thread placed under the spring-holder or finger b^2, as has been described. In this position of the bobbin-clamp M, M^2, (Fig. 16.) First, the bobbin-carrier J, (Figs. 4 and 10,) is at the limit of its backward stroke in the bobbin-channel F, and it is in position for a bobbin then to drop from the bobbin-hopper A, into its rounded opening K, at the inner end of its tines a. Second, the pintle-carrier or bar A^2, and the lower clamp-carrier X, are in their lower-most position (Fig. 16). Third, the half screw-nut F^2, is engaged with the screw-threaded shaft, C^2, and the sleeve K^2, of such shaft is in its lower most position (Fig. 16), thus placing it out of interlock with the loose horizontal gear-wheel D^2, of such shaft and locking the horizontal gear-wheel S, with which the loose gear-wheel D^2, meshes against turning by the then engagement between it and

the lever M^3, (Fig. 16) and, fourth, the thread follower V (in dotted lines Fig. 16), is at rest against the periphery of the upper clamp jaw M, and the finger piece W, which moves in conjunction with it is just beyond its position, not shown, of pressure by its lip *f*, against the horizontal support z^2, of the pintle-carrier or bar A^2, and of the clamp-jaws, and by which pressure of said lip f^2, of the finger-piece W, against the horizontal support z^2, said support was released for the drop or fall of the pintle-carrier A^2, and the bobbin-clamp-jaw M^2, as has been before stated. With this position of the parts the driving shaft P^2, is now turned, which revolves the vertical shaft C, and as the half screwnut F^2, is then engaged with said vertical shaft the pintle-carrier A^2, and lower clamp-jaw M^2, are moved upward toward the upper clamp-jaw M; the pin f^2, of the screw-nut passing up along and in contact with the front side or face of the guide-plate G^2. As the pintle-carrier so rises its pintle *z*, enters the lower clamp-jaw M^2, but before exerting any upward pressure thereon the upper end of the side-projection m^2, of the screw-nut F^2, abuts against the under side of the free arm *o* of the crank-lever *m*, and thereby lifts and continues to lift such arm at the same time moving the bobbin-carrier against the tension of its spring *r*, forward to the lower jaw of the bobbin-clamp M, M^2, placing the bobbin carried by it over and upon the concave face of the lower clamp-jaw M^2. In the continuation of this rise of the screw-nut F^2, and pintle-carrier A^2, as afore said, the upper edge of the projection m^2, to said screw-nut F^2, escapes from the under side of the free arm of the angular-crank *m*, thus ending the forward movement of the bobbin-carrier. On this escape of the nut-projection m^2, said projection by its vertical face o^3, presents a bearing for the extreme end *p*, of said free arm of the angular-crank *m*, and such bearing continues during the further upward movement of the nut-projection and until said face o^3, has fully passed by the said end *t*, of the angular-crank *m*. During this bearing of the end *t*, of the crank *m*, against the vertical face of the projection m^2 the bobbin-carrier remains stationary, for the reason that the nut projection then binds the crank *m*, against swinging and as a consequence holds the spring *r*, of the bobbin-carrier J, from acting upon it to move it backward, or in other words, to return it to its normal or original position. During this rest of the bobbin-carrier the lower clamp-jaw M^2, by the continued rise of the pintle-carrier Z, is made to move through and across the bobbin-carrier J, and bobbin-channel F, and as it so moves it carries the bobbin which was resting upon it into contact with the upper clamp-jaw M, and then through this bobbin it lifts said jaw against its spring *w*, until the bobbin-clamp and bobbin between its jaws are as a whole placed in the proper plane above the bobbin-channel for the bobbin which has its open edge exposed for its whole periphery to be wound with thread as will hereinafter appear.

During the lift of the bobbin and its clamp above described and when the bobbin is out of the line of travel of the bobbin-carrier the hold above described by the nut-projection m^2, upon the crank-lever ceases because of the escape of the upright face o^3, of the screw-nut projection m^2, from said, lever and the bobbin carrier then under the action of its spring *r*, moves backward into its position under the bobbin-hopper A, to receive another bobbin therefrom to be carried forward by it as before. After this backward throw of the bobbin-carrier and while the bobbin and its clamp are still on their upward movement the upper end of the vertical tubular extension of the upwardly moving pintle-carrier or bar A^2, abuts against the lower end of the revolving-sleeve K^2, of the revolving vertical shaft C^2, and lifts such sleeve into interlock with the loose horizontal gear-wheel D^2, on said shaft C^2, and also through it release the lever M^3, from the horizontal gear-wheel S, which meshes into the gear-wheel D^2. By this means the loose gear-wheel D^2, of the rotating shaft C^2, is put into connection with said shaft to be rotated thereby, and the gear-wheel S, meshing with said gear-wheel D^2, and to the sleeve of which the thread-carrier *x*, is fastened, is set free, through the operation of its holding lever M^2, to, be rotated from the gear-wheel D^2, and at this time the pintle-carrier A^2, and the lower-clamp-jaw M^2, have reached their highest position and are supported through the arm y^2 of said pintle-carrier I, resting upon the horizontal arm or support z^2, which during the upward travel of the pintle-carrier was forced aside, against the pressure of its spring b^3, by the arm y^2, of said carrier and then after said arm y^2 had passed beyond it was thrown by the reaction of its said spring into position to act as the support for the pintle-carrier and lower clamp-jaw M^2, in their highest position, clamping a bobbin, for being wound as before described. Just before and as this support for the pintle-carrier A^2, and the lower clamp-jaw M^2, with the clamped-bobbin is being made, the projection f^2, of the screw-nut F^2, moving with the pintle-carrier, is passing between the front-face of the guide-plate G^2, and the spring l^2, covering the upper notch h^2, of the said plate, and finally as said support is made, it is forced through said upper notch, by the pressure of said spring, to the back side of said plate, which puts said screw-nut out of engagement with the screw-shaft C^2, arresting all further travel of the pintle-carrier and lower-clamp-jaw, both of which then remain stationary for the winding of the bobbin to be accomplished, which then goes on, as will be now described.

Through the connection established between the gear-wheel S, released for operation by the with-drawal of the lever-catch M^3, therefrom, and the rotating-shaft C^2, put