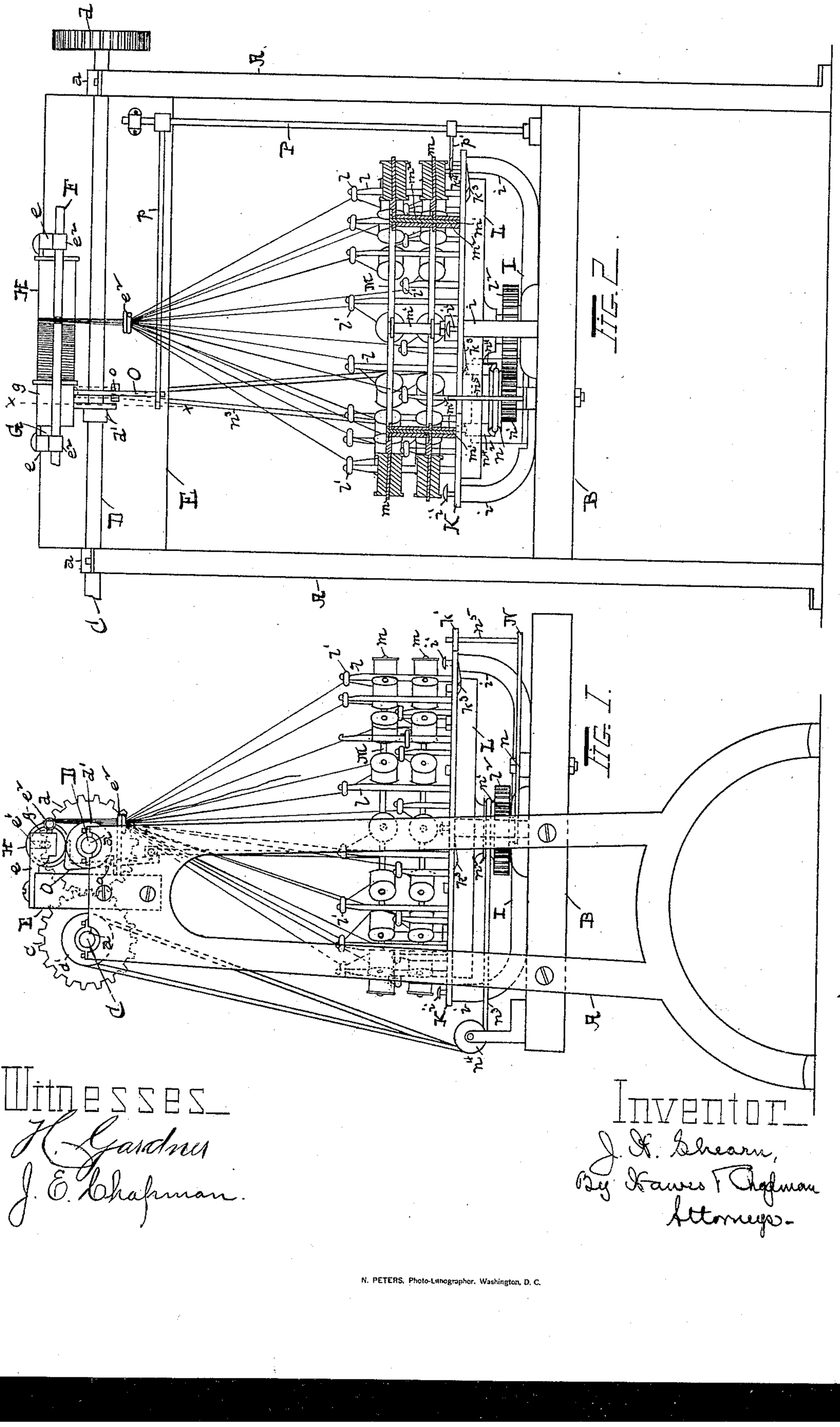
(No Model.)

2 Sheets—Sheet 1.

J. H. SHEARN.

DOUBLING MACHINE.

No. 408,140. Patented July 30, 1889.



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(No Model.)

2 Sheets—Sheet 2.

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DOUBLING MACHINE.

No. 408,140. Patented July 30, 1889.

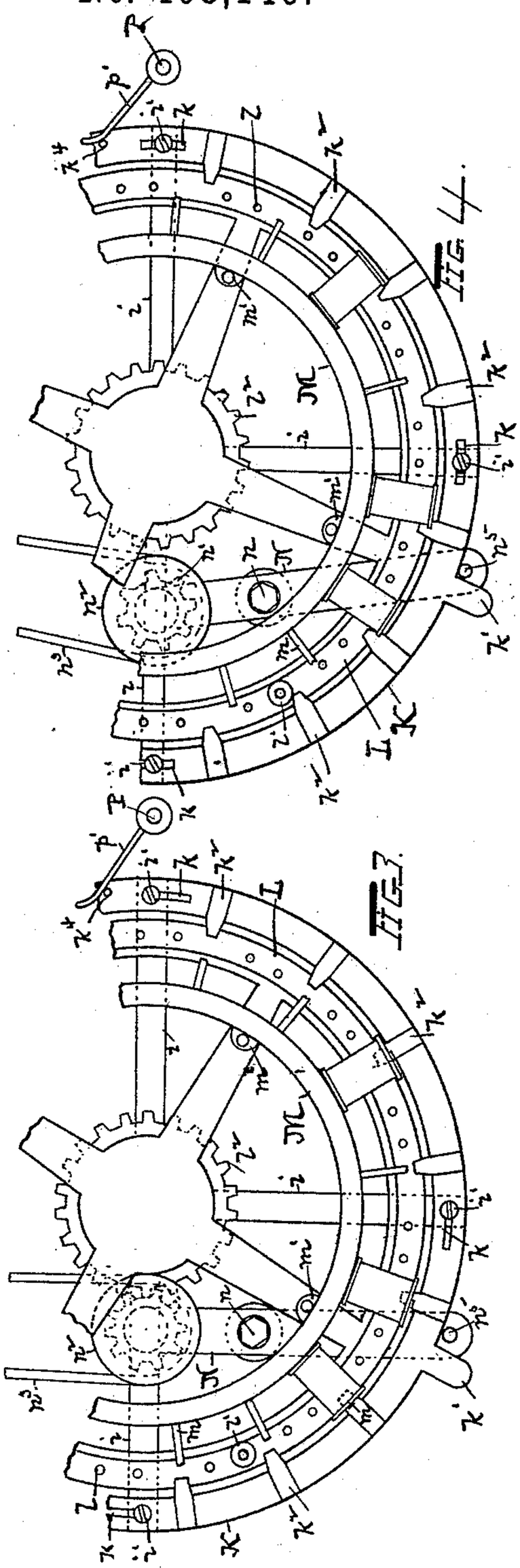

FIG. 4.

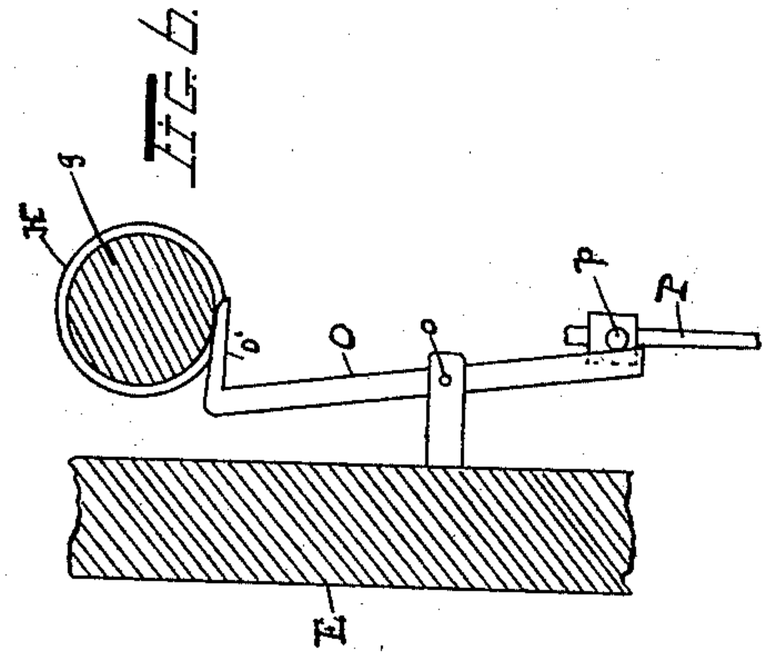

FIG. 6.

FIG. 7.

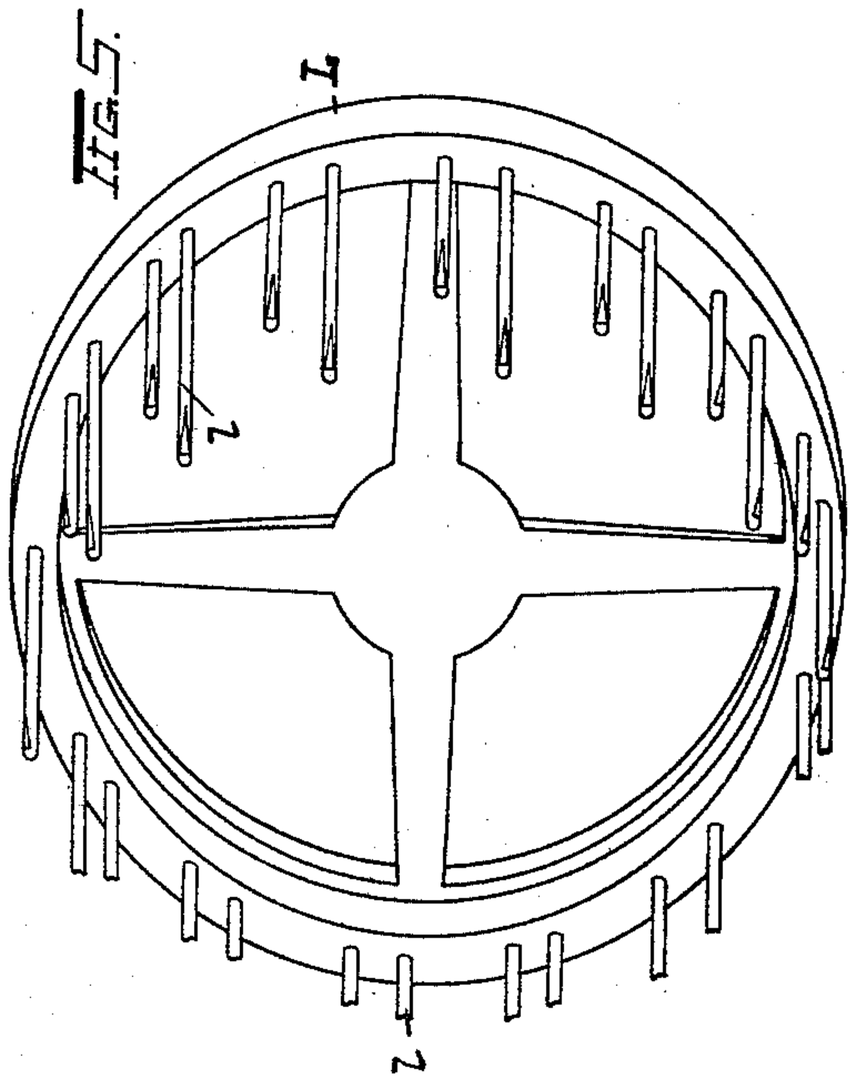

FIG. 5.

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UNITED STATES PATENT OFFICE.

JOSEPH H. SHEARN, OF LEEDS, ASSIGNOR TO HIMSELF, AND THE NONOTUCK SILK COMPANY, OF FLORENCE, MASSACHUSETTS.

DOUBLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 408,140, dated July 30, 1889.

Application filed August 27, 1888. Serial No. 283,939. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. SHEARN, of Leeds, in the county of Hampshire and Commonwealth of Massachusetts, have invented a new and useful Improvement in Doubling-Machines, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

My invention relates to machines for performing the operation in the manufacture of thread from silk known as "doubling," in which the filaments of silk from a series of bobbins are wound collectively upon a single bobbin preparatory to the spinning operation.

In doubling-machines as ordinarily constructed the series of bobbins containing the raw silk are supported upon a series of stationary pegs arranged in such manner that no two of the bobbins will lie in the same vertical plane, and the filaments of silk are led upwardly from said bobbins through an eye or other guiding means upon a traverse-bar and from thence to the receiving-bobbin. Between the traverse-bar and said series of bobbins are usually located a series of drop-wires, each of which wires is retained in an upright position by one of the filaments, and which, upon being released by the breaking of its filament or by the withdrawal of all of the silk from one of the bobbins, actuates a lever in such manner as to cause the stoppage of the receiving-bobbin to enable the ends of the filament to be united.

It has been found that doubling-machines constructed in this manner are open to very serious objections. In the first place, as the traverse-bar moves back and forth over a series of bobbins whose filaments are led through the series of drop-wires an unequal strain or tension on the series of filaments is caused by such alternate movement of said bar, as the filaments at one extremity of the series are drawn upwardly at an acute angle, while those that come directly under the traverse-bar guide are drawn substantially in a perpendicular direction. Such unequal strain causes some of the filaments to be wound upon the receiving-bobbin more loosely than others, and when they are spun into thread the difference in the length of such closely and loosely wound filaments weakens the thread, as it will have the resisting strength of the shorter filaments only. Moreover, it has been found to be impracticable to use at one time more than a limited number of the supply-bobbins containing the raw silk in connection with each receiving-bobbin, as it will be seen that the greater the number of bobbins used in a series the greater the number of drop-wires which must be used, thus causing the angles in filaments drawn from the extremities of the series to be still more acute and the strain exerted upon the filaments to be still more unequal. In order, therefore, to effect a combination of a greater number of filaments—for example, forty—it has been necessary to first wind ten filaments upon each of four receiving-bobbins, and then to rewind the "ten double" groups of filaments from said four bobbins upon a fifth receiving-bobbin, thus multiplying the number of operations required, at a great expense of time and labor.

Another disadvantage incident to this method is that when one of these ten double filaments breaks or the bobbin is emptied a knot has to be made with twenty filaments, which knot forms an enlargement in the completed thread which will not pass through the eye of a needle, and thereby impairs the quality of the thread. It frequently happens, also, that one of said ten double groups of filaments will become separated from the others in such manner as to form a sort of traversing ring upon the receiving-bobbin, which, by its obstruction to the filaments composing the remaining groups, causes many of the latter to break and necessitates the removal of some portion of the silk already wound upon the receiving-bobbin in the form of waste, in order to find and reunite the ends of the broken filaments.

It is the object of my invention to provide a doubling-machine which will be so constructed as to obviate all of the above-noted objections incident to existing machines—that is to say, one in which the strain exerted upon the filaments as they are fed to the receiving-bobbin will be uniform throughout the entire series, and which will enable any

desired number of bobbins containing the raw silk to be used in connection with a single receiving-bobbin at one operation.

Another object is to increase the facility with which the ends of a broken filament can be found and reunited by the operator, whereby a great saving in time in the operation of the machine is effected.

To these ends my invention consists in the doubling-machine comprising a revolving bobbin-rack, revolving receiving-bobbin, automatic stop-motion devices, and other details, hereinafter fully described, and particularly pointed out in the claims.

Referring to the drawings, in which like letters designate like parts in the several figures, Figure 1 is an end elevation of the machine, looking toward the right in Fig. 2. Fig. 2 is a front elevation thereof, partly in section. Fig. 3 is a plan view of a portion of the revolving rack and shipping-ring. Fig. 4 is a similar view of the same parts after the shipping-ring has disconnected the power. Fig. 5 is a view in perspective of the revolving frame which carries the bobbin-rack. Fig. 6 is a vertical section of a portion of the machine, taken upon line *x x* of Fig. 2 and looking toward the right in said figure.

The letters A A designate the two end pieces of the frame, which will be secured by screws or in any other convenient manner to the floor. Between said end pieces is supported a bed-piece B, which is located at a suitable distance above the floor to enable the operator to conveniently reach the parts carried upon said bed-piece, and for the same reason the latter preferably projects farther at the front than at the rear side of the frame, as shown. At the upper end of said end pieces A are bearings *a*, within which are mounted two horizontal and parallel shafts C D, carrying at one end corresponding gears *c d*, respectively, which gears mesh with each other. At its opposite end the shaft C will be provided with a suitable band-pulley, (not shown,) whereby motion can be transmitted to said shaft from a counter-shaft in the usual manner. A cross-piece E is located between said shafts C D, and is secured at its ends to the end pieces, as shown, and upon the upper side of said cross-piece, at equidistant points from the center thereof, are secured forwardly-projecting brackets *e*, containing within their inner sides vertical grooves *e'*, open at the top and having at their front ends bearings e^2 for the traverse-bar F. The grooves *e'* in said brackets form bearings for the ends of the spindle G, which supports the receiving-bobbin H, said spindle being free to revolve and also to move vertically in said bearings.

Upon spindle G is secured a drum *g*, which normally rests by gravity upon the periphery of a disk-wheel *d'*, mounted upon shaft D, whereby the frictional engagement of the drum and said wheel will transmit the motion of shaft D to spindle G and bobbin H in a reverse direction.

Rigidly secured upon bed-piece B is a support I for the shipping-ring, which support I prefer to make in the form of four upwardly-curving spider-arms *i*, connected at their lower ends to a common base, and terminating at their upper ends in a horizontal face, as shown. Upon the horizontal faces of said spider-arms is supported the shipping-ring K, it being retained thereon in such manner as to have a limited revolving movement by screws *i'*, passing through slots *k* in the ring into said arms. Said screws also permit a limited vertical movement of said ring between their heads and the arms *i*, for a purpose presently to be described.

At the front side of the machine the shipping-ring is provided with a suitable handle *k'*, by which it can be turned manually. Upon the upper surface of the shipping-ring at frequent intervals, as shown, are lugs k^2, which may be made integral with the ring, or may be secured thereto in any suitable manner, and which project a short distance beyond the inner surface of said ring. A revolving frame L (shown detached in Fig. 5 and preferably made in wheel form to lessen its weight) is mounted concentrically within the circle described by the shipping-ring, the central hub of said frame having its bearing in the base of support I in such manner as to permit the frame to revolve freely in a horizontal plane. A series of vertical rods *l* are mounted in the rim of said frame L in such manner as to barely clear the inner ends of the lugs k^2 of the shipping-ring, and the upper surface of the rim of said frame occupies a slightly-lower plane than the lower surface of said lugs, so that the latter do not engage said rim. The bobbin-rack M is preferably composed of two or more rings having radially projecting therefrom pegs *m*, which rings are supported upon standards *m'*, secured at their lower ends to frame L, sleeves m^2 upon said standards serving to separate said rings from each other, as shown in section in Fig. 2. The radial pegs upon said rings are preferably located in the same vertical plane, as shown, and are of a proper size to receive the usual bobbins containing raw silk, while the rings themselves are of such diameter that when said bobbins are mounted upon said pegs the vertical rods *l* on the frame will occupy a position substantially midway between the ends of said bobbins, as shown in Figs. 3 and 4. The bobbin-rack being thus rigidly secured to frame L will revolve with the latter in a horizontal plane beneath receiving-bobbin H, which latter is located over the center of said rack. Upon each of the rods *l* is mounted loosely an annulet *l'*, and the filament of raw silk from each of the bobbins carried by the bobbin-rack is led through the annulet upon one of the adjacent rods, thence upwardly through a stationary eye e^2 upon beam E, and through the eye or other guide upon traverse-bar F to the receiving-bobbin. The rods *l* thus co-operating with the up-

per and lower series of bobbins upon the rack are preferably of different heights, as shown, so that the angle described by each filament in passing from its bobbin to and through its annulet, and from thence to eye e^2, is uniform with respect to all of the filaments. The annulets l' are normally retained at the top of the rods l by the draft exerted by the filaments, and said rods are provided with notches at their upper ends, as shown, to prevent the entire withdrawal of the annulets therefrom by such draft of the filaments. Whenever one of the filaments breaks, however, or one of the bobbins upon rack M is empty, its annulet falls by gravity to the bottom of its rod l and effects the stoppage of the motion of the bobbin-rack, and also of the receiving-bobbin H, as will be presently described.

A revolving movement is imparted to frame L and the bobbin-rack as follows: Rigidly secured to the hub of said frame L is a gear-wheel l^2, and upon the inner end of a lever N, pivoted at n upon bed B, is a pinion n', turning in bearings in said lever and having connected thereto band-pulley n^2. A belt n^3 is led from said pulley n^2 beneath two idler-pulleys n^4, mounted in bearings at the rear side of bed B, and thence around a pulley c' upon shaft C. The motion of said shaft C is thus transmitted by said belt to pulley n^2 and pinion n', and by moving lever N to place said pinion in mesh with gear l^2 said motion is likewise communicated to frame L and the bobbin-rack. By such construction it is obvious that by moving the continuously-revolving pinion n' into and out of engagement with gear l^2 by means of lever N frame L and the bobbin-rack can be almost instantly set in motion and as quickly caused to cease their movement. It is the office of shipping-ring K and the annulets l' to automatically cause such movement of said lever as to disengage said pinion from the gear and effect the stoppage of the movement of frame L whenever by the breaking of a filament or the removal of all the silk from one of the bobbins one of said annulets is permitted to drop to the bottom of its rod l, as above described. For this purpose the front end of lever N is extended slightly beyond the plane of the outer surface of ring K, and is provided at said front end with a pin n^5, extending upwardly into the path of movement of handle k' of the ring, whereby movement of the ring in one direction will, through the contact of its handle with said pin, operate said lever to disengage the pinion from the gear. As shown in Fig. 3, the shipping-ring is in the position which it occupies when the machine is in operation, one of the annulets l', however, being represented as having just fallen to the bottom of its rod l. With the continued movement of frame L said annulet is brought into contact with the lug k^2 of the shipping-ring lying next before it, the space between the ends of lugs k^2 and rods l being less than the thickness of the annulets, and by its engagement with said lug moves said ring to the position shown in Fig. 4, thereby, through handle k' and pin n^5, moving lever N to a position to disengage the pinion from the gear, as just described. As the annulet which thus causes the stoppage of the bobbin-rack may at the time be at the rear side of the frame, and thus render it desirable for the operator to manually impart a partial revolution to frame L and said rack in order to more conveniently find and reunite the ends of the broken filament or replace the empty bobbin with a full one, as the case may be, I make the slots k in the shipping-ring of sufficient length to permit said ring to move a greater distance than is necessary to operate lever N, as just described, and locate upon the lower side of said ring four inclines k^3 adjacent to the four arms i of support I, so arranged that a slight additional movement imparted to the ring by means of its handle k' will cause said inclines to co-operate with the horizontal faces of said arms i to elevate the ring sufficiently to permit the fallen annulet to pass beneath the projecting lugs k^2 of the ring. The frame L and bobbin-rack can then be turned freely in either direction to bring the bobbin requiring attention directly before the operator.

As it is essential that the motion of the receiving-bobbin H be stopped with the stoppage of the movement of the bobbin-rack, I provide means whereby this result is also secured by the movement of the shipping-ring, as just described. Such means consist of the usual lever O, which in this instance is pivoted at o to beam E, and has the wedge-shaped arm o', adapted to be moved beneath and to elevate drum g of spindle G, whereby it is released from its engagement with wheel d' of shaft D, and a vertical rock-shaft P, mounted in bearings on beam E and bed B, respectively, said shaft having adjustably secured thereon by suitable collars arms $p\,p'$. The arm p of said rock-shaft engages the lower end of lever O, and the arm p' engages a pin k^4 on shipping-ring K, whereby the movement of said ring to operate lever N, as previously described, will also, through said rock-shaft, operate lever O, and through the latter raise drum g from wheel d and stop the movement of receiving-bobbin H. Traverse-bar F will be given the usual reciprocating movement by any of the well-known mechanisms at present used for such purpose.

The operation of the machine thus constructed is as follows: Receiving-bobbin H is placed upon spindle G, and the latter is dropped into its bearings with its drum g resting upon wheel d' of shaft D. The bobbins containing the raw silk are placed upon pegs m of the bobbin-rack, and the filament of silk from each of said bobbins is led through the annulet l' upon one of the adjacent rods l to and through eye e^2, and from thence through the guide upon traverse-bar F to said receiving-bobbin. Lever N is then

moved to place pinion n' in mesh with gear l^2, and shaft C is set in operation by the motion transmitted thereto from a suitably-arranged counter-shaft. Motion from said shaft C is transmitted through gears c d, shaft D, wheel d', and drum g to spindle G and bobbin H, and also through belt n^3, pulley n^2, pinion n', and gear l^2 to frame L and bobbin-rack M. The group of filaments are moved back and forth in front of the receiving-bobbin by the traverse-bar, and are wound upon said bobbin in the usual manner. The central location of eye e^2 with respect to the radial pegs of the bobbin-rack causes the draft upon the filaments to be uniform with respect to all of the bobbins mounted upon said pegs and reduces the liability of breakage of the filaments to a minimum. Should one of the filaments break, however, or should all of the silk be withdrawn from one of the bobbins, its annulet l' immediately falls by gravity to the bottom of its rod. In Fig. 1 I have represented one of the filaments as having just broken, and have shown its annulet in the act of falling, as just stated. As hereinbefore described, the fallen annulet is directly brought into contact with one of the lugs k^2 of the shipping-ring, and through the latter disengages pinion n' and drum g from gear l^2 and wheel d', respectively, thereby stopping the movement of the bobbin-rack and the receiving-bobbin. Should the bobbin-rack stop with the broken filament or the empty bobbin at the rear side thereof, the operator imparts the slight additional movement to the shipping-ring necessary to raise the latter by means of its inclines k^3, manually revolves the bobbin-rack a half-revolution, and reunites the ends of the broken filament or replaces the empty bobbin with a full one. Lever N is then moved to restore pinion n' to its engagement with gear l^2, carrying with it the shipping-ring through the engagement of its pin n^5 with the handle of said ring. The weight of drum g upon the inclined upper edge of arm o' of lever O returns said lever and rock-shaft P to their former positions, and the winding proceeds as before.

It will be observed that the operations of reuniting the ends of a broken filament and replacing an empty bobbin with a full one can be very quickly performed, and that the machine can be kept in almost continuous operation. It will be observed, furthermore, that as the bobbin-rack can be made to hold bobbins equal to the greatest number of filaments which it may be desired to double or group together, the machine will perform at a single operation what has heretofore required two or three separate operations.

The facility with which the ends of broken filaments can be found and reunited avoids almost entirely the waste of silk which usually accompanies such operation.

Attention is called to the fact that by timing the revolutions of the bobbin-rack relatively to those of the receiving-bobbin in such manner as to impart a slight twisting movement to the group of filaments as they pass to the receiving-bobbin, said filaments are more effectually united in the group, so that if it should become necessary to partially unwind them from the receiving-bobbin to reach the ends of broken filaments, or for any other purpose, they will not separate in such manner as to interfere with such unwinding movement.

The peg-holding rings and the standards of the bobbin-rack can be made integral with each other, if preferred, instead of utilizing the sleeves m' to separate said rings, as shown; but I prefer to use the construction shown, as it enables each ring to be located at any desired height above frame L by using longer or shorter sleeves.

It is obvious that various modifications of the details of construction herein shown and described can be made without departing from the spirit of my invention.

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

1. In a doubling-machine, the combination of the following instrumentalities, viz: a spindle adapted for carrying a receiving-bobbin, a revoluble frame carrying a rack, which rack supports a series of supply-bobbins, means, substantially as described, for revolving said spindle and frame, a series of vertical rods mounted upon said frame adjacent to said supply-bobbins, an annulet loosely mounted upon each of said rods, which annulets serve as guides for the filaments from said supply-bobbins as they pass to the receiving-bobbin, and which are retained at or near the upper ends of the rods by said filaments, a shipping-ring located adjacent to and circumscribed about said frame, said shipping-ring being supported in such manner as to be capable of a limited revolving movement, and having a series of lugs projecting into the path of movement of said annulets when the latter are at the bottom of their supporting-rods, a lever governing the application of power to said frame, whereby the latter is revolved, and intermediate connections, substantially as described, between said shipping-ring and said lever for disconnecting the power by the movement of said ring, whereby the descent of one of said annulets to the bottom of its rod will effect the stoppage of the movement of the frame, substantially as set forth.

2. In a doubling-machine, a spindle adapted for carrying a receiving-bobbin, a revoluble frame supporting a series of supply-bobbins, means, substantially as described, for revolving said spindle and frame, releasing devices, substantially as described, for disconnecting the power from said spindle and also from said frame, a series of annulets held in an elevated position upon said frame by the filaments passing from said supply-bobbins to said receiving-bobbin, a shipping-ring, suit-

able intermediate connections between said ring and both of said power-releasing devices, whereby the latter are operated by the former, and a series of contact devices projecting from said ring over said frame to a point beneath the plane of revolution of said annulets, whereby, upon the release of either of said annulets by its filament, it will descend to a position to engage one of said contact devices and impart movement to said shipping-ring, combined and operating substantially in the manner described.

3. In a doubling-machine, a frame supporting at its upper end the revolving receiving-bobbin H and having a bed, as B, located beneath said bobbin, shipping-ring K, supported upon said bed in such manner as to have a limited revolving movement, and having the inwardly-projecting lugs k^2, circular frame L, having a revolving movement upon said bed within said shipping-ring, the upper surface of said frame being located in a plane slightly below that of the lower surface of said lugs k^2, rods l, mounted upon said frame and supporting loosely thereon annulets l', bobbin-rack M, secured upon said frame and having pegs m projecting radially therefrom, gear l^2, secured to said frame, lever N, pivotally mounted upon said bed, said lever carrying at one end pinion n' and pulley n^2, intermediate connections between said lever and said shipping-ring, and a belt connecting said pulley n^2 with a suitable source of power, combined and operating substantially as described.

4. In a doubling-machine, a frame supporting at its upper end revolving shaft D, carrying wheel d', spindle G, carrying receiving-bobbin H and having drum g, resting by gravity upon the periphery of said wheel d', lever O, pivoted to said frame and having arm o' adapted to be moved against said drum g to elevate the latter, rock-shaft P, having an arm engaging said lever, revolving bobbin-rack M, mounted upon said frame near the lower end of the latter, means for imparting motion to said rack, lever N, governing the means by which motion is transmitted to said bobbin-rack, shipping-ring K, intermediate connections between said ring and said lever N, and also between said ring and said rock-shaft P, and intermediate connections, substantially as described, between said bobbin-rack and said shipping-ring, whereby movement will be imparted to the latter from the former upon the breaking of a filament in its passage from one of the bobbins carried by said rack to the receiving-bobbin H, combined and operating substantially as set forth.

5. In a doubling-machine, support I, having arms i, terminating in horizontal faces, in combination with shipping-ring K, adjustably secured upon said arms by screws i', passing through slots k in said ring, said ring having the inclines k^3 upon its lower side adjacent to said arms, arranged and operating substantially as and for the purpose set forth.

6. In a doubling-machine, support I, having arms i, shipping-ring K, adjustably mounted upon said arms, frame L, having a central hub revolubly supported upon said support I, said frame having the series of rods l, provided with annulets l', means for revolving said frame, bobbin-rack M, secured to said frame and having pegs m radially projecting therefrom, and lugs k^2, projecting from said shipping-ring into the path of movement of said annulets l' at the bottom of said rods l, combined and operating substantially as and for the purpose set forth.

7. In a doubling-machine, the combination, with the spindle adapted for carrying the receiving-bobbin H, frame L, carrying bobbin-rack M, and shipping-ring K, said frame also carrying gear l^2, of shaft C, carrying band-pulley c', lever N, carrying at one end pinion n' and pulley n^2 and having at its opposite end pin n^5, engaging a portion of said shipping-ring, and belt n^3, connecting said pulley c' with pulley n^2, substantially as described.

8. In a doubling-machine, the combination, with revolving frame L, of bobbin-rack M, mounted thereon, said rack consisting of standards m', secured to said frame, a plurality of rings having radially-projecting pegs m, supported upon said standards, and sleeves m^2, located upon said standards between said rings, substantially as set forth.

9. In a doubling-machine, a frame composed of end pieces A A, supporting between them bed B and united at their upper ends by cross-piece E, shafts C D, carrying intermeshing gears c d, mounted in bearings at the upper end of said frame, spindle G, hung in brackets projecting from said cross-piece E and having drum g resting by gravity upon a wheel d' on said shaft D, frame L, mounted upon said bed B and carrying bobbin-rack M, pinion n', engaging a gear l^2 on said frame, pulley n^2, connected with said pinion, and a belt connecting said pulley n^2 with a pulley c' on said shaft C, substantially as described.

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