(No Model.) 4 Sheets—Sheet 1.

N. LOMBARD.

BRAIDING MACHINE.

No. 458,470. Patented Aug. 25, 1891.

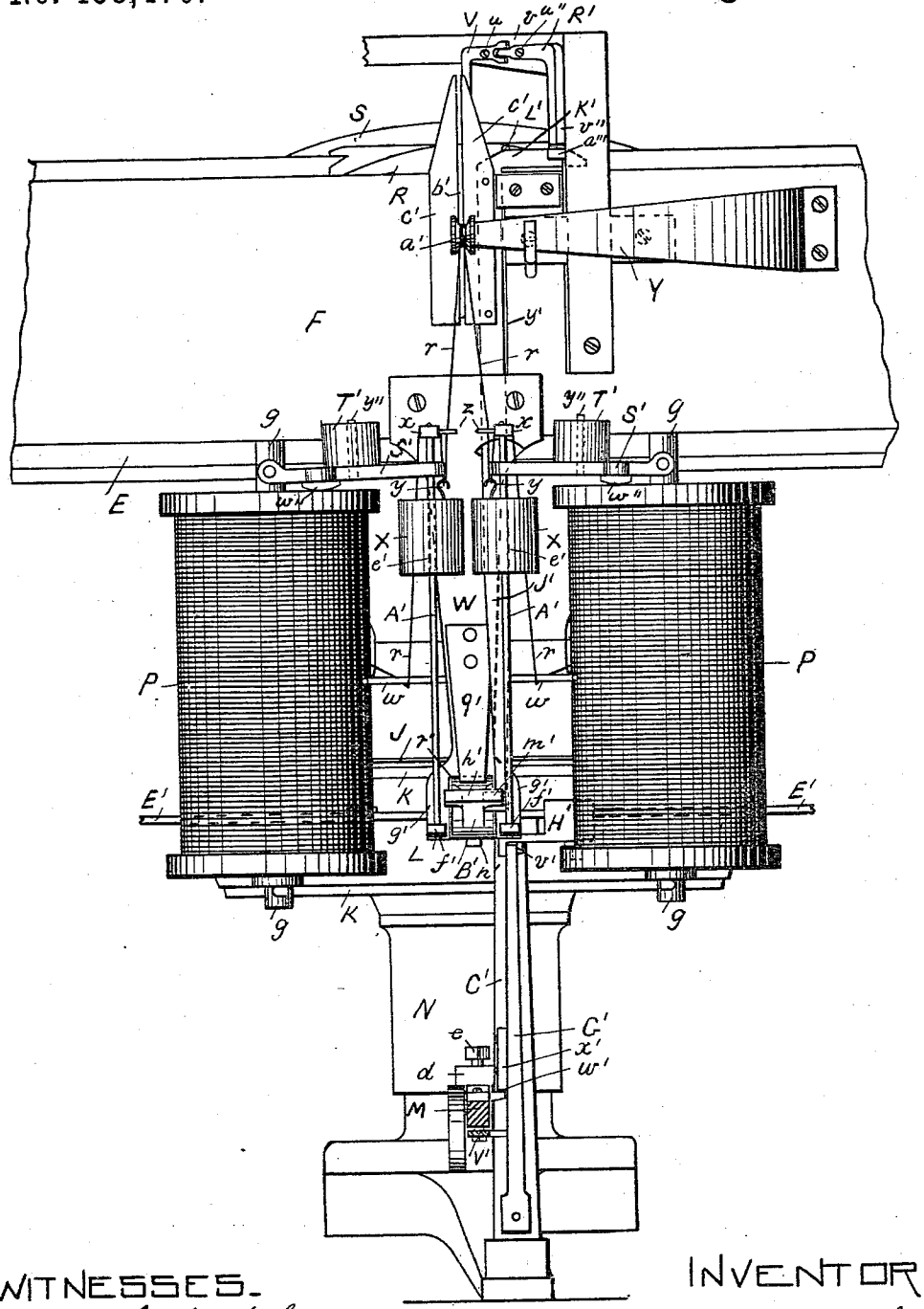


Fig. 1.

WITNESSES.

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(No Model.) 4 Sheets—Sheet 2.

N. LOMBARD.

BRAIDING MACHINE.

No. 458,470. Patented Aug. 25, 1891.

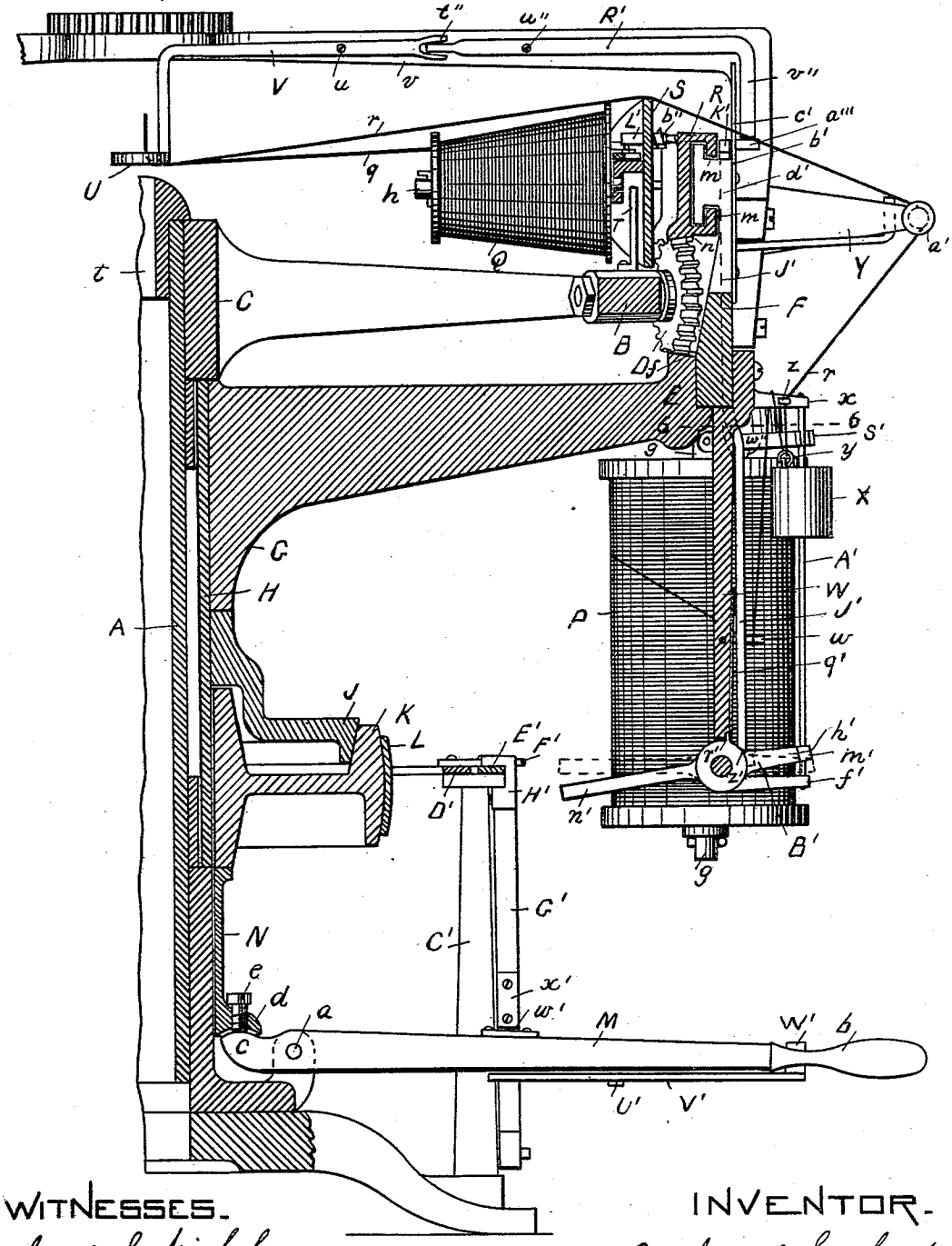


Fig. 2.

WITNESSES.

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(No Model.) 4 Sheets—Sheet 3.

N. LOMBARD.

BRAIDING MACHINE.

No. 458,470. Patented Aug. 25, 1891.

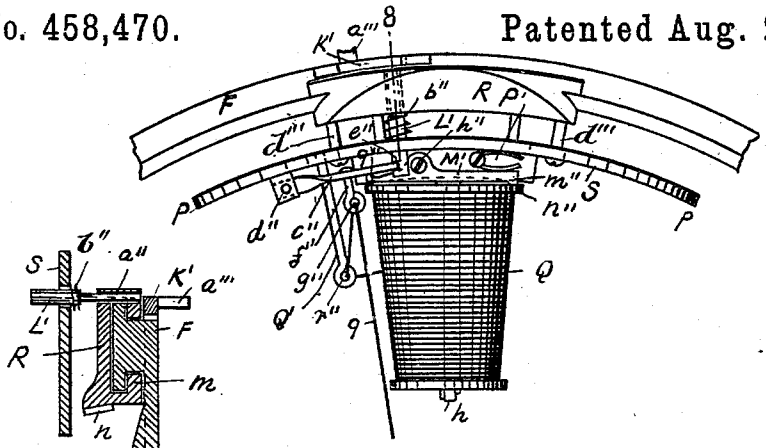


Fig. 3.

Fig. 8.

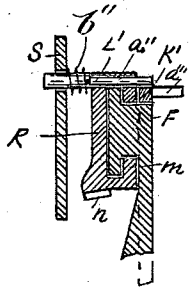


Fig. 9.

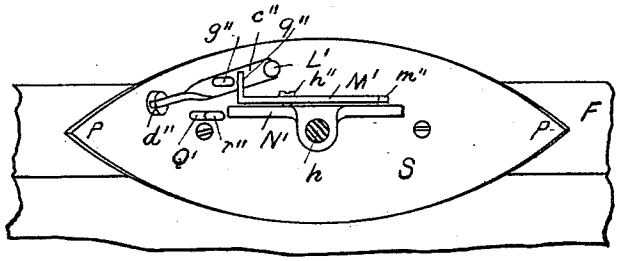


Fig. 4.

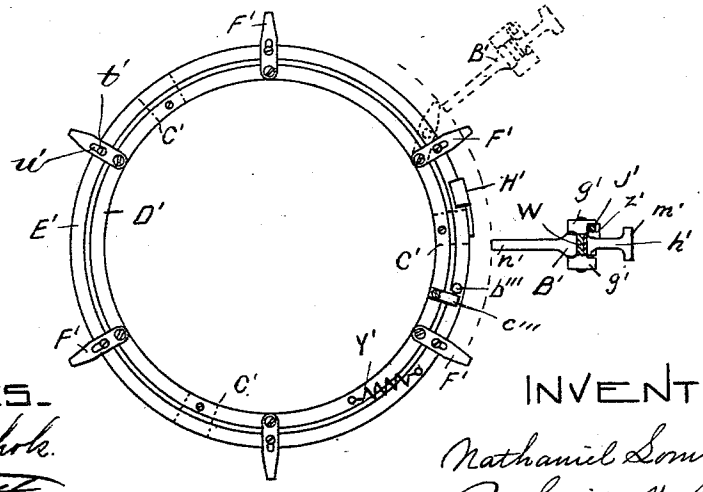


Fig. 5.

WITNESSES.

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(No Model.) 4 Sheets—Sheet 4.

N. LOMBARD.

BRAIDING MACHINE.

No. 458,470. Patented Aug. 25, 1891.

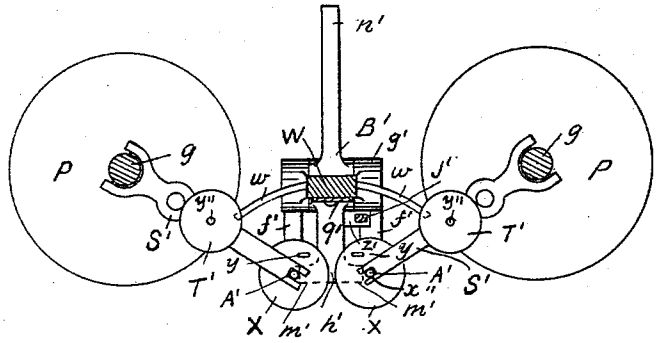


Fig. 6.

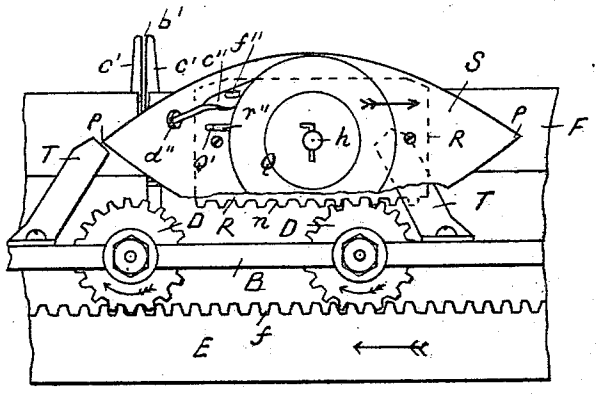


Fig. 7.

WITNESSES.

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UNITED STATES PATENT OFFICE.

NATHANIEL LOMBARD, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THOMAS A. JOHNSTON AND HENRY A. CLARK, OF SAME PLACE.

BRAIDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 458,470, dated August 25, 1891.

Application filed October 3, 1890. Serial No. 366,951. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL LOMBARD, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Braiding-Machines, of which the following is a full, clear, and exact description.

This invention relates to improvements in a braiding-machine for which I made application June 21, 1890, for Letters Patent of the United States, Serial No. 356,265; and it consists of means for producing tension upon the bobbin-threads, and also of means for automatically stopping the machine in case a thread breaks or the braiding becomes entangled at the braiding-point of the machine, so that the machine will immediately stop braiding, all substantially as hereinafter fully described.

The braiding-machine described and shown in the application referred to is of the class of braiding-machines which have two sets of bobbins arranged to move horizontally in circular lines about a common center, one set of bobbins moving in an opposite direction to the other set of bobbins.

The invention described in the application aforesaid consists, substantially, of a ring fixed upon a suitable support upon which are radially mounted a series of gears equidistantly spaced, and another ring concentric with the fixed ring and arranged to rotate upon a suitable support, and upon which latter ring is an endless circular rack or gear. The rotary ring also has a vertical ring or raceway for the shuttles or carriers for one set of bobbins, the other set of bobbins being placed in proper positions beneath and secured to and carried by the rotary ring. Each upper bobbin is connected with a curved plate toothed on its under edge, and of a length to span from center to center of the radial gears, with which it meshes at certain times, and when in connection with a single gear it permits the passage of a thread from one of the other set of bobbins at stated intervals of time beneath it and its shuttle. The endless rack or gear, by suitable connection with proper mechanism, is made to rotate in one direction, carrying with it the bobbins supported thereon, which compels the shuttle-bobbins, through their gear-plates engaging with the radially-mounted gears, to travel in the opposite direction, and as they all so travel the threads therefrom lead to the center of the machine and are there braided together to either form a braid complete in itself, or are braided round and about a central core or wire which passes up through the hollow standard, and which is fed from the machine in the usual or in any suitable manner. To secure this braiding of the threads, the threads from the lower bobbins are passed over and under the upper or shuttle bobbins and their threads alternately and successively by means of switch-plates, each secured to a bobbin-carrier plate, each of which switch-plates is of such a length and width in relation to the distance the shuttles or bobbin-carriers are apart and so located on its carrier-plate that in running the machine in the movements of the bobbins the threads of the lower bobbins are carried over certain shuttle-bobbins and their threads, and then under the next bobbins and their threads, and so on alternately over and under the shuttle or upper bobbins and their threads.

In the drawings accompanying this specification are illustrated portions of the braiding-machine described and shown in said application, sufficient, it is deemed, for a full understanding thereof, and in connection therewith the parts pertaining to the present invention.

In the drawings, Figure 1 is a detail front elevation of a portion of the braiding-machine referred to, showing two of the bobbins and the tension device and parts connecting with the stopping mechanism. Fig. 2 is a vertical central section of the machine from the center to its outside at one side on a vertical line between the two bobbins. Fig. 3 is a plan view of an upper bobbin and its carrier or shuttle and detail plan view of some of the parts of the stopping mechanism. Fig. 4 is a detail elevation of the parts represented in Fig. 3 back of the bobbin. Fig. 5 is a detail plan view of parts of the stopping mechanism. Fig. 6 is a detail plan view below line 6 6, Fig. 2. Fig. 7 is a detail elevation from the inside of the machine looking outward, to be hereinafter referred to, parts being broken away. Figs. 8 and 9 are detail

sections on line 8, Fig. 3, but showing the parts in two different positions.

The machine represented in the drawings has eight bobbins in the upper set and sixteen in the lower set, the latter being arranged in pairs, the two threads from each pair of bobbins joining as one as they are braided with an upper bobbin-thread; but in the machine in the application referred to there are eight bobbins in each set.

In the drawings, A is a tubular post or standard, to which is secured the ring B by its hub C, having a series of gears D radially mounted thereon at regular intervals. Concentrically with and below this ring B is another ring E, having a vertical rim F, the top edge of which serves as a raceway for the upper bobbins, and by its hub G the ring E is rigidly fixed to a sleeve H. This sleeve is adapted to revolve about the standard, and motion is communicated to it and the ring E by a circular disk J, fixed to it and arranged to engage by friction with a pulley K, operated by a belt L, connected to any suitable driving mechanism. The friction-pulley K loosely fits the sleeve H, and is raised to engage with the disk J by a lever M, pivoted at *a* to the lower part of the standard, the said lever having a handle *b*, for operating it, and bearing by its shorter arm *c* on the under side of a lug *d* or vertical screw *e* in the lug of a collar N, loosely fitting the standard and on which the pulley K rests. The collar, however, does not revolve, but is arranged to move freely up and down the standard a short distance when operated by the lever. The ring E has an endless rack or gear *f*, with which the gears D engage, and on the ring are supported the bobbins P, two of which bobbins are shown in side elevation in the drawings, each of which is supported on a separate downwardly-projecting arm or spindle *g* of the ring E, so that they can freely turn thereon.

Q is a bobbin in the upper set, and each is similar to every other in the set, and the mechanism for operating each is alike in every respect. The bobbin Q is supported on a horizontal arm *h*, carried by a bar N′ on a switch-plate S, secured to a carrier-plate R, which arm extends radially toward the central line of the machine, and on which arm the bobbin can freely turn. The carrier-plate consists of a bent casting rectangular in side elevation, of the same curvature as the rim or circular raceway F, upon which it travels, and it has top and bottom lateral lips *m*, which grasp the raceway, as shown in Fig. 2, and its under edge is toothed, as at *n* in Fig. 7, to engage with the radial gears D, the length of the plate extending from center to center of any two adjacent gears, which are double in number to the bobbins Q. The motion of the bobbin-carrier plate is continuous; but while it is being carried solely by one of these gears an interval or opening between the plate and the next gear occurs, whereby a lower bobbin-thread is enabled to pass down by the upper bobbin and carrier-plate, which moves across and over it. The switch-plate S is attached to the inner side of the bobbin-carrier plate by screws *d*‴, which, from its width as the lower bobbin-thread passes over it and under it, causes the said bobbin-thread to be carried clear of the bobbin above and the carrier-plate teeth below. The normal height of each lower bobbin-thread as it travels through the guide-slot *b*′, hereinafter referred to, is in a plane slightly below the longitudinal axis of the switch-plate, so that when the thread is in its normal position the end P of the switch-plate will pass above the thread, the thread passing along the under edge of the switch-plate being depressed and held below the plane of the teeth of the bobbin-carrier plate, so that all parts of the upper bobbin and its supporting carrier or shuttle are free to pass over said thread. To have the thread pass over the next upper bobbin, the lower-bobbin thread in its continued movement strikes a switch-arm T, fixed to the ring B, which raises it sufficiently for it to be in a plane above the longitudinal axis or point *p* of the moving switch-plate, which then raises the thread as it passes over it high enough for the upper bobbin and all the connected parts to pass freely under it, so that the threads from each pair of lower bobbins pass alternately below and above the upper bobbins as they travel along in opposite directions. The threads *q* and *r* from all the bobbins extend toward the center of the machine and pass up through a horizontal eye U above and vertically concentric with the opening *t* in the standard, the said eye U being formed at the end of an arm V, pivoted at *u* to a support *v* of the framework. The threads from each pair of lower bobbins first separately pass under a cross-bar *w*, attached to an arm W, Fig. 1, depending from and secured by screws to the rim F of the ring E, thence each over a separate projecting arm *x*, down to and through an eye *y* of a weight X, to and over an eye or hook *z*, fixed on said arm X, and then together to and over wheel *a*′ in the free end of a horizontal tension-spring Y, thence through a vertical guide-slot *b*′ between two uprights *c*′, secured to the outside of the rim, to the central eye U, the rim also having a vertical slot *d*′ in it back of and coincident with said guide-slot *b*′. Each of the weights X has a central vertical hole *e*′, by means of which it fits loosely over a vertical rod A′, secured in position near a bobbin P to the arm *x* and an arm *f*′ of the downwardly-projecting arm W and so that each weight can freely move up and down upon its guide-rod. Horizontally pivoted between the bifurcated arms *g*′ of the arm W is a lever B′, one arm *h*′ of which projects forward and has a cross-piece *m*′, which is under the weights X, as shown in Figs. 1 and 2, the rear arm *n*′ of the lever projecting toward the center of the machine.

q' is a spring secured to the outside of the supporting-arm W and bearing by its free end against a lug or shoulder r' on the lever B′ to return it to its normal position after being acted upon, as will be hereinafter described, the lug resting against the arm W when the lever is in its normal position.

Secured rigidly on posts C′, rising from the feet of the machine, is a flat ring D′, and outside of this ring in the same horizontal plane is another ring E′, concentric therewith and arranged to rest upon the top of the posts to swing or slide back and forth thereon and connected to the other ring D′ by a series of fingers F′, placed at regular intervals, each finger being pivoted to the stationary or inner ring D′ concentric with the center of the machine and connected to the outer ring by a pin t' of the ring passing through a longitudinal slot u' in the finger, the fingers projecting beyond the outer ring, as shown in Fig. 5.

Pivoted at its lower end to the side of one of the posts C′ near the lever M is a vertical arm G′ at the side of the lever, its upper end engaging in a socket v', Fig. 1, in a block H′, firmly secured to the outer ring E′ by a screw or in any suitable manner. On the side of this swinging arm G′ is a shoulder w', made by securing a block x' by screws to the arm, under which the pulley-operating lever M is placed when pressed down and the pulley K moved into frictional contact with the disk J for running the machine, which shoulder holds the lever pressed down. Moving the lever out from under the shoulder lets the pulley drop sufficiently to release it from frictional connection with the disk, stopping the machine. The inner ends n' of the levers B′ are normally in a horizontal plane below the fingers F′, as shown in Fig. 2; but if any one of these levers is swung up to its position shown in dotted lines in Fig. 2 its inner end then will be in the same horizontal plane as the ring-fingers, which will be in the path of such raised lever, and as the lever is carried round in the running of the machine it will strike against the side of the finger next to it in advance and move it and consequently swing the ring E′, and by its block H′ in engagement with the upper end of the pivoted arm G′, will swing the said arm G′ on its pivot and its shoulder w' from over the operating-lever M, leaving the lever M free to move, so that the pulley K by its weight will drop and be released from frictional contact with the disk J, thereby stopping the machine.

The levers B′ are operated automatically by the weights X, each of which is suspended on a thread r, leading from a bobbin P to the center of the machine, and in the operation of the machine each of these weights, from the tension of the threads when the machine is operation, is held up nearly to the top of the bobbin, as shown in Figs. 1 and 2, and if one of these threads should break when the machine is running its weight X would instantly drop onto the outer end of the lever B′ under it, and pressing it down raise its inner end into the horizontal plane of the fingers F′ for it to strike the next one in advance and move the ring E′, and consequently the arm G′, from its engagement with the lever M, thereby releasing the pulley and stopping the machine, as before stated. In the drawings the ring E′ has six of these fingers F′, so that immediately a thread breaks its lever will be near enough to a finger as it is moved to operate it and stop the machine before it can make more than a small part of a revolution.

In Fig. 5 is shown in dotted lines a finger as moved by the lever, the latter being also shown in dotted lines and as having just moved the finger and in the act of passing the finger, the semicircular dotted line indicating the line of movement of the end n' of the lever.

J′ is a vertical bar set and arranged to move up and down in an outer vertical groove y' in the rim F, being flush with the same, and it extends above the rim sufficiently for a horizontal extension or arm K′ of it to lie a short distance above and along the upper edge of the rim, but out far enough to be clear of the bobbin-carrier plates as they travel along the raceway. This bar extends down in front of the arm W, which supports the lever B′, and between each pair of bobbins P, and rests by its lower end on a shoulder Z′ of the lever. Pushing this bar J′ down moves the lever B′ in the same manner as one of the weights when falling on it and stops the machine, as before described,

Back of each bobbin Q is a horizontal pin L′, arranged to move back and forth radially in a socket a'' in its carrier-plate R and a socket in the switch-plate S. A spiral spring b'' around the pin L′ between the two plates by its tension acts to push the pin outward for its outer end to project beyond the bobbin-carrier plate. An arm c'', pivoted at d'' to the inner side of the switch-plate by its free end, lies in and engages with a cross-slot e'' in the inner end of the pin L′, and attached to the inner side of this arm c'' is a short wire f'', having an eye g'', through which the thread from the bobbin Q passes.

M′ is a lever pivoted at h'' to the side of the bar N′ of the switch-plate S and adapted to bear by its angular end m'' against the bobbin-head n'', being held there by a spring P′, bearing against its side and the side of the switch-plate to create friction on the bobbin. The other end of this pivoted lever has an upwardly-extending arm q'', against which rests the arm c'', as shown in Figs. 3 and 4. The thread q from a bobbin Q passes through an eye r'' of an arm Q′, rigidly secured to the switch-plate, to and through the eye g'' of the lever c'', and thence to the central guiding-eye U of the machine. As the thread is unwound from its bobbin in braiding, it pulls more or less upon the arm c'', pressing corre-

spondingly upon the arm q'' of the lever M′, relieving the pressure of its end m'' upon the bobbin, letting the thread deliver freely as needed, and as the pull upon the thread is lessened or relaxed the arm c'' is accordingly released from pressure upon the lever M′, allowing its spring P′ to press the lever the firmer upon the bobbin to prevent the thread from unwinding too freely. During the running of the machine the tension on the thread q pulls upon the lever c'' strongly enough to overcome the power of the spring b'' on the pin L′ and holds the said pin forward or near to the bobbin, as shown in Fig. 3, preventing its outer end from projecting beyond the bobbin-carrier plate; but the instant the thread breaks, its tension on the lever c'' being then off, the spring b'' acts on the pin and throws or moves it outward for its outer end to project beyond the bobbin-carrier plate, and as it is then the same distance radially from the center of the machine as the horizontal arm K′ of the operating-bar J′, and as such pin is on a horizontal plane lower than the horizontal plane of the top of said horizontal arm when pushed out, as described, its outer end will ride over and upon such arm, pressing down the arm, and thus the bar J′, which operates the lever B′ to move it into the plane of the ring-fingers to act upon one of them, as before described, to stop the machine. The central guiding eye-lever V engages by fork t'' with the end of a lever R′, pivoted at u'' to the support v, the other end v'' of lever R′ being bent down and arranged to be just over an outer extension or arm a''' of the horizontal arm K′ of the bar J′, but out of range of the operating-pins L′ of the shuttle or bobbin carrier. When the machine is running, the threads are drawn tightly under the guiding-eye, which hold it up, and consequently the end of the lever engaging with it; but if by reason of imperfect braiding or bunching of the threads they are caused to lower, the eye end, being weighted, falls with the threads, thus pressing down, through its connection with the lever R′, the bar J′ upon the lever B′ and stopping the machine, as before described. Thus if any thread breaks, or the threads at the central eye do not braid properly or run down in braiding, the machine will be automatically stopped and further braiding cease. The eye end of the lever V is weighted sufficiently to always fall if the threads lower in braiding to insure the end v'' of its connected lever R′ being moved into position to operate the bar J′ to stop the machine.

S′ is a horizontal arm pivoted to the rod g, on which a bobbin P is supported and resting by a rounded under projection w'' upon the head of the bobbin on its supporting-rod, its outer end having an open slot x'', Fig. 6, in which loosely lies the rod A′, and on top of this arm is a weight T′, held thereon by being placed over an upright pin y'' of the arm. This weighted arm is for the purpose of creating friction on the head of the bobbin to prevent it moving to loosen or unwind the thread faster than it is pulled off in the braiding operation.

As intended in this braiding-machine, the threads from each pair of lower bobbins are joined together as they pass over the wheel a' on the spring Y, passing from thence practically as one thread in lieu of having only one bobbin and having two threads wound upon it. As is obvious, if desired, only one bobbin need be used, and one, two, or more threads may be wound upon it, as desired. The weights X in their normal positions when supported on the bobbin-threads are at a height to bear more or less against the under side of the weighted tension-levers S′, so that if the thread is delivered too hard the weight will be lifted higher, raising the tension-lever from the bobbin and relieving it of its pressure more or less, so that the thread will run off the bobbin freer and easier, and thus between the two the bobbin-thread will be automatically controlled in its delivery therefrom.

On the under side of the operating-lever M is pivoted at U′ an arm V′, bearing by one end against the side of the vertical stop-arm G′ and having at its other end an upwardly-projecting piece W′ at the side of the lever. When it is desired to stop the machine, the end W′ is pressed toward the lever, which will cause arm V′ by its other end to move the arm G′ from its engagement with the lever, stopping the machine, as before described.

In running the machine the ring E with the lower bobbins moves to the right, the upper bobbins traveling to the left or in the opposite direction; but the machine is arranged to run in the reverse directions. The spring q' to the lever B′ acts to return it to and hold it in its normal position when otherwise free to be moved for operation thereon again. The arm K′ to the bar J′ is beveled upon its upper side at each end to allow either end to freely pass under the pin L′ when it is moved out to act upon the bar. The support D′ for the fingers F′ need not be in the form of a ring, it only being essential to have the fingers pivoted to a support. A spring Y′ is attached to the two rings D′ and E′ to return the ring E′ to its normal position again after the lever B′ has acted upon it and passed its finger F′, a pin b''' of the ring E′ resting against a stop c''' secured to the ring D′, as shown in Fig. 5.

Having thus described my invention, what I claim is—

1. In a braiding-machine, the combination of a revolving ring, a support for a bobbin secured to said ring, a weight adapted to be hung on the bobbin-thread, a guide for said weight, a lever B′, and mechanism adapted to be actuated by said lever to stop the operation of the machine.

2. In a braiding-machine, the combination of a revolving ring, a support for a bobbin

secured to said ring, a weight adapted to be hung on the bobbin-thread, a guide for said weight, a lever B′, a finger F′, a support for said finger, a lever M controlling the driving mechanism, an arm G′ to lock said lever, and mechanism operated by said finger to disengage said arm G′ from said lever, for the purpose specified.

3. In a braiding-machine, a bobbin-carrier having a pin or rod adapted to move back and forth in said carrier, a spring acting on said pin or rod, and a lever c'' engaging with the pin or rod and engaging with the thread from the bobbin, combined with a vertically-moving bar or arm J′, adapted to be engaged by the pin or rod when moved outward by said spring, a lever B′, and mechanism operated by the lever B′ for stopping the driving mechanism of the machine.

4. In a braiding-machine, the combination of a revolving ring, a support for a bobbin secured to said ring, a weight adapted to be hung on the bobbin-thread, a guide for said weight, a lever B′, a series of fingers or arms concentrically arranged and pivoted upon a suitable support, a ring connected by pins and slots to said fingers or arms and adapted to move forward and backward on a suitable support, an arm engaging with said ring, and a lever connected to the driving mechanism arranged to be locked by said arm, for the purpose specified.

5. In a braiding-machine, the combination, with a lever having a central guiding-eye through which the threads from all the bobbins pass in braiding, of a lever engaging with said lever, a vertically-moving bar or arm J′, adapted to be operated upon by said latter lever, a lever B′, adapted by one of its arms to be operated by said bar or arm, and mechanism for releasing the driving mechanism of the machine, arranged to be operated by the other arm of said lever.

6. In a braiding-machine, the combination, with a carrier for a bobbin having a pivoted spring-pressed arm arranged to bear upon the bobbin, a pin or rod adapted to move back and forth in said carrier, a spring acting on said pin or rod, and a lever c'' engaging with the pin or rod and engaging with the thread from the bobbin, of a vertically-moving bar or arm J′, adapted to be engaged by the pin or rod when moved outward by said spring, a lever B′, and mechanism operated by said lever for stopping the driving mechanism of the machine.

7. In a braiding-machine, the combination, with a support for a bobbin, of a weight adapted to be hung upon the bobbin-thread, a guide for said weight, consisting of a rod or arm secured to a support, the weight having a hole or socket through it, through which the rod passes and on which the weight is arranged to freely slide up and down, and a weighted arm pivoted to a support and arranged to bear upon the bobbin, for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

NATHANIEL LOMBARD.

Witnesses:
EDWIN W. BROWN,
CARRIE E. NICHOLS.