S. W. WARDWELL.

TENSION CONTROLLING DEVICE.

APPLICATION FILED MAR. 3, 1908.

949,407.

Patented Feb. 15, 1910.

2 SHEETS—SHEET 1.

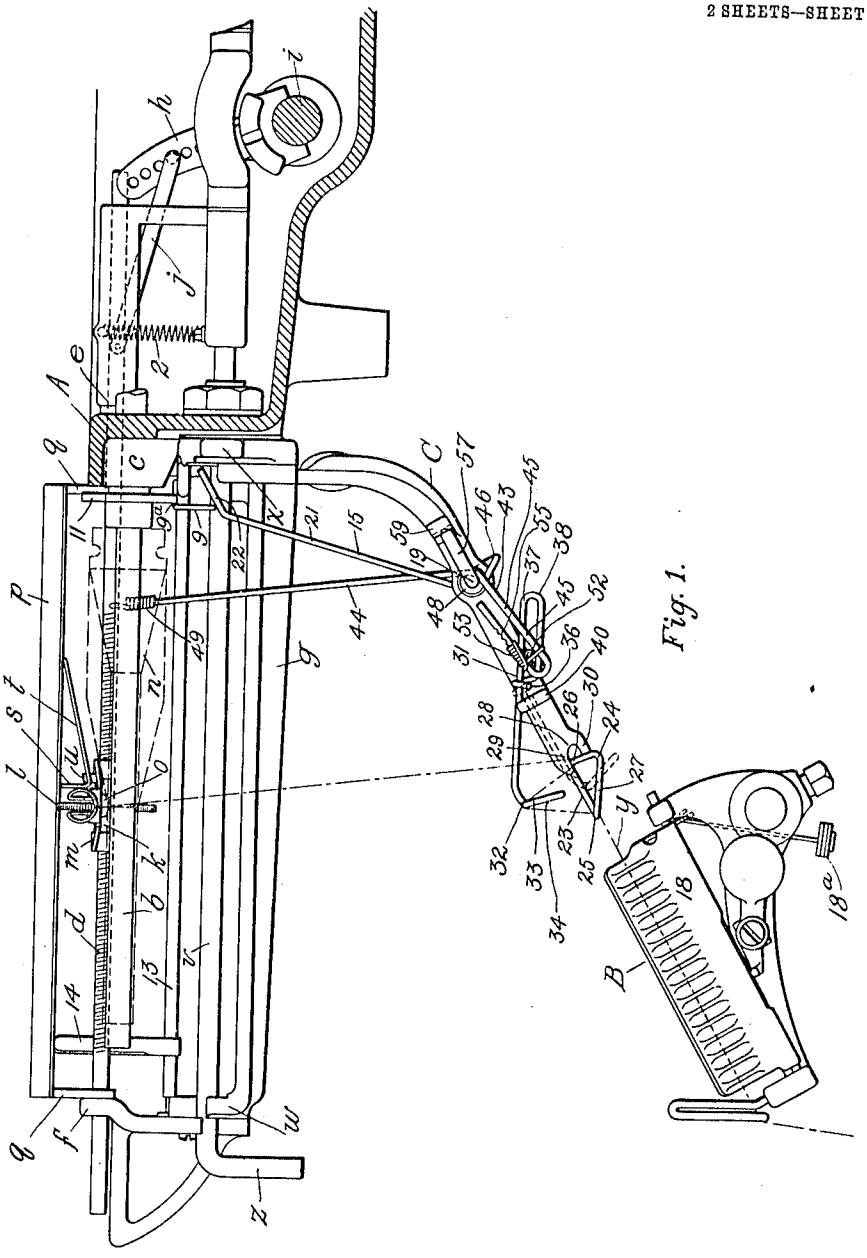

Fig. 1.

WITNESSES

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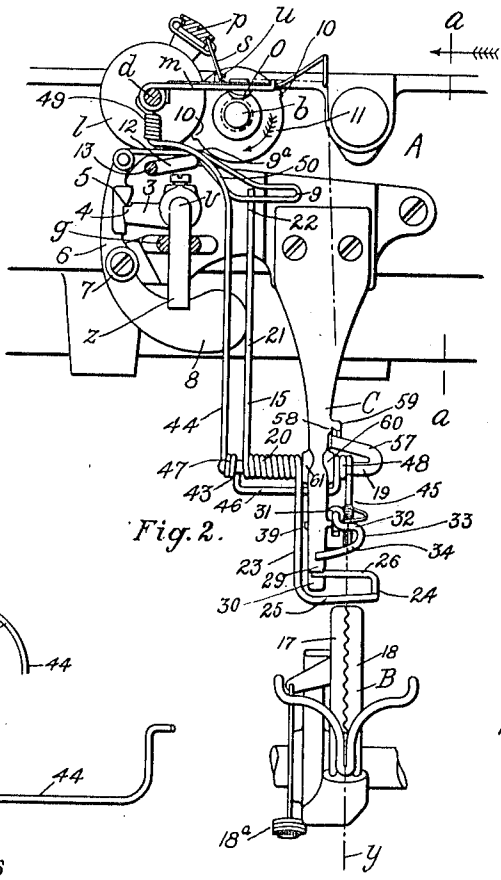

Fig. 2.

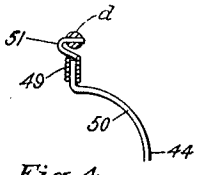

Fig. 4.

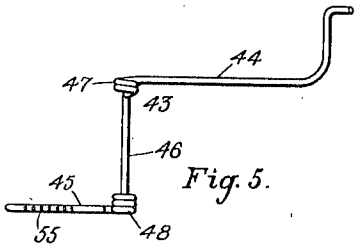

Fig. 5.

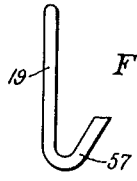

Fig. 6.

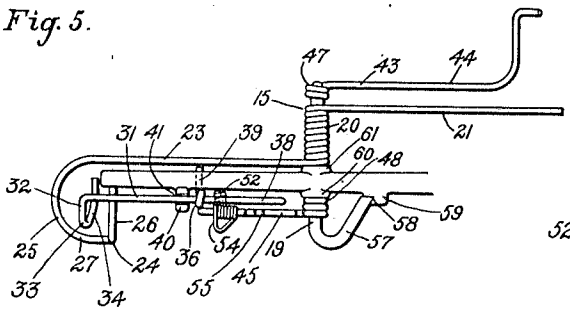

Fig. 3.

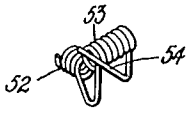

Fig. 7.

WITNESSES.

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UNITED STATES PATENT OFFICE.

SIMON W. WARDWELL, OF PROVIDENCE, RHODE ISLAND.

TENSION-CONTROLLING DEVICE.

949,407. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed March 3, 1908. Serial No. 419,000.

To all whom it may concern:

Be it known that I, SIMON W. WARDWELL, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Tension-Controlling Devices, of which the following is a specification.

My invention relates to tension devices for winding machines, for automatically controlling and varying the degree of tension applied to the yarn in winding.

My improvement is especially adapted to winding filling bobbins, quills or shuttle cops, in which the yarn is wound in conical layers to form the tapering nose of the cop, and the object of my invention is to provide for winding with maximum tension at the apex of the cone and with decreasing tension as the yarn traverses toward the base of the cone, to add stability to the yarn mass.

My invention is fully described in the following specification, illustrated by the accompanying drawings, in which:—

Figure 1 is a front elevation of a portion of the winding machine, showing my device applied thereto, in part section on the line *a*—*a* of Fig. 2, looking in the direction indicated by the arrow; Fig. 2, a side elevation of the same; Fig. 3, a plan view of the device, in detail; Figs. 4, 5, 6 and 7, detail views of the parts.

I have shown my invention applied to a machine of the character described in my pending application, Serial No. 418,998, filed March 3rd, 1908 but it will be obvious that the device is equally well adapted to any style of machine for producing taper-ended quills, cops or bobbins. These bobbins are for use in cloth looms, and contain the weft or filling which is delivered from the shuttle as the latter is thrown across the loom in weaving. It is necessary to have a free, unrestricted delivery from the shuttle, otherwise the quick draft on the yarn will cause breaks, which limit production, make waste, and spoil the quality of the fabric. The object in laying the yarn with a short traverse, as compared with the length of the bobbin, and building the bobbin with a tapered nose is, of course, to provide for the greatest freedom in delivery, but in practice, several defects have been found in this style of bobbin.

Previous to my invention, in all machines designed for producing shuttle bobbins, the yarn is wound with very little tension, so that the coils are loose and the bobbin soft and unstable. In handling, the end coils at the apex of the cop become loosened and "slough off," causing snarling and tangling. The displaced coils must be pulled off before the bobbin can be used, and much yarn is thus wasted by the operator. Again, the jar and shock of the shuttle at the ends of its throw across the loom, often loosens the yarn from the bobbin and the coils become snarled and clog the eye of the shuttle. This results in frequent breaks in the filling, with consequent loss of time and material. To correct this defect, I have found, after considerable experimenting, that, if the coils of yarn at the apex or point of the cop are wound with increased tension, they will remain in place and give greater stability to the nose of the bobbin, thus preventing "slough-offs." It is pointed out, however, that it is not desirable to wind the yarn at the base of the cone (at the greatest diameter of the bobbin) with extreme tension, because the constriction of the outer coils would be liable to cause the displacement of the inner ones, and the nose of the cop would bulge, making the cop deformed and useless.

The means for augmenting the tension on the yarn while the latter is being wound on the apex of the bobbin is the principal feature of the present invention, and will now be described.

In Fig. 1, A is the frame of the machine, from which projects the winding spindle *b*, adapted to rotate in the bearing *c* and driven from suitable gearing or other connections not here shown. The traverse-bar or rod *d* extends from the frame A parallel with the spindle *b* and is adapted to reciprocate in bearings *e* and *f*, the latter formed in a bracket *g* attached to the frame A. The traverse-rod *d* is reciprocated from an arm *h* on the rocker shaft *i*, through the connecting link *j*, as described in my pending application above referred to. The traverse-rod *d* is threaded, and engaging the thread is a nut *k*, on which is mounted a wheel *l* adapted to contact with the periphery of the bobbin. The nut *k* is arranged to be straddled by the two legs of the traverse-guide arm or holder *m*, which also surround the rod *d*, see Fig. 2, so that the feeding of the nut along the rod *d* causes the

traverse-guide *o* to advance longitudinally of the winding spindle. The turning of the nut *k* is effected through the contact of the wheel *l* with the bobbin, which occurs each time the traverse-guide reaches the extreme of traverse nearest the frame A, or, in other words, each time the guide reaches the base of the cone on which it is winding, at the periphery of the cop. The winding is started on the conical face of the bobbin or tube *n*, and the cop grows by longitudinal extension, caused by the feeding of the guide along its traverse-rod as the wheel *l* is turned at each complete reciprocation. The thread-guide *o* is held in the holder *m*, which is hinged on the traverse-rod *d*, as previously explained, and through this arrangement, the guide *o* is adapted to oscillate, to allow it to ride up the incline of the nose of the cop. To provide for keeping the thread-guide *o* constantly in contact with the surface on which the winding is done, a pressure frame or bearing bar *p* is provided. The bar *p* is formed with two legs *q*—*q*, which have bearings on the traverse-rod *d*, thus hinging it on the same axis as the thread-guide holder *m*. The bearing bar *p* does not bear directly on the thread-guide, but between the guide-holder and bar is interposed a wire bail *s*, having a guiding wire *t* which is formed to correspond to the angle of the nose of the cop. A lug *u* on the guide-holder *m* hooks up over the wire *t*, so that the guide *o* follows the form of the wire in its traverse. The bail *s* slides in grooves along the bar *p*, as the guide travels along the traverse-rod *d*. By this arrangement, the weight of the bar *p* provides pressure on the thread-guide, to keep the latter firmly in contact with the surface of the cop, the function of the bail *s* being to allow the guide to move toward and away from the axis of the cop without causing the bar *p* to rise and fall therewith. All of this with the purpose and benefit thereof is fully explained in the pending application above referred to.

The starting and stopping of the machine is controlled through a rock-shaft or rod *v*, arranged in bearings *w* and *x*, and manually operated to start the machine, by the handle *z*, see Fig. 2. The rod *v* extends through the frame of the machine and is operated by a spring 2 to control the clutch levers, not here shown in detail. On the outside of the machine the rod carries an arm 3, formed at its outer end with a detent 4, adapted to engage the corresponding detent 5 on the lever 6. The lever 6 is pivoted on the frame A at 7 and is weighted at 8 to keep it normally in engagement with the arm 3. At the top of the lever 6, is hinged a pawl or stopping-lever 9, formed of wire and having an offset 9^a adapted to be engaged by projections 10 on the collar 11, which is fast on the spindle *b* and rotates therewith in the direction indicated by its arrow, Fig. 2. The stopping-lever 9 is limited in its downward movement by an element 12, on which it rests, the element 12 being part of, or fastened on, a rod 13 which extends parallel with the rod *v*. The rod 13 carries at its outer end a lever 14 which is adjustable along the rod and adapted to be engaged by the thread-guide holder *m*, when the latter reaches the end of the tube on which the cop is being wound. The engagement of the guide-holder with the lever 14 tilts the latter and rocks the rod 13 to throw the stopping-lever 9, into engagement with the collar 11, to release the detents and stop the machine. The stopping-lever 9 is also adapted to be thrown into engagement with the collar 11, by the action of the end-stop-bar 15, to be later described.

To apply the normal degree of tension to the thread or yarn, I provide a usual tension device, such, for instance, as that shown at B in the drawings. This consists of two hinged plates 17 and 18, adapted to be pressed toward each other by the action of weights 18^a or other means, and formed with corrugations on their faces. The yarn *y* is led between the tension plates and is given a sinuous course as it draws across the corrugations, which creates resistance to its draft and thereby applies tension.

Extending downward from the frame A and projecting outward toward the tension device B, is a bracket C which carries the end-stop-bar and, also, the tension varying mechanism now described.

Projecting through the bracket C is a pin 19, which forms a pivot for the end-stop-bar 15, the latter being preferably of wire, formed with a helical coil 20, which serves as a bearing on the pin 19. An arm 21 of the end-stop-bar extends upward from one end of the coil 20 and is bent back at 22, to form an incline underneath, and adapted to contact with, the stopping-lever 9. When the arm 21 is tilted or rocked away from the frame A, the inclined end 22 acts as a wedge to raise the stopping-lever 9 into position to be engaged by the collar 11, to move it to stop the machine. Extending from the opposite end of the coil 20 is an arm 23 formed at its end with a loop 24 which provides two bearing-bars, 25 and 26, for the thread. The loop portion of the wire is preferably of V-shape, bent downward to form a guide 27 for the yarn, to direct it under the two bars 25 and 26, when the machine is threaded up. The end of the bracket C is provided with an opening 28, having jaws or lugs 29 and 30, between which the bar 26 is located. These lugs serve as stops to limit the movement of the end-stop-lever 15. The yarn *y* supports the arm 23 in its raised position, as shown by

full lines, Fig. 1, but when the yarn breaks or is exhausted, the weight of the arm 23 causes it to drop, thus tilting the arm 21 and raising the stopping-lever or pawl 9, to stop the machine, as hertofore explained.

The auxiliary tension device for automatically augmenting the normal tension, when the yarn is being wound on the apex of the cone, comprises essentially, a moving element, preferably a rocking or oscillating lever 31, to which, motion is imparted from any going member of the machine. I have shown the lever 31 as preferably oscillated through connections with the transverse-rod *d*, because this method provides for timing the movement of the lever 31 synchronously with the transverse of the thread-guide. The lever 31 is preferably formed of wire and is provided with a bearing-bar 32, for the yarn, which is arranged to be normally in a position intermediate the two bars 25 and 26 and approximately in line therewith. The yarn *y*, as it leaves the tensions B, draws under the bar 25, then over the bar 32, and under the bar 26. It will be seen that by moving the bar 32 upward, away from the bars 25 and 26, an angular course is imparted to the yarn, so that it makes sharp bends around the bars, and it will be obvious that the resistance to its draft will be increased with the distance of the bar 32 from the bars 25 and 26.

The bearing-bar 32 is bent down into a loop 33, formed with an inclined portion 34 which acts as a guide in threading the yarn up over the bar 32. With the lever 31 in the position shown by dash lines, Fig. 1, when the yarn is drawn up under the loop 24, it rides up the incline 34, over the top of the bar 32, in position to be deflected from its straight course by the upward movement of the bar. If the machine happens to stop with the bar 32 in its raised position, as shown by full lines, Fig. 1, it is only necessary to thread the yarn up under the bars 25 and 26 and lead it up through the thread-guide *o* to the winding spindle; and when the machine is started the bar 32 will descend and automatically pick up the yarn, the incline 34 acting to force the yarn outward, around the loop 33 and up over the bar 32. The lever 31 is pivoted at 36, on the bracket C, in the following described manner: The arm 37 of the lever extends in a loop 38 and at the end of this loop the wire is bent upward and coiled around the main wire with its end 39 extending at right angles and adapted to project through a bore in the bracket C. To retain the lever 31 in its bearing, a lug 40 on the bracket C is provided with a slot 41, in which the main arm of the lever 31 is adapted to play up and down, but which limits the lateral movement of the wire, see Fig. 3.

The pin 19, besides serving as a bearing for the end-stop-bar 15, also performs a similar function for the rocking lever 43, from which the lever 31 is oscillated. The lever 43, is preferably formed of wire and has two arms 44 and 45, connected by the horizontal wire 46, which is coiled at 47 and 48 to form bearings surrounding the pin 19, see Figs. 3 and 5. The arm 44 extends upward from the coil 47 to the transverse-rod *d*, to which it is connected by the member 49. The arm 44 is arched at 50 to clear the stopping mechanism. The member 49 is preferably of wire, coiled to form a thimble surrounding the end of the arm 44, with a hook 51 adapted to engage a bore in the rod *d*. The thimble 49 is adapted to slide on the arm 44 and the latter rides up and down within the thimble to provide for the arcal movement of the end of the arm as it oscillates back and forth.

The arm 45 of the lever 43 takes the form of a loop, corresponding to, and arranged alongside, the loop 38 of the lever 31. To connect the lever 43 with the lever 31, I provide a stud or pintle 52, which has a support slidable on the arm 45, and projects through the loop 38. The stud 52 is preferably formed of wire, close coiled to a diameter adapted to enter the loop 38, and extending down around the lower wire of the arm 45 and coiled again at 53 to surround the upper wire, see Figs. 1 and 7. From the end of the coil 53 the wire is bent outward and then back across the top of the upper wire of the arm 45, the end 54 acting as a spring detent adapted to engage notches 55 in the arm 45. The stud 52 can be slid along the arm 45, toward or away from the pivot point of the lever 43, so that the throw of the stud, when the lever oscillates, may be varied to regulate the degree of action of the lever 31. The purpose of this arrangement is to provide for regulating the amount of extra tension applied to the yarn as it is wound near the apex of the cone of the bobbin, some varieties of material requiring more tension than others to make the cop stable.

The pin 19 is secured in the bracket C in the ingenious and novel manner now described: As before mentioned, it projects through a bore in the bracket and one end is bent around in the hook 57, the end of which is beveled off and adapted to fit a V-shaped notch 58 in a lug 59 on said bracket. The hook 57 is so formed that its end must be sprung into the notch, against the spring tension of the wire, and when so engaged, it is firmly held, laterally and longitudinally, against accidental displacement. To remove the pin, it is only necessary to apply sufficient force to turn it in its bearing to overcome the frictional engagement of its end with the notch 58.

It will be seen that the coil 48 of the lever

43 bears against a hub or boss 60 on the bracket C, which limits its lateral movement in one direction and movement in the opposite direction is limited by the coil 20 of the end-stop-bar 15, which, in turn, bears against the boss 61 on the bracket C. The coil 47 retains the end-stop-bar 15 in position on the pin 19 and the coil 20 locates the bearings of the lever 31 so that both are held by mutual coaction. An important advantage results from forming the parts of wire, because they can be manufactured more cheaply, and, particularly, because they may be made much lighter than castings, yet have the required strength.

The operation of the device is as follows: After determining the amount of additional tension to be applied to the yarn as it winds on the point of the bobbin, the stud 52 is adjusted on the arm 45 of the lever 43, toward or away from the fulcrum of said lever to give a greater or less range of movement of the stud, as the case may require, when the lever 43 is rocked. The detent 54 will spring into an appropriate notch on the arm 45 to retain the stud in its adjusted position. The yarn *y* is then led up between the plates 17 and 18 of the tension device B, under the thread bearing bars 25 and 26, and thence to its seat in the thread-guide *o*. If the lever 31 is in position with the bearing bar 32 at the lowest point of its throw, the yarn will be guided by the incline 34 to ride up over the bar 32, but, in any event, the downward movement of the incline 34 acts with the same effect and the yarn is automatically picked up to lead across the top of the bar 32. When the winding is started, the reciprocatory movement of the traverse-rod *d* is transmitted through the lever 43 to oscillate the lever 31, the rocking of the latter being so timed that the bar 32 is raised to its highest point each time the thread-guide *o* reaches the apex of the cone on which the winding is being done. As the bar 32 rises, it deflects the course of the yarn from a straight line to a triangular course having sharp bends, which adds increased resistance to its draft. It will, therefore, be seen, that as the thread-guide winds down toward the point of the bobbin, the tension on the yarn is gradually increased to give the maximum amount at the smallest diameter of the bobbin; and as the guide *o* traverses back in the opposite direction, up on to the base of the cone, the tension is decreased, to give a minimum degree at the full diameter of the bobbin.

When the yarn *y* breaks or is exhausted, the end-stop bar 15 drops and its arm 21 acts on the lever 9 to stop the machine as before explained.

Without limiting myself to the precise form and arrangement of parts shown, what I claim is:

1. The combination in a tension controlling device for a winding machine with a winding spindle, and traverse-guide adapted to oscillate toward and away from the spindle, of means to apply tension to the thread and means operating synchronously with the movement of the guide to vary the tension on the thread at each oscillation thereof.

2. The combination with a winding machine having a rotating spindle, and a reciprocating thread-guide adapted to oscillate toward and away from the spindle at each reciprocation, of tension means for applying a normal degree of tension to the thread, and an auxiliary tension device adapted to augment the normal tension at each movement of the guide toward the spindle and to remove the added tension with each movement of the guide away from the spindle.

3. The combination with a winding machine having a rotating spindle, a reciprocating traverse-bar, and a thread-guide mounted on the traverse-bar and adapted to oscillate toward and away from the spindle, of tension applying means and means controlled by the reciprocation of the traverse-bar to automatically vary the tension applied to the thread.

4. The combination with a winding machine having a rotating spindle and a reciprocating thread-guide, of an end-stop-bar having bearing-bars under which the thread draws, an oscillating lever having a bearing-bar adapted to be moved across the path of the thread as it leads under the end-stop-bar, and means to connect the lever with the thread-guide to cause it to oscillate.

5. The combination with a winding machine having a reciprocating traverse-bar, a rotating spindle and stop-mechanism to control the operation of the traverse-bar and spindle, of an end-stop-bar supported by the running thread and adapted to engage the stopping-mechanism when the thread breaks, a lever formed with a thread bearing-bar adapted to be oscillated across the path of the thread, and means to oscillate the lever from the machine.

6. The combination with a winding machine having a reciprocating traverse-bar, a rotating spindle, and stopping devices therefor, of a pivoted end-stop-bar supported by the running thread and adapted to drop to engage the stopping devices, an oscillating lever with a thread bearing-bar adapted to bear on the thread as it leads under the end-stop-bar, and a second lever oscillated from the traverse-bar and engaging the first lever to rock the latter.

7. The combination with a winding machine having a reciprocating member *d*, of a lever 43 having arms 44 and 45 with the arm 44 connected to the member *d*, a lever 31 having one arm formed with a bearing-bar 32 for the thread and an arm 37 formed

with a loop 38, and a stud 52 adjustable along the arm 45 of the lever 43 and adapted to engage the loop of the lever 31.

8. In a tension controlling device the combination with a bracket C having a lug 40 with a slot 41, of a lever 31 formed of wire and having an end 39, bent at right-angles to the lever and extending through the bracket C for a bearing, with the main wire of said lever arranged in the slot 41 to retain the lever from lateral displacement.

9. As an article of manufacture, a lever 31 formed of wire, with one arm bent at right-angles to form the bearing-bar 32, having the downturned loop 33 terminating in the inclined portion 34, and the opposite arm formed with a loop 38, having parallel sides extending in the same plane, and the end of the loop coiled around the main portion and extending at right angles to the plane of the loop in the end 39.

10. As an article of manufacture, a thimble 49 for tension devices, formed of wire helically coiled to provide a socket or bearing and with one end of the wire extending in the plane of the axis of the coil and bent to form the hook 51.

11. As an article of manufacture, a stud 52 formed of wire, helically coiled with one end extending downward in a loop and coiled again at 53 to form a bushing with its axis at right-angles to the axis of the coil 52, and with the end of the coil 53 extending outward and back across the axis of the coil 53 to form a spring detent 54.

12. The combination with the lever 43 having an arm 45 formed with a loop extending in parallel sides, one above the other in the same plane, with notches 55 on the upper side, of a stud 52 formed of wire helically coiled and extending down around the lower side of the loop and coiled at 53 to surround the upper side of the loop, with the end of the wire extending laterally from the coil 53 and bent back to form the spring detent 54, adapted to engage the notches 55.

13. The combination with a bracket C, having a lug 59 with a V-shaped notch 58, of a pin 19 projecting through a bore in the bracket and extending in a loop 57, bent in the form of a hook with its end adapted to be sprung into the notch 58, to retain the pin laterally and longitudinally against displacement.

14. As an article of manufacture, an end-stop-bar 15, formed of wire helically coiled at 20 for a bearing, with the wire extending from one end of the coil in the vertical arm 21, bent at 22 to form an inclined portion, and a second arm 23 extending from the opposite end of the coil 20, bent at right angles to form the thread bearing-bar 25 and extending downward in a loop 24 with an inclined portion 27, then upward and back toward the arm 23 to form a second thread bearing-bar 26 parallel with the bar 25.

15. As an article of manufacture, a lever 43 formed of wire coiled at 47 and 48 to form alining hub bearings, the coils connected by a U-shaped loop 46 of the wire, the outer end of the bearing 47 extending at right-angles to the axis of the coils in a vertical arm 44, and the opposite end of the coil 48 extending at approximately right-angles to the arm 44 in an arm 45 formed in a loop with parallel sides in the same plane.

16. In a tension controlling device, the combination with a bracket C, of a pin 19 fast in the bracket, an end-stop-bar formed of wire helically coiled at 20 to form a bearing on the pin on one side of the bracket and extending in the arms 21 and 23, a lever 43 formed of wire coiled at 47 to surround the pin 19 outside of the coil 20 and extending in a U-shaped loop 46 to straddle the coil 20, with a coil 48 surrounding the pin 19 on the opposite side of the bracket, and an arm 45 extending from the coil 48.

17. The combination with a bracket C formed at its end with an opening 28 having jaws 29 and 30, of an end-stop-bar 15 pivoted on the bracket and formed with a laterally extending bar 26 arranged between the jaws 29 and 30 to limit the movement of the end-stop-bar.

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

SIMON W. WARDWELL.

Witnesses:
CHAS. A. EDDY,
ARTHUR I. HARVEY.