

(Model.)

2 Sheets—Sheet 1.

S. BORTON & C. H. WILLCOX.

THREAD CONTROLLING APPARATUS FOR SEWING MACHINES.

No. 255,581.

Patented Mar. 28, 1882.

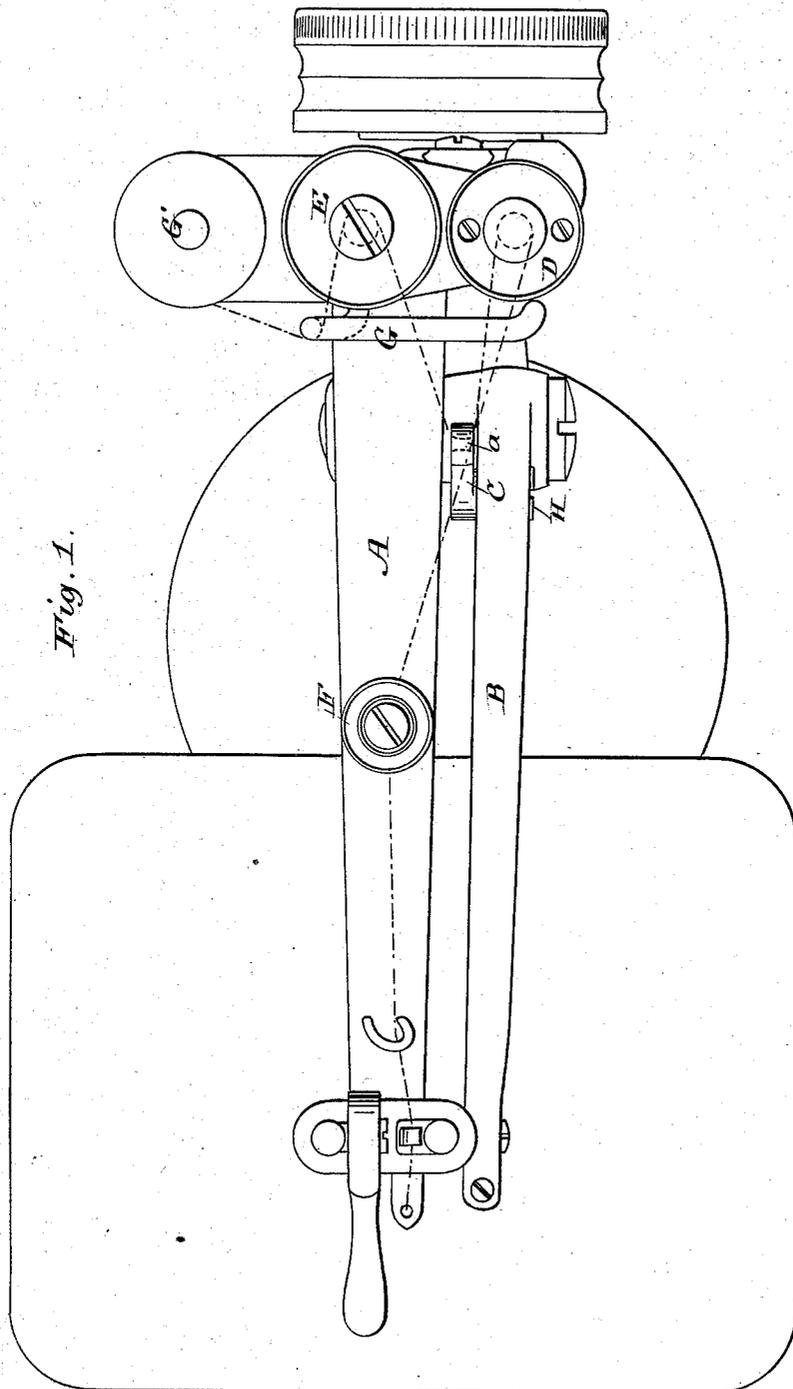


Fig. 1.

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(Model.)

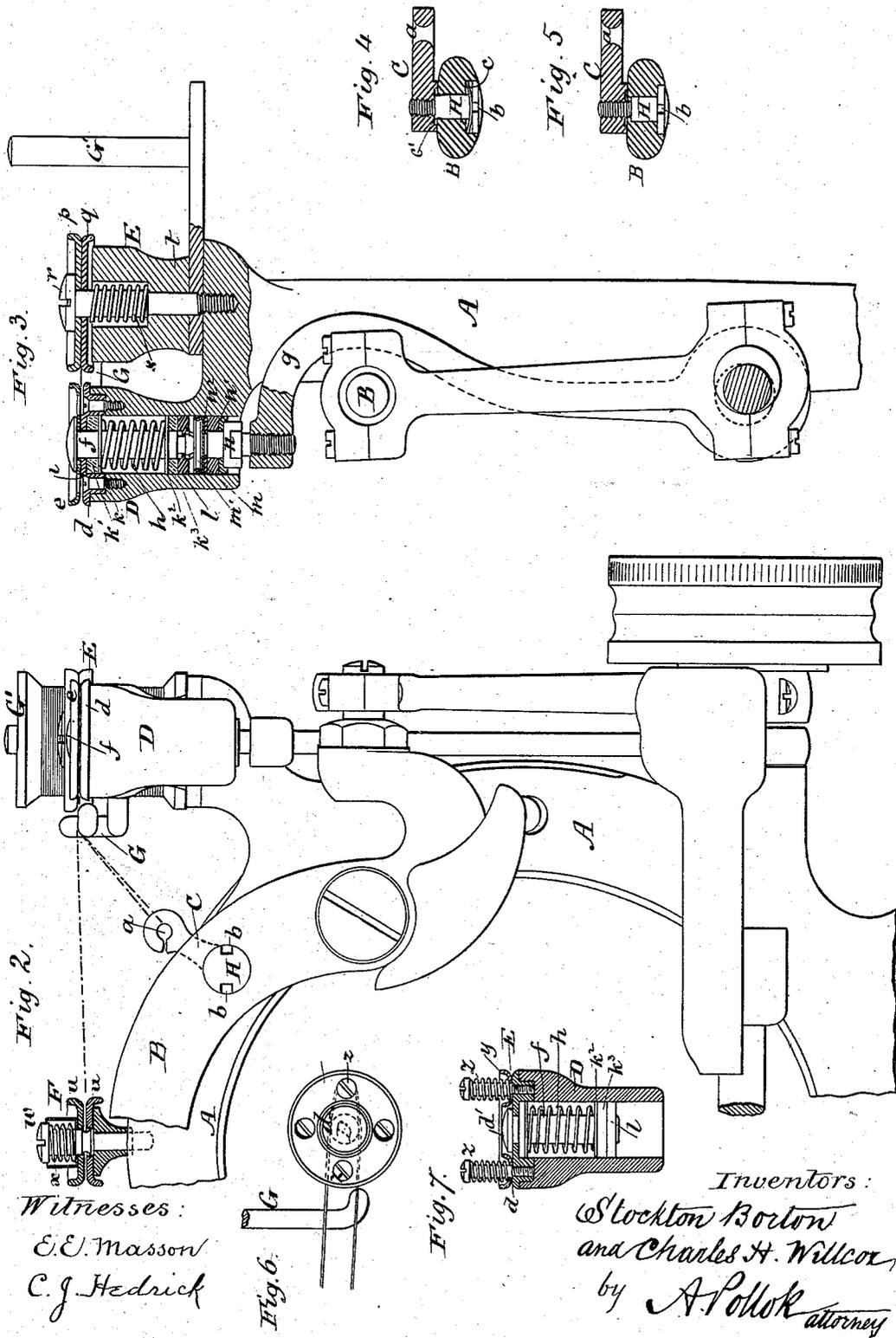
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# UNITED STATES PATENT OFFICE.

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## THREAD-CONTROLLING APPARATUS FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 255,581, dated March 23, 1882.

Application filed January 3, 1882. (Model.)

*To all whom it may concern:*

Be it known that we, STOCKTON BORTON, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, and CHARLES H. WILLCOX, of New York city, in the county and State of New York, have invented a new and useful Improvement in Tension and Thread Controlling Apparatus for Sewing-Machines, which improvement is fully set forth in the following specification.

This invention relates to a measuring tension or apparatus which will automatically measure out the thread for each stitch, so that a uniform and elastic seam may be made without special care or skill on the part of the operator. Heretofore apparatus of this description has been made having a pull-off combined with two constant tensions of different force, the pull-off acting upon the thread between the two tensions, the lighter tension being between the spool-pin and pull-off and the heavier between the latter and the take-up. In the said apparatus the take-up and other stitch-forming devices have to draw the measured thread through the heavier tension aforesaid, which is liable sometimes so to hold back the thread as to prevent the stitching mechanism from taking the full amount measured, and thus to render the work irregular. The liability to irregular action is particularly great in sewing knit goods, for which this invention is mainly designed. In the present invention the tension between the pull-off and stitching mechanism is made automatic in its action, so that the thread drawn by the pull-off is left free to be worked into the sewing, and each stitch will receive the measured quantity. The tension between the pull-off and spool or other supply of thread is made heavy enough to prevent, under ordinary conditions of working, the drawing of thread directly from the spool by the stitch-forming mechanism, and effect the necessary tightening of the stitches. In order to insure the working of all the measured thread into each stitch, it is desirable to leave the thread perfectly free to be taken up by the stitch-forming mechanism; but in running from one piece of work to another the chain or series of stitches between the two

pieces, being outside the fabric, do not need all the thread, and would be too loose if no restraint be placed on its delivery. A check-tension too light to interfere with the free delivery of all the measured thread so long as the fabric is sewed, but sufficient to draw up the chain properly by holding back a portion of the thread when the stitches are made outside of the fabric, is therefore arranged to act upon the thread between the pull-off and take-up.

For convenience of reference, and to distinguish them from each other and from the check-tension, the automatic or intermittent tension between the pull-off and take-up, which prevents the thread drawing back, may be called the "clamping-tension," and that between the pull-off and spool, which prevents the stitch-forming mechanism from drawing thread from the spool instead of tightening the stitch in the work, the "resisting-tension." The resisting-tension may be automatic or intermittent in its action; but a constantly-acting friction-tension is preferred. Any known or suitable device for producing a hold or tension on the thread—such as weighting the spool, passing the thread through a series of eyes, and other well-known devices—can be used; but a disk-tension with disks held together by spring-pressure is preferred and is shown herein. The intermittent or automatic tension can be made to release altogether the tension on the thread or simply relieve it in part. Whatever be the form of tension used, it is preferred to have all the tensions adjusted so that in case of an extraordinary strain upon the thread—say in passing over a very thick seam—a small quantity can be drawn directly from the spool or other source of supply and breakage of the thread avoided, while with the ordinary sewing the supply of thread is regulated by the measuring pull-off. With some classes of work, especially in sewing stockings and other knit goods, this precaution may be unnecessary.

It may be here observed that it is common to combine with an automatic or intermittent tension, as well as with other tensions, a pull-off—that is, a device auxiliary to the take-up

and other stitch-forming mechanism—which operates to draw off from the spool or its equivalent at each stitch a small quantity of thread, so as to maintain a supply of loose thread to be delivered to the stitch-forming mechanism; but the pull-offs heretofore used in such combination have always been so constructed and arranged as to maintain constantly a supply of thread greater than required for the longest stitch, and have not been adapted to measure the thread for the several stitches; nor have they been arranged to operate upon the thread between an intermittent clamping-tension and a resisting-tension, as above indicated. They have also been without adjustment, keeping supplied always the same quantity of thread to be drawn from by the stitch-forming mechanism.

As more thread is required for long than for short stitches and for thick than for thin goods, the measuring pull-off is in this invention made adjustable, so as to be adapted to any ordinary use. It is obvious that the pull-off can be made adjustable in its action by altering the point at which it begins to pull off the thread, the movement being the same, as well as by varying the movement. The term "adjustable," as here applied to the pull-off, is to be understood broadly as referring to the adjustability of the action, and not as being limited to a pull-off wherein the part which acts on the thread is variable, although the latter is deemed the most advantageous arrangement and is shown herein. Under this first part of the invention a measuring or adjustable pull-off with an eye or similar device to act upon the thread, but otherwise of any ordinary or suitable construction, can be used. The invention, however, relates also to the special construction and operation of a pull-off.

It consists, first, in operating the pull-off from the needle-lever of the sewing-machine by means of an adjustable connection; second, in carrying the pull-off on the needle-lever or other vibrating part of the machine and adjusting the part which acts upon the thread nearer to or farther from the fulcrum of the needle-lever, which is, of course, also the center about which the pull-off moves; third, in pivoting the pull-off to the needle-lever, so that the adjustment may be effected by turning the pull-off on its pivot; and, fourth, in locking the pull-off to prevent unauthorized alteration of its position.

The invention further has reference to the particular construction and special timing of the action of the pull-off with reference to the stitch-forming devices, and to the special combination of the different parts of the apparatus, as hereinafter more fully set forth.

The accompanying drawings, which form a part of this specification, represent a tension and thread-controlling apparatus embodying the invention. A portion of the frame and operating parts of a Willcox & Gibbs single-thread chain stitch machine is illustrated in

order to show the application; but the apparatus can be used in connection with any of the well-known machines making a chain, double-chain, lock, or other form of stitch.

The parts of the machine not shown are or may be of ordinary or suitable construction.

Figure 1 is a plan; Fig. 2, a side elevation, partly in section; Fig. 3, a vertical cross-section through the two tensions; Figs. 4 and 5, views in section through the pull-off and needle-lever, the means for holding the pull-off being somewhat different in the two figures; and Figs. 6 and 7, views in plan and vertical section, respectively, of a check-tension supported upon the base of the clamping-tension.

A is the machine-frame, and B the needle-lever, operated, as usual, from the main shaft of the machine. C is the pull-off; D, the clamping-tension; E, the resisting-tension; F, the check-tension; G, a guide-bar over which the thread passes to and from the tensions and pull-off, and G' a spool-pin.

The pull-off, as shown, consists of a short bar pivoted to the needle-lever B, and provided at its outer end with an eye, *a*, through which the thread passes. It is held in place by the large headed screw H, which passes through the needle-lever, and is tapped into the end of the pull-off. By loosening this screw the pull-off is left free to be turned on it as on a pivot, and by tightening the screw the pull-off may be held in any position to which it may be adjusted. To prevent tampering on the part of the operator or other unauthorized persons, the head of this screw is formed so that a special key is required to turn it. Thus, instead of the usual nick or groove, the screw-head is provided near its edge with two recesses, *b*, for receiving the prongs on the special key. Other and more elaborate means can be used, if desired, to prevent tampering, but such as shown will ordinarily be sufficient.

In Fig. 4 a spring-washer, *c*, (omitted in Fig. 5,) is shown under the head of the screw H. It is of advantage, as it keeps an elastic pressure on the pull-off, even when the screw is loosened. It is also possible with it to tighten the screw sufficient to hold the pull-off in place against the action of the thread, while allowing it to be turned by the fingers to regulate the amount of thread which shall be pulled off from the spool at each stitch. When it is to be thus adjusted a shoulder, *c'*, may be formed on the screw to bear against the pull-off to prevent the screw being turned too far. By setting the pull-off to the right (Figs. 1 and 2) the eye *a* is brought nearer the fulcrum of the needle-lever, and consequently it moves through a shorter distance than before at each vibration of the needle-lever, and pulls off a less amount of thread from the spool, whereas by setting it to the left a greater length is pulled off for each stitch.

The clamping-tension D, which is intermittent in its action, may be that in common use on the Willcox & Gibbs automatic machine;

but it is preferred to have it modified, as shown in the drawings. The lower tension-disk, *d*, is secured by screws to the machine-frame. The upper disk, *e*, is fixed, by soldering or otherwise, to the clamp-stud *f*, and is raised at intervals against the pressure of the spring *h* by the eccentric-rod *g* acting against the clamp-stud *f*. The spring *h* surrounds the latter and tends to draw the tension-disks into contact.

10 A raised seat, *i*, is made on the lower disk, and the thread is clamped between this seat and the under surface of the upper disk. An annular opening between the edges of the disks is thus left at all times, so that the thread can be inserted as far as the raised seat, even when the device is closed by the action of spring *h*. This spring bears at its upper end against the lower disk, a metal washer, *k*, and leather washer *k'* being interposed. At its lower end it bears against a collar, *l*, on the clamp-stud *f*, a metal washer, *k<sup>2</sup>*, and a leather washer, *k<sup>3</sup>*, being interposed. The collar is loosely connected with the clamp-stud *f*, but moves vertically with it.

Below the stud *f* is a washer or small disk, *m*, faced with cloth, *m'*, on the bottom and sides. The cloth-faced washer remains by the friction of its cloth-covered edge always in contact with the rod of clamp-stud *f* when the eccentric-rod goes down and leaves it. The screw in the end of eccentric-rod has leather washers *n'*, forming its bearing in the hole, while it has a steel washer, *n<sup>2</sup>*, riveted above the leather washer, which strikes flat against the cloth face of washer *m*.

35 The resisting-tension, which is constant in its action, consists of the two disks *p* *q*, the screw *r*, the spring *s*, and the base-piece *t*. The screw *r* holds the parts together, and also attaches them, together with the spool-holder, to the machine-frame. In practice, however, the thread will commonly be delivered from above from a spool on an independent support. The thread-guide-bar *G* is attached in any suitable way to the machine-frame. As shown, one end is secured on the base-piece *t* of the resisting-tension.

The check-tension shown in Figs. 1 and 2 consists of two disks, *u*, held in place by a screw, *w*, and pressed together by a spring, *x*.

50 In Figs. 6 and 7 it consists of an annular washer, *y*, surrounding the head *d'* of the clamp-stud *f*, which head acts as the upper disk of the clamping-tension, and two screws with springs *z*, which press said washer against the disk *d*.

55 The thread is led from the spool under the guide-bar *G* between the disks of the resisting-tension, over the guide-bar, through the eye *a* of the pull-off, between the disks of the clamping and check tensions, and thence to the take-up and eye of the needle. In operation, the pull-off draws from the spool during the descent of the needle-lever the amount of thread required for each stitch, the thread being clamped by the clamping-tension, so that it is necessarily drawn from the spool through the resisting-tension. After the loop has been

taken by the looper below the work-plate of the sewing-machine, and while the needle-bar is rising, the clamping-tension is released, and the thread which has been pulled off is gradually given off by the pull-off and goes into the stitch which is forming. All the thread is used, and no more, the resisting-tension, aided by the check-tension and the various bends in the thread through and over its guides, being sufficient, except under extraordinary strain, to prevent any thread from being drawn directly from the spool. The thread is then again clamped by the clamping-tension, and the same quantity of thread is again drawn from the thread by the pull-off. By timing the parts so that the thread is delivered by the pull-off gradually during the upstroke of the needle the thread is best worked into the chain-stitch, (made by the machine shown;) but the parts could be otherwise timed without departing from the invention.

It is obvious that portions of the invention could be used separately, and that various modifications could be made in addition to those already indicated. For example, the clamping-tension could be carried by the pull-off instead of being placed on the machine-frame, as shown. The pull-off could be formed by an eye on the needle-lever, and a series of such eyes could be used in order that the amount measured off could be varied. In special machines which are to be used constantly on one style of work the measuring pull-off need not be adjustable.

The term "measuring pull-off" is employed in this specification to denote a pull-off, whether fixed or adjustable, adapted by virtue of its construction or adjustability to draw off and give up at each stitch the amount of thread required for making a stitch, so that the pull-off measures out the thread instead of maintaining, like the pull-offs in common use, more loose thread than will be required for a stitch, and leaving it to the stitch-forming mechanism to supply itself therefrom.

In machines not using a needle-lever, or when, from any reason, it may not be desirable to operate the pull-off therefrom, the latter may be operated from the shuttle-driving lever in machines using a shuttle, or from other moving part.

Having now fully described our said invention, and the manner of carrying the same into effect, what we claim is—

1. A measuring pull-off adapted to measure at each stitch the amount of thread therefor, in combination with an automatic or intermittent tension between said pull-off and the stitching mechanism, and a tension between the spool or supply of thread and the pull-off, substantially as described.

2. The combination, with an adjustable pull-off, of an intermittent clamping-tension and a resisting-tension, substantially as described.

3. The combination of an automatic or intermittent tension, a constant tension, and a measuring pull-off arranged to act upon the

thread between the two, substantially as described.

4. The combination, with an intermittent tension and a constant tension, of an adjustable pull-off arranged to act on the thread between the two, substantially as described.

5. The combination of the measuring pull-off and the intermittent clamping-tension between itself and the stitching mechanism, substantially as described.

6. The combination of an adjustable pull-off and an intermittent clamping-tension between itself and the stitch-forming mechanism, substantially as described.

7. The combination of the measuring pull-off, the intermittent clamping-tension, the check-tension, and the resisting tension, substantially as described.

8. The combination of the needle-lever, pull-off, and adjustable connection, substantially as described.

9. The combination, with a vibratory part of the sewing-machine, such as the needle-lever, of a pull-off rigidly attached to and carried by said part, so that the eye or portion of the pull-off which acts upon the thread moves in a circular arc with the fulcrum of said vibratory part as the center, said pull-off being adjustable to bring said eye or operating portion of the pull-off nearer to or farther from the said fulcrum, substantially as described.

10. The combination, with a moving part of a sewing-machine, such as the needle-lever, of a pull-off rigidly attached and pivoted thereto, so as to be carried thereby and adjustable on its pivot as a center, so as to alter its action upon the thread, substantially as described.

11. The combination, with an adjustable pull-

off, of means, as explained, for locking it in position, requiring a special key for releasing the same, substantially as described.

12. The combination of the adjustable pull-off, needle-lever, and holding-screw, substantially as described.

13. The combination of the needle-lever, pull-off, holding-screw, and spring-washer, substantially as described.

14. In an automatic or intermittent tension, the combination, with the eccentric-rod, of an independent clamp-stud and a tension-disk fixed thereto, substantially as described.

15. In a sewing-machine forming stitches by means of a looper, a measuring pull-off, and intermittent clamping-tension, combined with operating mechanism, and timed, as explained, so as to deliver the measured thread gradually during the ascent of the needle-bar, substantially as described.

16. The check-tension formed by an annular washer, combined with a stationary disk, supporting-pins, and independent tension-springs for holding said washer against said disk, substantially as described.

17. The combination, with an intermittent tension, of an annular spring-check tension surrounding a disk of the intermittent tension, substantially as described.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

STOCKTON BORTON.  
CHAS. H. WILLCOX.

Witnesses:

JOHN C. PURKIS,  
GILMAN E. JOPP.