2 Sheets—Sheet 1.

D. TRACY.

Sewing Machine.

No. 30,012.

Patented Sept. 11, 1860.

Fig. 1,

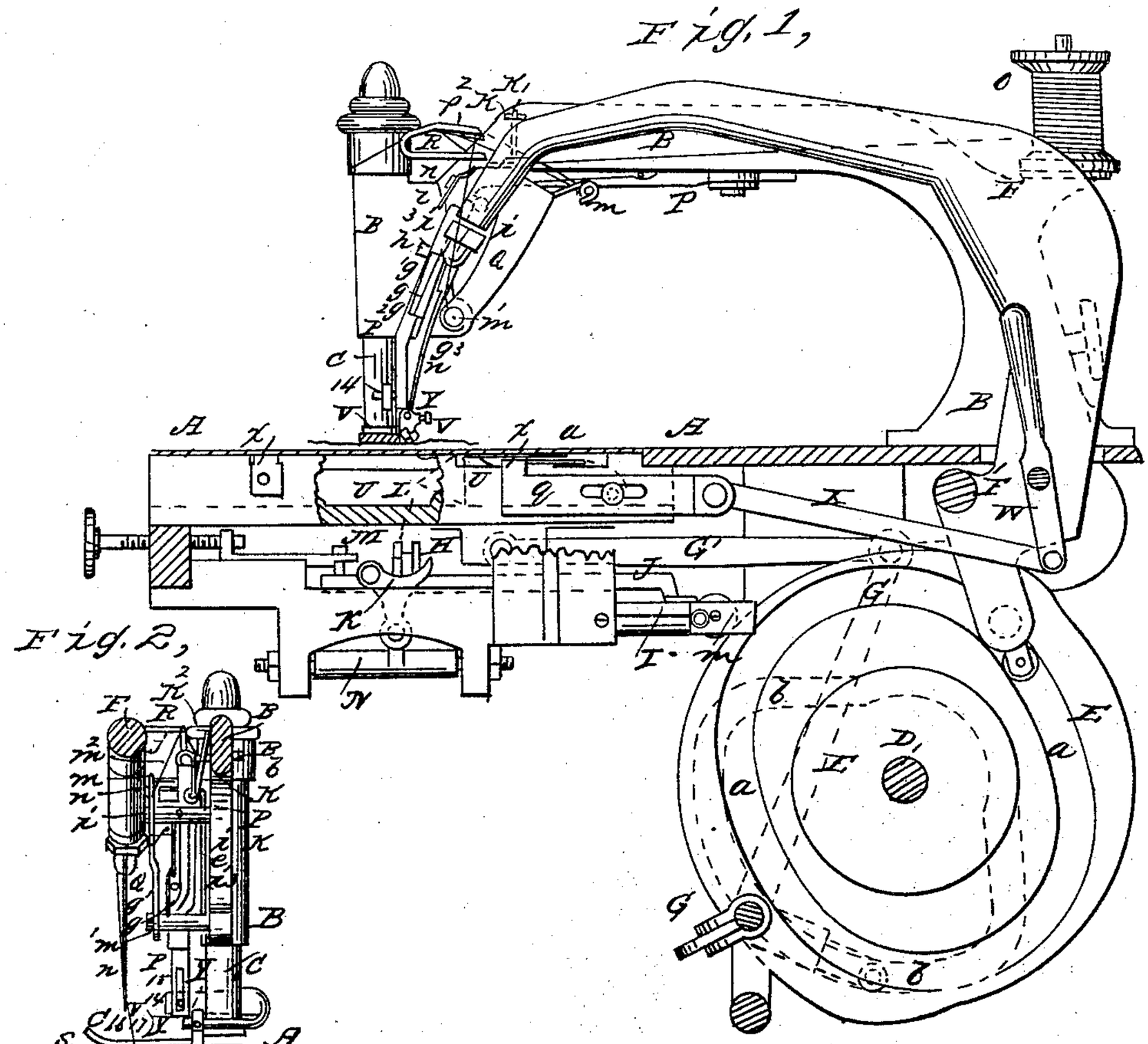
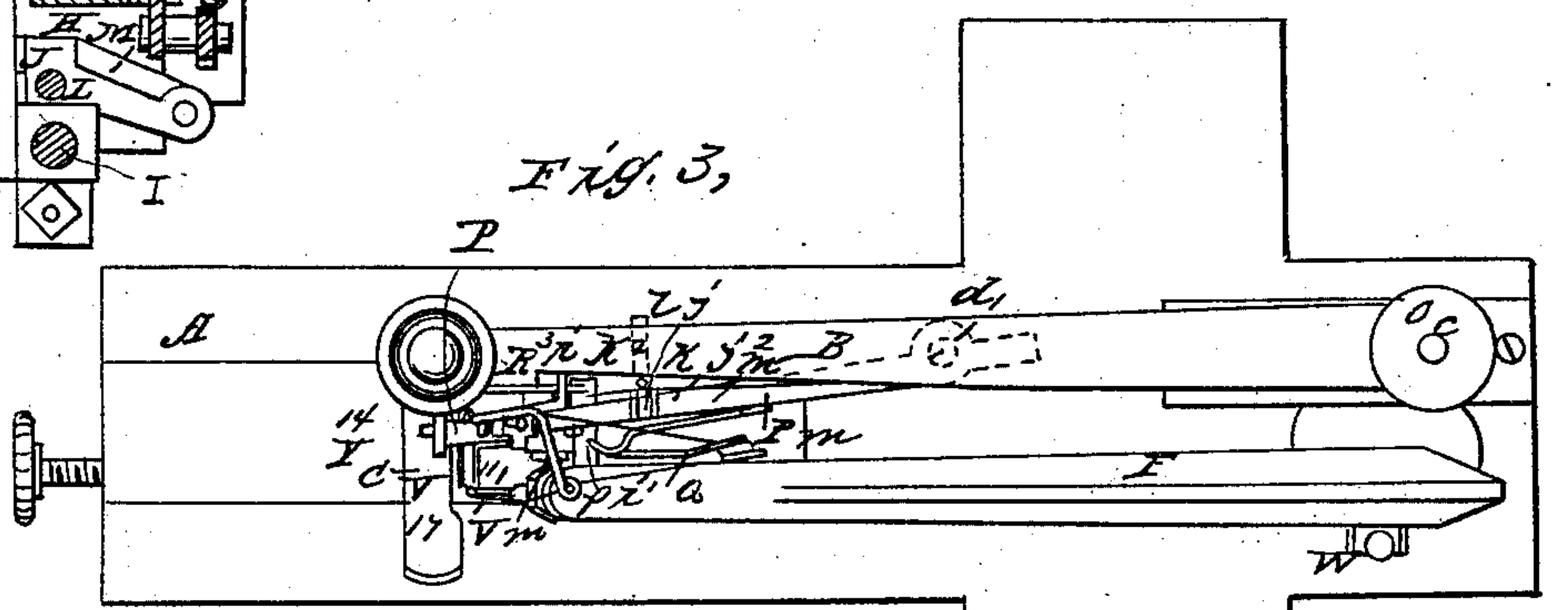


Fig. 2,

Fig. 3,



Witnesses:

H. J. Brown

Geo. Gibbs

Inventor:

Dwight Tracy

2 Sheets—Sheet 2.

D. TRACY.

Sewing Machine.

No. 30,012.

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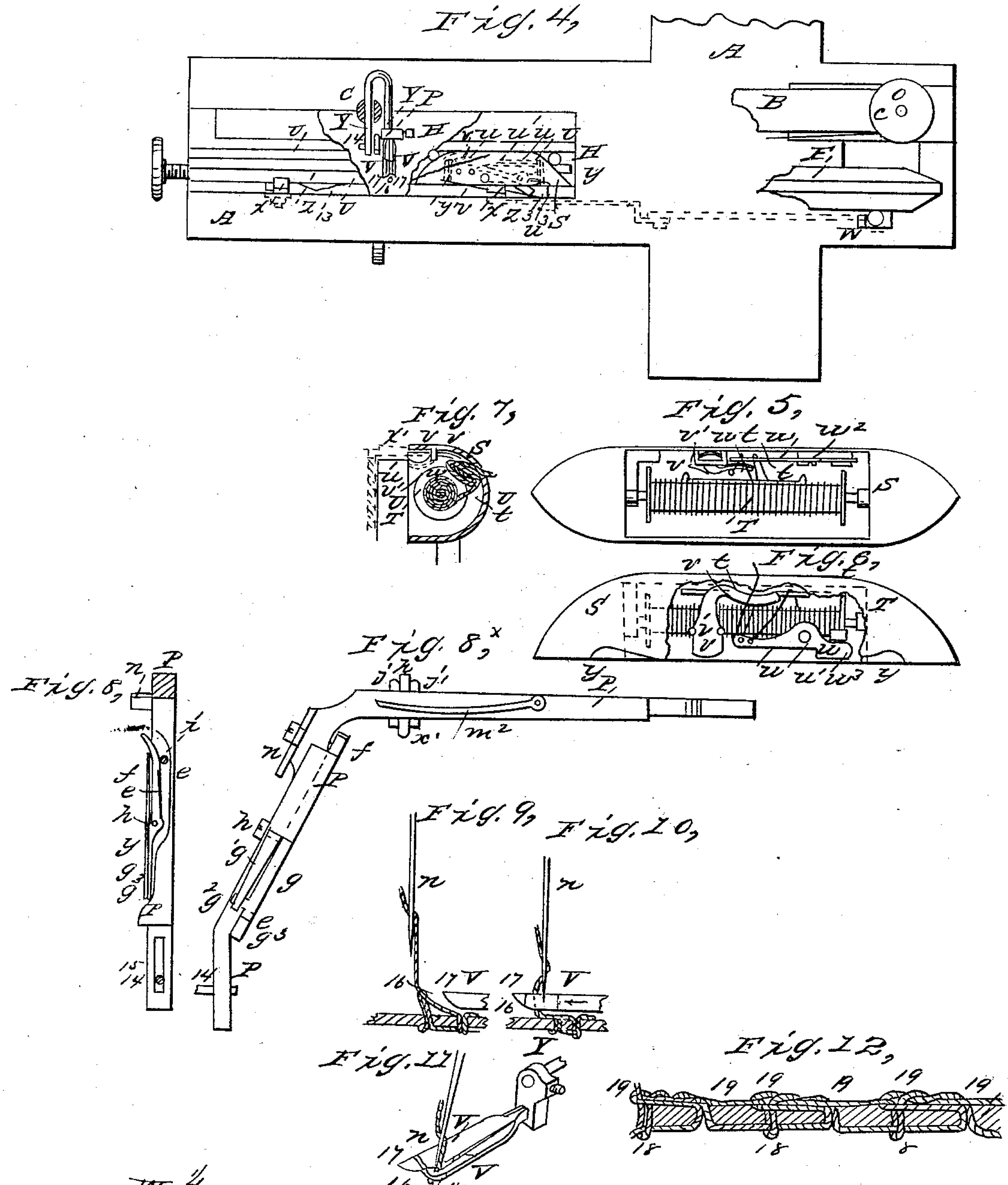

Witnesses!
H. S. Room
[illegible]

Inventor!
Dwight Tracy

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

DWIGHT TRACY, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. **30,012,** dated September 11, 1860.

To all whom it may concern:

Be it known that I, DWIGHT TRACY, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front view, partly in section, of a sewing-machine with my improvements. Fig. 2 is a transverse vertical section of the same. Fig. 3 is a plan view of the same complete. Fig. 4 is a plan of the same, representing some parts broken away to expose other parts to view. Fig. 5 is a front view of the shuttle on a scale larger than the real size. Fig. 6 is a top view of the same with the shell partly broken away to expose the interior. Fig. 7 is a transverse section of the same. Figs. 8, 8*, 9, 10, 11 are views of some of the details of the machine on a scale larger than the real size. Fig. 12 represents the sewing performed by the machine as exhibited in a section of a piece of cloth.

Similar letters of reference indicate corresponding parts in the several figures.

My invention consists in certain means of controlling the needle-thread of a sewing-machine, whereby the quantity supplied to the needle is caused to be always in proportion to the thickness of the cloth or other material being sewed and to the length of the feed movement, and a uniform tightness of stitch is produced, whatever variation may occur in the thickness of the material, or however the feed movement may be varied, or whatever may be the relative sizes of the needle and thread, obviating entirely the necessity of any manual adjustment for the needle-thread.

It also consists in certain means of controlling the shuttle-thread, whereby it is caused to be drawn to a uniform tightness in the cloth or other material, whatever may be the quantity of thread on the bobbin or from whatever part of the bobbin the thread may be drawn.

It further consists in a certain means of operating an elastic pointed fork, in combination with a needle and a double-pointed and double-acting shuttle, for the purpose of forming a knotted stitch of particular character.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is the bed of the machine.

B is the stationary arm holding the presser C, which confines the cloth or other material to the bed and to the feeding device.

D is the main shaft, working in bearings in hangers below the bed A, and furnished with a triple cam, E, one side of the said cam containing a groove, *a*, to operate the vibrating needle-arm F, which is attached to a rock-shaft, F′, and the other side a groove, *b*, to operate a rocker, G, which works the shuttle-driver H through the agency of a rod, G′, and the periphery of the said cam operating upon a slide, I, which works the feeding mechanism J K L M N.

The needle and shuttle driving and feeding mechanism require no particular description, as they may be of any well-known or suitable character.

O is the spool which supplies the thread for the perforating-needle *n*, which is of the eye-pointed kind in common use. This spool is arranged to turn freely upon a stationary pin, *c*, attached to the stationary arm B, or need have no more friction applied than is necessary to prevent it letting the thread inconveniently slack behind the thread-controlling apparatus. This apparatus is shown in Figs. 1, 2, and 3, and a portion of it on a larger scale in Figs. 8 and 8*. The principal portion of the said apparatus consists of two levers, P and Q. The lever P has a limited horizontal movement toward and from the needle-arm, and transversely to the planes of motion thereof, on a fulcrum-pin, *d*, which attaches it to the stationary arm B. A portion of this lever, of which Fig. 8 is a section and Fig. 8* a side view, is bent downward in a curved form corresponding with the arc described by the needle, and the so curved portion has in the side nearest the center of motion of the needle-arm a curved groove, *e*, that is fitted with a switch, *f g*, which works on a pivot, *h*, by which it is attached to the said lever, the said groove being intended to receive a pin, *i*, which is carried by a stud, *i′*, that is secured to the back of the needle-arm. The said switch has a spring, *g′*, applied to its lower part to force it toward the opposite side of the groove, the lower part of which is open

in front, the said spring pressing upon a piece, g^2, of the switch, which laps over the front of the lever P. Below the switch, and immediately below the opening of the groove *e*, there is a wedge-like projection, g^3, on the front of the said lever. The stud i' on the needle-arm has formed in it a transverse notch, i^2, (see Fig. 3,) to work on a fixed guide-plate, i^3, that is secured to the stationary arm B, for the purpose of preventing the lateral springing of the needle-arm by its operation on the lever P. The said lever has attached to the back of its upper part, near where its downward bend commences, a small clamp, *j j' k*, (see Figs. 2 and 3,) consisting of two small jaws, *j j'*, attached to the said lever at a short distance apart, one of the said jaws being rigid and the other elastic, and a tongue-like piece, *k*, hinged to the lever below the said jaws, as shown at k' in Fig. 2, in such manner as to be capable of pressing the needle-thread between the jaws. The space between the said jaws *j j'* and the thickness of the tongue *k* are such that when the tongue is pressed with the needle-thread between the jaws it is caused to be held there by the elasticity of the jaw *j'*, and so to continue to bite the thread until the pressure by which it has been forced between the jaws has been removed. The upper part of the said tongue enters a fixed eye, k^2, attached to the stationary arm B, and opposite to the said tongue a small screw, *l*, screws into the stationary arm.

The lever Q consists of a thin flat piece of plate-metal, with a wire thread, guide, *m*, attached, and is arranged between the needle-arm F and the lever P, to move in planes parallel with the planes of motion of the said arm on a fixed pin, m', which attaches it to the stationary arm B. The said lever Q is pressed toward the needle-arm with just sufficient force to make it work steadily on its fulcrum-pin m' by a tight friction-spring, m^2, attached to the lever P, and the said lever Q operates, as will be presently described, in combination with a stop-piece, n', attached to the lever P. A stationary thread-guide, R, having an eye, *p*, at its end and secured to the stationary arm B, completes the apparatus for controlling the needle-thread, whose operation is as follows: The thread passes, as shown in Figs. 1 and 3 in red color, from the spool O between the tongue *k* and the jaws *j j'*, under the lower part of the guide R, upward to and round the upper part of the said guide, from whence it passes to and through the eye *m* of the lever Q, and from thence to the eye *p* of the stationary guide R, whence it descends to the needle. During the descent of the needle-arm the pin *i* works between the switch *f g* and the back of the groove *e* of the lever P; but during the ascent of the needle-arm it is caused to pass up the front of the switch and the lever P, outside of the groove, owing to the closing of the lower part of the switch by the spring g'. The pin *i*, in its descent, as it enters the groove *e* above the pivot *h* of the switch *f g*, pulls the lever P forward away from the stationary arm B, and so opens the clamp *j j' k*, owing to the tongue *k* being held back while the jaws *j j'* move forward with the said lever; but as the needle completes its descent the pin *i* passes out of the groove below the pivot *h* of the switch, and passes down the projection g^3 of the said lever, on which it acts to force back the said lever and close the clamp again. The stud i', in its ascent with the needle-arm, operates on the curved adjacent edge of the lever Q to move the said lever to the right, or toward the spool O, but in its descent leaves the said lever under the control of the friction-spring m^2, which should produce upon it an amount of friction less than the friction produced on the thread by the stationary guide R. As the needle descends the friction of the said spring m^2 holds the lever Q with sufficient force to keep the thread tense enough for the eye of the needle to slide freely down it till it (the eye) arrives in the cloth and begins to double the thread and take it double through the cloth, when the tension produced on the thread between the eye *m* of the lever Q and the needle by the continued movement into and through the cloth is increased to such a degree as to overcome the friction of the spring m^2 upon the said lever and to draw the lever Q toward the guide R, or toward the left hand of Fig. 1, till the said lever strikes the stop *n* on the lever P and is prevented moving any farther, when the clamp *j j' k* still being open, the continued descent of the needle draws off thread from the spool till by the farther descent the pin *i*, by its action on the projection g^3, pushes back the lever P and causes the tongue *k* of the clamp to be carried back against the front of the set-screw *l* and to be forced between the jaws *j j* to make it clamp the thread. The above-mentioned backward movement of the lever P takes the stop *n* out of the way of the lever, so that during the rise of the needle and the extension of the loop of its thread by the shuttle the lever Q may be allowed a farther movement in the same direction as above specified, to give sufficient thread to enable the loop to be extended to a proper size for the shuttle to pass through. As the needle continues to rise the stud *i* comes into operation on the lever Q and moves it in the opposite direction—that is to say, toward the spool O—and causes it to take up the slack thread, the thread still remaining clamped by the clamp *j j' k;* and as the ascent of the needle terminates, the loop is drawn up perfectly tight, the action of the lever Q upon it being perfectly positive, as, owing to the clamp being yet in action, no thread can be drawn from the spool or allowed to pass through the eye of the needle toward the cloth at this stage of the operation. The pin *i*, before completing its ascent with the needle, pushes back and passes the curved upper end of the switch, which, after the said pin passes, is forced forward again by the action of the spring g' in the lower part, so that

when the said pin descends again it passes behind the switch into the groove *e*, and so draws forward the lever P and opens the clamp *j j' k*.

I will now explain how this thread-controlling apparatus adjusts itself to suit various thicknesses of cloth and various lengths of feed.

According as the cloth presented to the needle is thicker or thinner, the eye of the needle enters it in a higher or lower position, and so commences to double the thread and draw the lever Q toward the stop *n* at an earlier or later stage in the descent of the needle-arm, and consequently the said lever arrives in contact with the stop *n* at an early or later stage in the descent. Now, as the stop is invariably removed from the lever Q at one point in the descent of the needle, and it is only while the stop is in contact that the needle draws the thread from the spool, it is obvious that the quantity of thread drawn off must be greater or less, according as the said lever reaches the stop sooner or later, and this, it has been above shown, depends on the thickness of the material. The automatic adjustment to suit various lengths of feed is also effected by a substantially similar variable operation of the lever Q, which commences to move before the eye of the needle reaches the cloth, though when a short feed movement is made such movement is hardly perceptible. As the needle arrives near the material the thread, owing to the feed movement which has taken place since the last perforation, is caused to assume an angular form at the eye of the needle, and the distance between the guide-eye *p* and the cloth, measured along the thread, increases, and so causes the lever Q to move to let off enough to make up the deficiency in length. As the feed is greater the increase of distance above mentioned is greater or less, and so the lever is moved more or less in this way in proportion to the length of feed, and the farther it is moved the sooner is it brought in contact with the stop *n*, as before described, to effect the drawing off from the spool.

It will be understood by the foregoing description that the operation of drawing the thread from the spool is entirely distinct from the operation of drawing the stitch tight, and that at the time of drawing the stitch tight the thread is held securely, so that none is permitted to be drawn off from the spool, and these points constitute a most important feature of my invention, as without it I do not believe it practicable to produce a uniform tightness of sewing in all thicknesses of material without some manual adjustment of the tension or of a take-up or let-off apparatus.

The proper tightness of the sewing is regulated by moving the stop *n'* higher or lower, which causes the thread to commence drawing from the spool at an earliar or later stage in the operation of the needle, and consequently causes a greater or less quantity to be drawn off, and when once adjusted to produce a given tightness no further adjustment is ever necessary till it is required to do tighter or looser work.

The shuttle S represented is what is known as a "double-acting shuttle," having a point at each end, and making a movement in one direction only during every complete movement of the needle into and from the cloth, so that it makes a stitch by its movement in either direction. The bobbin T is applied to this shuttle substantially in the usual manner, and the shuttle is furnished internally with a stationary guide-bar, *t*, running nearly the whole length of the bobbin, with what I call a "take-off lever," *u*, and with what I call a "clamping-piece," *v*, as shown in Figs. 5, 6, 7. The guide-bar *t* is attached to the back of the shuttle. The take off lever is attached by a fulcrum-pin, *u'*, to the top of the shuttle. It has thread-holes in one end, situated nearly opposite the middle of the length of the bobbin, and has a fixed stop, u^2, provided for its other end within the shuttle, to prevent its moving too far inward. The clamping-piece *v* is of an elbow form, as shown in Fig. 6. It has a lever-like character, and is arranged to rock on a fulcrum, *v'*, which attaches it to the top of the shuttle. One arm extends some distance along the back part of the shuttle, near the eye *w*, at which the thread leaves the shuttle. The shuttle-thread (shown in blue color in the drawings) passes from the bobbin T, as shown in Figs. 5, 6, and 7, back under the guide-bar *t*, over the said bar to one of the holes in the take-off lever, thence back round the fixed guide-bar *t* to another eye in the take-off lever, and thence between the clamping-piece and the inside of the shuttle and through the eye *w*. The quantity of thread thus provided between the bobbin and the eye of the shuttle constitutes a reserve from which the thread is taken to make the stitches without drawing from the bobbin, the drawing of the thread from the bobbin being effected by an operation independent of that forming the stitch, as will be shortly described.

On the front or flat side of the shuttle-raceway U there are provided two stationary thin and nearly flat pieces of metal, *x x'*, with beveled edges, which project a short distance into the shuttle-race, as shown in Figs. 4 and 2. These pieces, which are parallel with the length of the raceway, are at such a height that the top of the interior of the shell of the shuttle will just pass over them in the movement of the shuttle, and notches are provided in the shell near the ends of the shuttle, as shown at *y y'* in Fig. 4, to enable it to pass over the said pieces, which are arranged in such positions relatively to the length of the raceway that the outer end of the clamping-piece *v* will just pass under one or other of them as the shuttle arrives near the end of its movement in either direction, and may thereby be depressed sufficiently to cause its back part to clamp the thread against the interior of the shell, close to the eye *w*, so that by the continued movement of the shuttle the stitch may

be tightened in a positive manner. The shuttle, however, moves far enough to leave the clamp free again at the time its movement is completed.

Near the pieces x x', which project into the raceway, there are in the front of the raceway two recesses, z z', so arranged that the end w^3 of the take-off lever is capable of entering one of them when the shuttle is at the end of its movement in either direction. These recesses have their faces 13 13 oblique to the straight face of the raceway, as shown in Fig. 4.

The operation of the above-described mechanism applied within the shuttle, in combination with the stationary pieces x x', attached to the raceway, and with the recesses z z', is as follows: The shuttle having passed through the loop of the needle-thread and arrived near the end of its stroke in one direction, the outer end of the clamping-piece passes under one of the stationary pieces x x', and so causes the clamping-piece v to clamp the thread close to the eye w of the shuttle. I will suppose, for example, the shuttle to be moving to the right, in which case the piece x will be that which operates. The clamping takes place just before any strain comes on the portion of the thread between the eye w and the cloth, and just before the loop of the needle-thread is drawn tight, so that by the continued movement of the shuttle its thread may be drawn tight at the same time as the loop of the needle-thread. At the time of the thread being thus drawn tight the take-off lever u is in the position shown in Fig. 6, lying nearly parallel with the length of the shuttle, in which position it has been left by the end w^3 moving along the unbroken part of the face of the shuttle; but as the shuttle, in completing its movement, passes far enough for the clamping-piece v to be free from the action of the piece x, the shuttle-thread is liberated from the clamp, and the draft produced upon it by the continued movement of the shuttle causes a small portion of the thread that is between the bobbin and the eye w to be drawn out, owing to the lever u having less friction upon it than the bobbin. The quantity of thread thus drawn out is only enough to be drawn into the cloth in making a stitch; but the feed, now taking place while the shuttle is stationary, causes the drawing out of a further portion equal to the length of the feed movement, thus completing the quantity necessary to form a stitch. This drawing out of the thread draws the perforated end of the take-off lever into the shuttle and causes the end w^3 to enter the recess z. During the return of the shuttle the clamping-piece, in passing the piece x', is caused again to clamp the thread, and the projecting end w^3 of the take-off lever, coming in contact with and passing along the inclined side 13 of the recess z, as shown in Fig. 4, while the thread is so clamped, is forced into the shuttle, causing the other end to be moved outward and to draw off as much thread from the bobbin as has just previously been drawn out through the eye w, the clamp preventing the slack thread outside of the eye from being drawn in again. The same operation of the clamping-piece and the take-off lever is produced at the opposite end of the raceway by the piece x and recess z z'; but in an ordinary single-acting shuttle this operation only takes place at the end of the raceway toward which the point of the shuttle is directed. In this operation it will be observed the thread drawn out from the shuttle in making the stitch is not taken directly from the bobbin, but from the quantity already drawn from the bobbin and held in reserve between the bobbin and the eye w by the take-off lever and the stationary guide t, on which portion the tension is always the same, and the variation in tension, which is unavoidable in drawing the thread from the bobbin, is prevented from affecting the sewing operation.

The clamping-piece v is more especially applied to the shuttle with a view to the production of the knotted stitch hereinbefore mentioned, the making of which will be presently described; and for making the ordinary shuttle-stitches the take-off lever u can be used in combination with the usual mode of producing friction on the shuttle-thread by passing it through a number of holes in the shell of the shuttle, and in this case the friction produced on the thread by the holes in the shell must be sufficient to draw the stitches tight, and after the stitch has been tightened at the completion of the movement of the shuttle the immediately subsequent action of the feeding device causes enough thread to make the next stitch to be drawn from between the bobbin and the hole where the thread first leaves the shuttle, and as the shuttle returns the take-off lever is operated in the same manner as before described by passing along the face 13 of the recess x or x'.

The devices used in combination with the needle and double-pointed shuttle to effect the knotting of their threads to make the knotted stitch hereinbefore mentioned consist, principally, of the clamping-piece, one of the projecting pieces, x or x', and an elastic fork, V V, of peculiar construction, (shown in Figs. 1, 2, 3, 4, 9, 10, and 11, but best in the perspective view, Fig. 11,) working above the upper surface of the cloth, the said fork being for the purpose of entering and spreading loops of the shuttle-thread which are drawn up through the cloth by the needle-thread, as will be presently described. In a machine constructed for making this stitch alone a projecting piece, x or x', will be provided near one end of the shuttle-race only; but in the machine represented, which is intended to sew both the ordinary shuttle-stitch and the knotted stitch, the piece x is formed on a slide, q, and fitted to slide in a groove in the shuttle-race, so that it may be drawn beyond where the clamping-piece of the shuttle will come in contact with it by means of a lever, W, which is connected with it by a rod, X. The fork V V is attached to a slide, Y, which is fitted to slide horizontally

in a slot in the stem of the presser C, has its two prongs, V V, elastic. The inner sides of the said prongs flare out in an upward direction from their lower edges, which remain in close contact when no force is applied to separate them, and which terminate in two short sharp points, 16 16, which are parallel on their inner sides, but beveled in opposite directions on their outer sides, so as to be capable of closing in a such a manner as to operate together like a single point in entering the small loops of the shuttle-thread, which are drawn up through the cloth. The upper parts of the said prongs project beyond the said points in the form of two horns, 17 17, which are so formed as to be capable of guiding the loops of the shuttle-thread to the points 16 16. The said fork is attached to a slide, Y, which is fitted to slide horizontally through a guide-slot in the stem of the presser in a direction parallel with the feed movement, and which has secured to it a pin, 14, which enters an upright slot, 15, in the lever P, before described, by which the said fork is caused to receive a short longitudinal movement parallel, or nearly so, with the feed movement of the cloth. The points 16 16 of the said fork are directed forward or in the opposite direction to the feed movement, and are so situated as to cross the path of the needle in their movement; and when the presser is down upon the cloth the fork just rests on the upper surface of the same. During the whole of each ascending movement of the needle and during a portion of its descending movement the fork V V is stationary, with its points some distance behind the needle; but immediately after the descent of the needle commences, and before the point of the latter arrives at the surface of the cloth, the said fork is caused to advance quickly by the movement of the lever P, produced as hereinbefore described, to such a position that the needle, to enter the cloth, must force apart and pass between its prongs in the manner represented in Fig. 11. The fork only remains in this advanced position till the needle has passed a short distance through the cloth, and is then drawn back again. During each descent of the needle which follows the movements of the shuttle to the left of Figs. 1, 3, and 4 the fork V V effects nothing by its movement, as the shuttle-thread has been drawn tight by the action of the clamping-piece *v*, produced by the piece *x'*, before described; but during each descent of the needle which follows the movement of the shuttle in the opposite direction the points 16 16 of the said fork enter a loop of the shuttle-thread, which has been drawn up through the cloth, in the manner shown in Fig. 9, by the tightening of the needle-thread, owing to clamping-piece *v* not having been brought into operation, and the shuttle-thread having consequently been left slack while the needle-thread was tightened. This advance takes place simultaneously, or nearly so, with the feed movement of the cloth in the opposite direction, and the said points draw the loop lengthwise over the surface of the cloth, as shown in Fig. 10, before the needle, by its descent between the prongs of the fork, forces them apart, and so spreads the loop laterally, as shown in Fig. 11, and passes through it. By the repetition of the above-described operations a series of knotted stitches, such as is represented in Fig. 12, is produced, two operations of the needle and a movement back and forth of the shuttle being required to produce every stitch. The peculiarity of this stitch consists in a loop, 18, of one thread passing through or partly through the cloth from one side and being locked by the other thread on the other side of or within the cloth and a loop, 19, of the second thread passing through the cloth from the opposite side and having the first thread wound once round it and a loop, 18, of the said thread passed through it.

The needle-thread-controlling apparatus may be varied in its construction to a considerable extent without altering the principle of my invention—that is to say, the clamping device for holding the thread, while it is tightened by the rise of the needle, may be applied in a variety of ways, and the contrivance for drawing off the thread from the spool O may be variously applied to make its operation independent of the operation of tightening the stitch.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with a perforating eye-pointed needle of a sewing-machine, of the thread-clamping device, constructed and operating substantially as described, and the independent thread-drawing device, constructed and operating substantially as herein shown and described.

2. The employment within the shuttle of a sewing-machine of a take-off apparatus operating to take off from the bobbin a quantity of thread, to be held in reserve between the bobbin and the point where the thread leaves the shuttle till it is required to be delivered from the shuttle, and then to let out the quantity necessary to form a stitch without drawing from the bobbin, substantially in the manner described.

3. The combination, in the shuttle of a sewing-machine, of the take-off apparatus above described, with the clamping-piece constructed as above described, and operating to hold the thread at the time of the tightening of the stitch, as herein specified.

4. The employment, in combination with a needle and shuttle, of an elastic pointed fork, constructed and applied and operating to extend and spread the loops of the shuttle-thread, which are drawn through the cloth, substantially as herein set forth.

DWIGHT TRACY.

Witnesses:
L. A. FULLER,
O. O. POTTER.