5 Sheets—Sheet 1.

E. TIFFANY.

Knitting-Machine.

No. 213,956. **Patented April 1, 1879.**

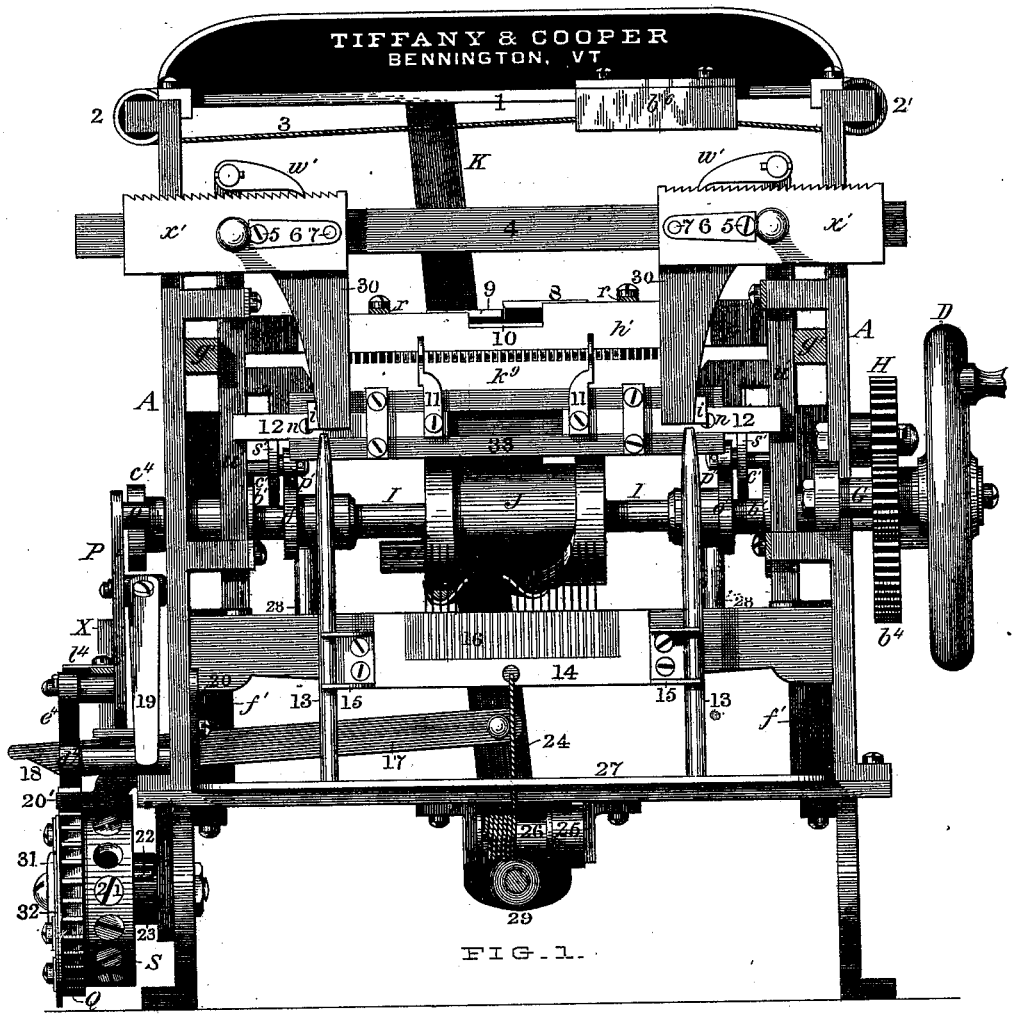


FIG. 1.

WITNESSES.

C. Hosking

N. T. Cushman

INVENTOR.

Eli Tiffany,

by Franklin Scott,

his Attorney.

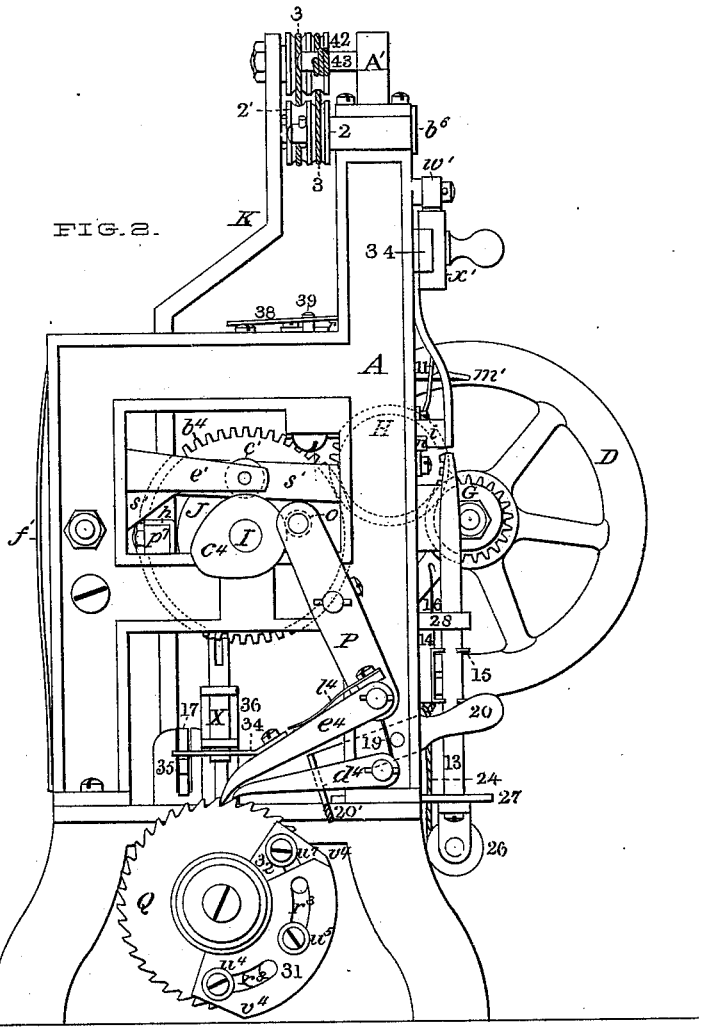
5 Sheets—Sheet 2.

E. TIFFANY.

Knitting-Machine.

No. 213,956. **Patented April 1, 1879.**

FIG. 2.



WITNESSES.

E. Hunting
N. T. Cushman.

INVENTOR.

Eli Tiffany,
by Franklin Scott,
his Attorney.

5 Sheets—Sheet 3

E. TIFFANY.

Knitting-Machine.

No. 213,956. **Patented April 1, 1879.**

FIG. 3.

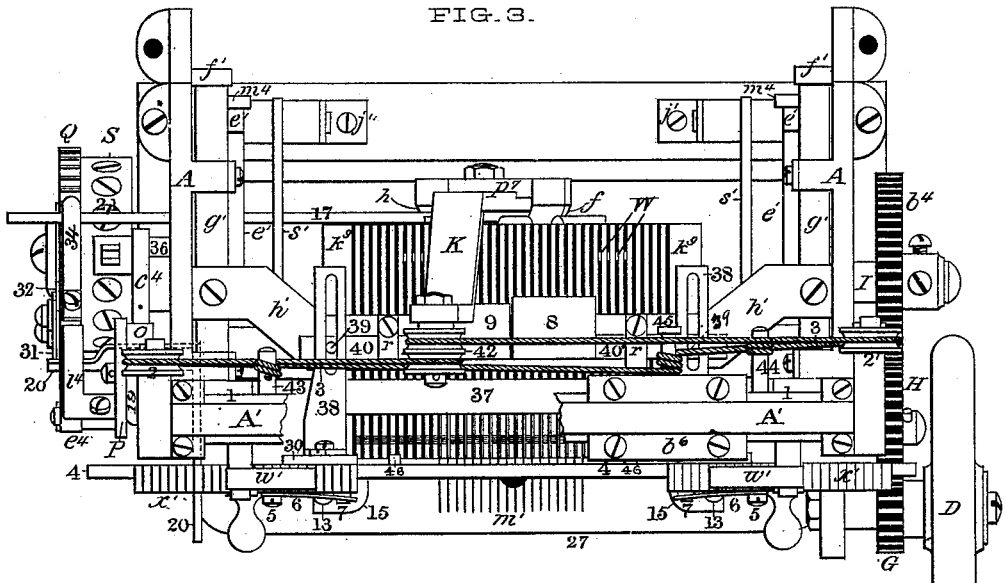
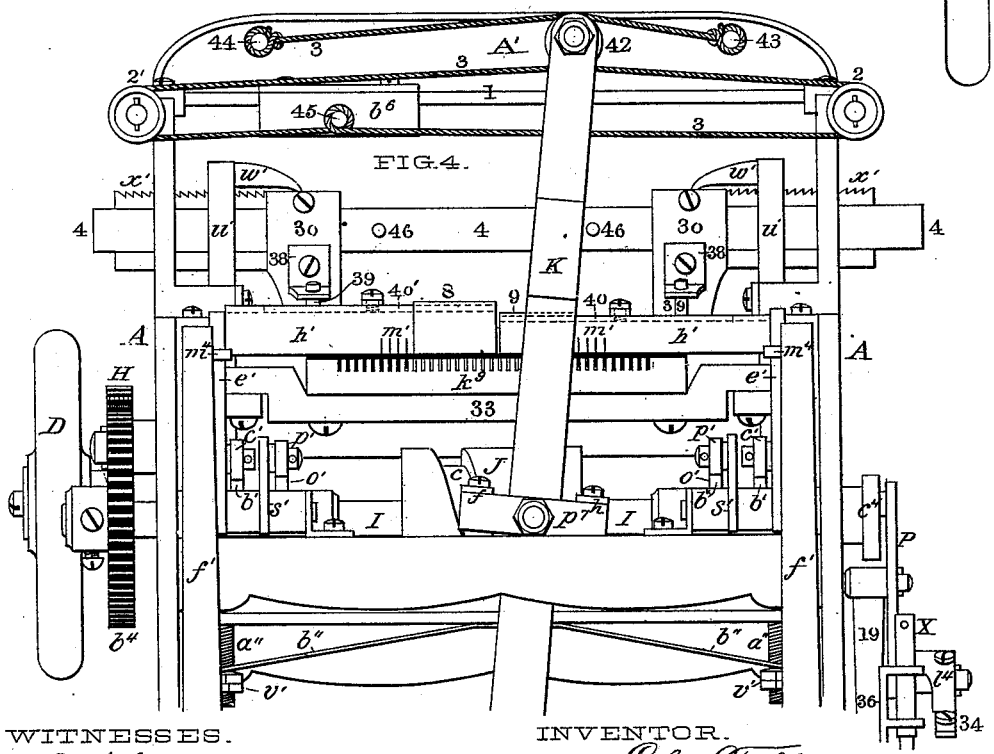


FIG. 4.



WITNESSES.

C. Harling

N. T. Cushman.

INVENTOR.

Eli Tiffany,

by Franklin Scott,

his Attorney.

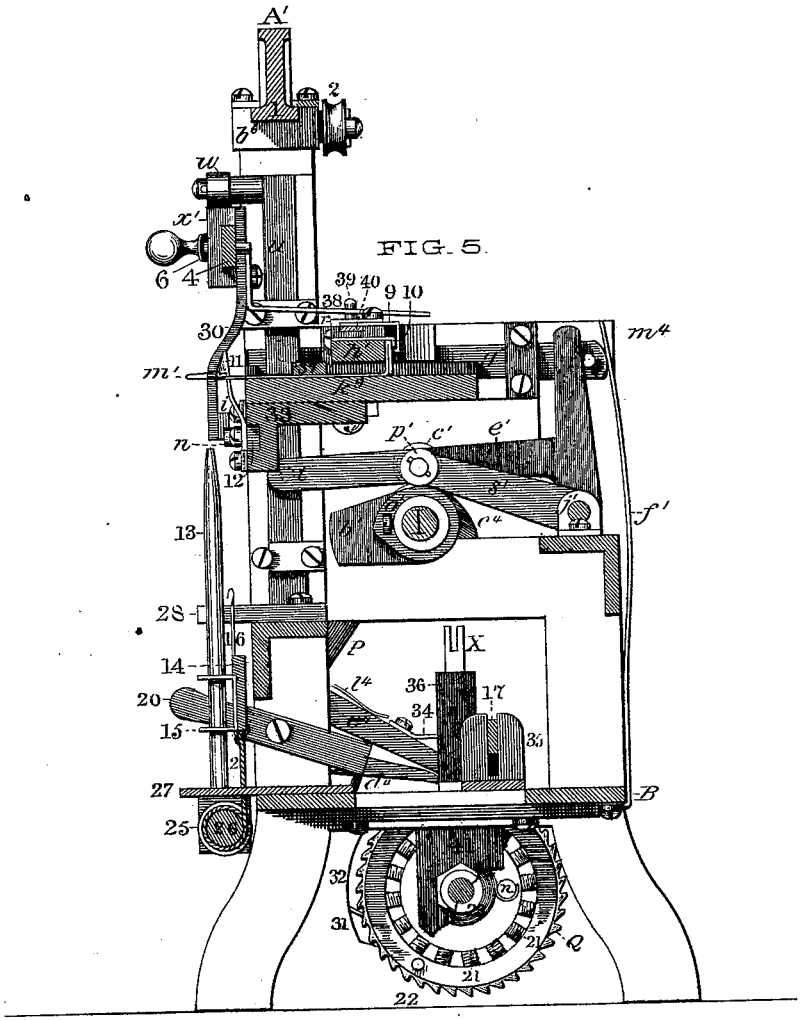
5 Sheets—Sheet 4.

E. TIFFANY.

Knitting-Machine.

No. 213,956. **Patented April 1, 1879.**

FIG. 5.



WITNESSES.

C. Hosking

N. T. Cushman

INVENTOR.

Eli Tiffany

by Franklin Scott

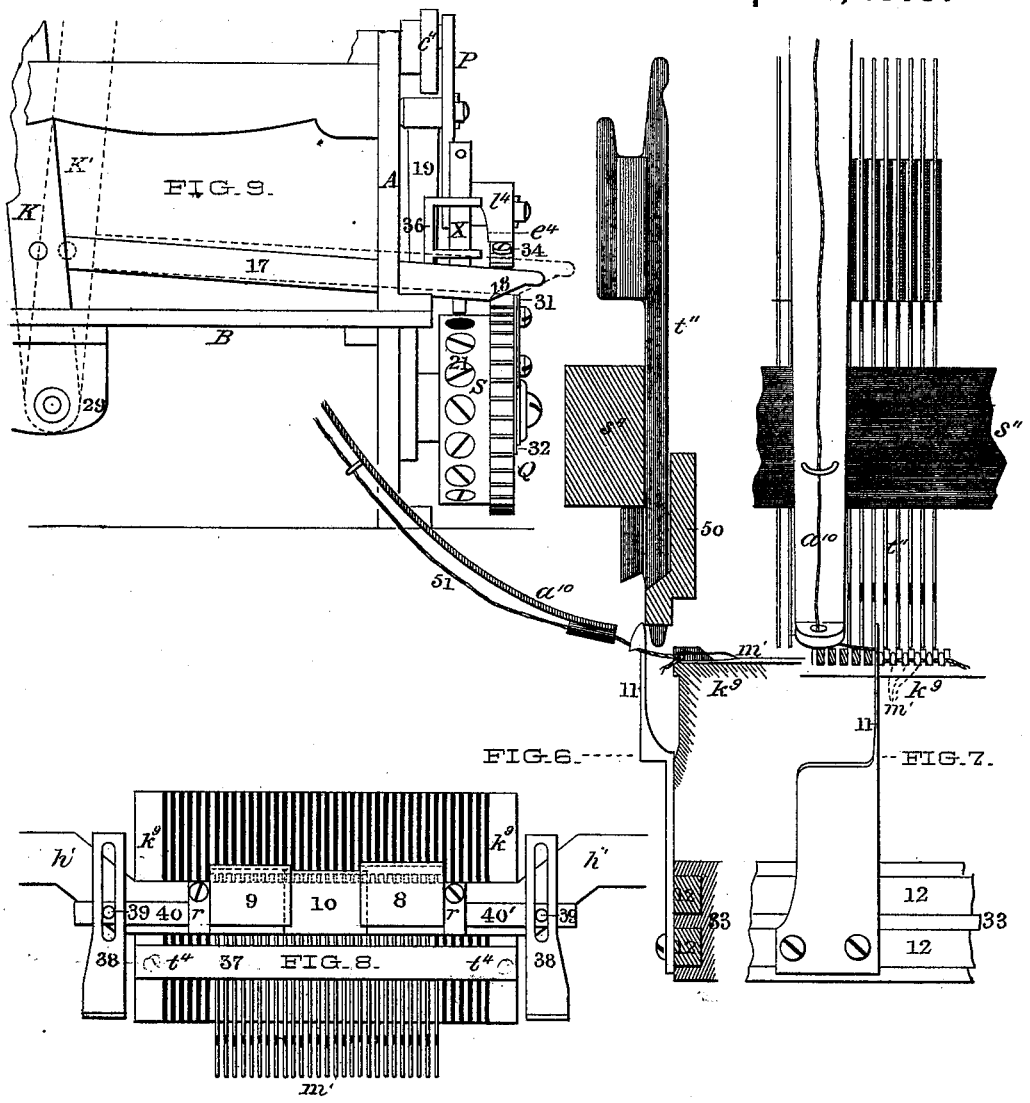
his Attorney.

5 Sheets—Sheet 5.

E. TIFFANY.

Knitting-Machine.

No. 213,956. Patented April 1, 1879.



WITNESSES.

C. Hesling

N. T. Cushman.

INVENTOR.

Eli Tiffany

by Franklin Scott

his Attorney.

UNITED STATES PATENT OFFICE.

ELI TIFFANY, OF BENNINGTON, VERMONT, ASSIGNOR OF ONE-HALF HIS RIGHT TO CHARLES COOPER, OF SAME PLACE.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **213,956**, dated April 1, 1879; application filed June 25, 1878.

To all whom it may concern:

Be it known that I, ELI TIFFANY, of the town of Bennington, in the county of Bennington and State of Vermont, have invented certain Improvements in Knitting-Machines, of which the following is a specification:

The several devices, groups of mechanism, and combinations thereof which constitute the subject-matter of this invention are improvements upon and adapted to be applied to the class of machines upon which Letters Patent No. 198,757 of the United States were granted to me January 1, 1878, to which patent and the drawings accompanying the same reference is or may be made for the clearer elucidation of the features embraced in this invention, premising here that such parts as are common to this machine and the machine forming the subject-matter of said Patent No. 198,757 are designated by like letters or figures of reference, and perform similar functions.

The leading features of this invention may be summarized as follows:

First, in the combination of horizontal laterally-movable overlapping plates, which govern the longitudinal action of the needle, with the needles and a driving-bar which actuates them, and mechanism for rendering such plates laterally adjustable.

Second, special mechanism for connecting the needle-driving bar with the overlapping plates, consisting of slides, to which such plates are attached, working in longitudinal grooves in said driving-bar, in combination with said bar and plates, and sliding ratchet-heads, from which, through the connections shown, the plates receive their lateral movements.

Third, the means shown for imparting to the needles their longitudinal reciprocating movements, consisting of the cams on main driving-shaft, elbow-levers for transmitting motion from cam-shaft to the horizontal slides, horizontal slides having the driving-bar before alluded to attached thereto, and the overlapping plates, all combined and arranged to operate as shown.

Fourth, special means for preventing the yarn from getting entangled in the sinkers or needles during the operation of narrowing, consisting of two vertical hooks or thread-guards, one at each selvage of the cloth, attached to horizontally-adjustable slides, which slides are connected with and have motion imparted to them from the same sliding ratchet-heads which impart motion to the overlapping needle-driving plates.

Fifth, the combination, with the sliding ratchets, which control the lateral action and movements of both overlapping plates and thread-guards simultaneously, of the system of cams, levers, slides, and pawls shown for operating said ratchets.

Sixth, the combination of a cord or chain, having its extremities attached to some part of the frame, with a double sheave attached to the lever which propels the yarn-carrier, and two single sheaves attached to either side of the machine, said cord being also attached to the yarn-carrier at a point intermediate the two single sheaves, whereby the extent of movement imparted to the yarn-carrier, in comparison with the extent of movement of the draw-lever, is doubled.

Seventh, special means for keeping the fabric taut or distent during the knitting process, consisting of a tension-bar armed with hooks for attaching to the fabric, and connected by a cord or chain with a coiled or other spring, attached to frame of the machine at or near its bottom.

Eighth, special means for securing the tension-bar and attached fabric from injury in the event of the same being detached from the needles, consisting of terminal guides at each end of the bar adapted to slide upon vertical standards erected upon the lower part of the frame.

Ninth, circumferentially-adjustable overlapping disk-plates attached to the face of the pattern-wheel, in combination with the pawl which actuates the same, and a bar attached to the draw-lever for lifting the pawl out of engagement with the ratcheted edge of the pattern-wheel, as a means of enhancing the capacity of the pattern-cylinder.

Tenth, the means shown for resetting the pattern-cylinder after the completion of a pattern or piece, consisting of an involute spring

attached to the pattern-cylinder and to the frame of the machine, or a stud projecting therefrom, in combination with a lever for disengaging the pawls which work on the ratcheted edge of the pattern-cylinder.

The elements of invention above enumerated are fully illustrated in the five sheets of drawings accompanying this specification, and which are made a constituent part thereof, wherein—

Figure 1 exhibits a front elevation of so much of a fashioning knitting-machine as is requisite to show the features of invention before enumerated as connected therewith. Fig. 2 shows a view of the left-hand end of said machine in elevation. Fig. 3 shows a plan view of the top of said machine. Fig. 4 shows a rear elevation of the upper section of the machine. Fig. 5 exhibits a view, in elevation, of a transverse section of said machine, taken through about the center of the machine and viewed looking toward the left. Fig. 6 shows a view, in cross-section, of the falling bar, sley, and other parts connected therewith, and especially of the relative positions of the yarn-carrier, sinkers, and thread-guard. Some of these parts are not shown in other parts of the drawings, but may be found in all machines to which the feature of the thread-guard is applied, and are shown in my Patent No. 198,757, aforesaid. Fig. 7 is a front elevation of Fig. 6. Figs. 6 and 7 are drawn from a full-sized working machine. Fig. 8 is a plan view of the sley and mechanism connected therewith, which latter both operates and regulates the needles. Fig. 9 is a rear view of the pattern-cylinder and devices connected therewith for augmenting its capacity when on straight knitting between narrowing points.

Spring barbed needles are exclusively employed in this machine, and each needle moves or works in a groove in the bed-piece or sley independently of every other needle, and if broken or injured may be readily removed by loosening a cap-piece which confines them in the grooves in which they work, withdrawing the defective needle, and substituting a perfect one, which operation involves but a momentary delay or stoppage of the machine.

Motion is transmitted from the driving wheel or pulley D through the gears G H and b^4 to main shaft I, from which, mainly through cams and friction-rolls in conjunction with levers, motion is communicated to the several groups of mechanism hereinbefore mentioned.

Upon shaft I, at or near the center of the machine, is placed grooved cam-cylinder J, from which a reciprocatory motion is communicated to the driver b^6 of the yarn-carrier slide or head. On either side of cam-cylinder J, as shown in Figs. 1 and 5, are cams o' o', which, through levers s' s', vertical slides u^1 u^1, pawls w^1 w^1, and sliding racks or ratchet-heads x' x', communicate the desired movements to slides 40 40′ and their appurtenances, arms 30 30 and their several attachments, including slides 12 12, carrying the thread-guards 11 11, and the necessary means for moving up the narrowing points. (Not shown here, but similar to that exhibited in Patent No. 198,757, aforesaid.)

Arranged next outside of cams o' o' are the cams b^1 b^1, which, through the agency of elbow-levers e^1 e^1, horizontal slides g' g', and needle-driving bar h', carrying slides 40 40′ and plates 8, 9, and 10, actuate the needles in process of knitting and narrowing by communicating to them their forward and backward movements.

On the left extreme end of shaft I cam c^4 is placed, which cam communicates rotary motion to pattern-cylinder S through the medium of lever P, to the upper end of which is pivoted friction-truck o, and to the other end pawl e^4, which works in ratchet Q, attached to pattern-cylinder S.

Upon the back side of the cross-piece A′ of the frame of the machine, near the ends thereof, project the two pins or lugs 43 and 44. At each end of cross-piece A′ are projections of the frame which carry the sheaves or pulleys 2 and 2′. To the inside of the upper extremity of draw-lever K is pivoted the double-grooved sheave 42. Upon the back side of slide b^6 projects a lug or pin, 45. These several parts are connected by the cord, or chain 3, as follows: One end of said cord, being firmly fastened to pin 44, as shown in Fig. 3, is next passed around that groove of sheave 42 next to the draw-lever K; thence back to, over, and around sheave 2′; thence to pin 45 on slide b^6, to which pin it is firmly secured; thence said cord passes across to, under, and around sheave 2; thence to, under, and around the other groove of sheave 42 back to pin 43, where the other end is firmly secured. When in use this cord or chain is kept taut, so that there may be no lost motion in taking up slack.

It will be observed that, when rigged as above described for operation, a lateral movement of double sheave 42 will cause to be taken up on the under side of said sheave (considered with reference to a fixed point on the machine) twice the length of cord that is paid out from the upper side of said sheave; hence slide b^6 will have imparted to it the same extent of movement in an opposite direction from the movement of sheave 42 as will be indicated by the take-up of cord or chain on the under side of sheave 42. This arrangement enables me to produce a complete traverse of slide b^6 with a stroke of draw-bar K of half the extent of said traverse. A beneficial result from this diminished stroke follows in the construction of cam-cylinder J, in which the cam-groove (other things being equal) requires but half the pitch formerly given it to produce the same movement. Besides the draft upon the slide b^6 is practically in a straight line from beginning to termination of the movement, and is uniform in velocity, both of which points constitute decided

improvements over movements produced by a crank and pitman or by a lever and connecting-rod attached to the slide.

This device works very silently and easily, and economizes power.

Motion being communicated to needle-driving bar h' from shaft I through the agency of cams b^1 b^1, trucks c^1 c^1, levers e^1 e^1, and horizontal slides g' g', to which the extremities of driving-bar h' are attached, as shown in Fig. 3, as before alluded to, I will here describe the functions of said driving-bar and of the mechanism attached thereto and co-operating therewith: Driving-bar h' spans the grooved bed or sley h^9 lengthwise, and is secured, as stated, at its extremities to slides g' g'. Its only movement is reciprocatory in the direction of the needles. A space in its central part, analogous to the width of the narrowest part of the fabric proposed to be knit upon the machine, is recessed down from the upper surface, as shown in Fig. 1. In this recess is fitted a plate, 10, which plate extends beyond the rear of bar h', as seen in Fig. 5, to the extent of the width of the stem or shank of the needle, and has its rear edge turned or bent down in the form of a downward-projecting ledge just behind the top of the upward-projecting needle-shank. The needles working underneath plate 10, of course, are in constant action during the progress of knitting from the commencement to the completion of the pattern.

The tops of right and left halves of bar h' are in different planes. In the top of said bar are constructed two longitudinal ways, the one at the left of the center to receive slide 40, and the one at the right, which is in the highest plane, to receive slide 40′. These slides are confined in their ways by caps r r, screwed to bar h'. To slide 40, at its inner extremity, is attached plate 9, the rear part of which projects over beyond the rear edge of plate 10, is bent down behind plate 10, and has turned inwardly upon the lower edge of such depending projection a horizontal flange edge, the interior of which edge is in the same vertical plane with the interior of projection or plate 10, as seen in Fig. 5. To slide 40′, at its inner extremity, is attached plate 8, the construction and functions of which are in all respects similar to plate 9, except that it is enough larger, in respect to height and rear projection, to overlap and posteriorly envelop plate 9 when both are advanced to their most contracted and intimate sphere of action. Plate 8 has an introverted flange edge, similar to that on plate 9, and in same vertical plane, which impinges against the needle-shanks during the knitting process. To the outer end of slides 40 40′, respectively, are affixed lugs or pins 39 39, which protrude up through slots in wings 38 38, said wings being attached to the back sides of the sliding racks x' x', Figs. 2, 3, and 4, and have lateral movements with said slides, which slides, in turn, have their motion imparted to them from pawls w^1 w^1, attached to vertical sliding rods u^1 u^1, actuated by cams o' o' through the intervention of truck p' and lever s', to the front extremity of which said slide u^1 is pivoted, as at t'. To the back sides of sliding racks x' x' are attached the depending plates 30 30. On back of bottom end of each plate 30 is a small wing or ledge, i i, which engages with a slot in top of stud n n, which studs, in turn, are connected with slides 12 12. The inner extremities of slides 12 12 sustain and carry the thread-guards 11 11, and, being connected with the same common motors (sliding ratchets x' x') as plates 8 and 9 are, have with them a uniform concurrent progressive movement in the narrowing process. The advanced movement of sliding ratchets x' x', and their dependent mechanism takes place at the moment when the needles are retracted to their utmost rear limit.

For the purpose of taking care of the slack yarn or feed-thread at the termination of each traverse of the yarn-carrier, and to keep the feed-thread well in front of and out of the path of the sinkers in their downward movement, so that the same may not become in any way entangled therewith, I have designed the devices shown more especially in Figs. 1, 6, and 7.

Resting upon ledges projecting from the inside of the frame, as seen in rear view in Fig. 4, and extending across the same, is the bed-piece 33. Upon its upper surface is supported the sley h^9, and in its front face are cut one or more (as may be required) horizontal longitudinal ways to receive the slides 12 12. The thread-guards 11 11 are attached to the inner ends of these slides, as shown. They are sufficiently thin at their upper ends to pass freely between the needles, and the top end of each is shaped in the form of a hook, (shown in detail in Figs. 6 and 7,) which hooks stand nearly opposite or a little above the path of travel of the yarn in process of being paid out to the needles, and as close to the needles as they can be placed and avoid interference with the downward movement of the sinkers.

By reference to Figs. 2 and 9 the construction and operation of pattern-cylinder S and its several attachments and appurtenances may be ascertained. Pattern-cylinder S in this invention is designed to perform the functions of pattern-drum S in my said Patent No. 198,757, but differs from that in having no axial, or at best but a limited axial, movement, (there being none when but a single range of holes are used,) and in being equipped with the ratchet-rim Q, to the outside of which rim are secured the segmental disks 31 and 32. The peripheries of said disks project slightly beyond the periphery of ratchet Q, and there may be two or more of such segmental disks. They are constructed with slots r^3 r^3, which are concentric with the axis of motion of the pattern-cylinder, and are so arranged that when they are adjusted on the face of the ratchet Q the ends overlap each other and the

concentric slots in one fall in juxtaposition with the slots of the other, so that set-screws w^5 will pass through both disks when they overlap each other. Disk 32 is confined at its outer end by set-screw w^7, and disk 31 by set-screw w^4, the intermediate overlapping ends of the disks being secured by set-screw w^5 passing through the concentric slots in the disks, as shown. The purpose of these concentric slots r^3 r^3 is to enable the periphery of the two disks, between points r^4 r^4, to be extended or contracted, as desired, as shown in Fig. 2.

The outer edges of the segmental disks 31 and 32 operate in conjunction with the beveled edge 18 of lifting-bar 17, which is connected with draw-lever K, which beveled edge 18, at every other stroke of lever K, impinges against and slides upon the top edges of disks 31 and 32 whenever pattern-cylinder S is rotated so as to present the periphery of disks 31 and 32 to the action of beveled face 18, as shown in Fig. 9 in dotted lines.

Pattern-cylinder S is propelled by pawl e^4, attached to lever P, which lever is actuated by cam c^4 on shaft I. Ratchet Q is held in check by pawl d^4, pivoted to some part of the frame of the machine. The joint operation of disks 31 and 32 with lifting-bar 17 is as follows: To the top of pawl e^4 is attached a projecting arm, 34, which extends backwardly over and in close proximity to the top edge of lifting-bar 17, immediately over the beveled face or edge 18. During the progress of the knitting, whenever cylinder S has been rotated by the action of pawl e^4 so as to bring the projecting edge of disk 32 under beveled edge 18, the succeeding throw of lever K toward the pattern-cylinder S will cause the beveled end of lifting-bar 17 to slide up on the edge of the disk, obstructing its normal path of travel, and, by this elevating movement, cause the upper edge of said bar 17 to impinge against the under side of arm 34, which consequently will be forced up, carrying with it pawl e^4, to such an elevation that the point of said pawl in its progressive movement will escape engagement with the ratchet-teeth, and thus leaving the pattern-cylinder stationary during the formation and knocking over of one range of stitches. When draw-lever K makes the opposite or return stroke it withdraws lifting-bar 17 from the influence of the disk edges, thus leaving pawl e^4 free to act on ratchet Q, and propel the pattern-cylinder the desired number of notches as adjusted. When in use all the holes in the pattern-cylinder opposite or against the projecting peripheries of disks 31 and 32 are closed, so that no narrowing occurs while said disks are in action.

Pattern-cylinder S may be provided with one or more ranges of holes, as may be required by the peculiar configuration of the selvage to be shaped or by the length of the piece to be wrought; but for small work, like sleeves, stockings, &c., a single range is sufficient, as by the use of disks, as shown, the capacity of the cylinder in knitting stretches of straight or parallel selvages is duplicated, and the length of such parallel or straight stretch may be determined by the adjustment of the disks 31 and 32, the length of such stretch coinciding with the length of the interval between points v^4 and v^4, Fig. 2.

Upon the lower front breast-girt of the machine is constructed a shelf or table, 27. Upon this shelf are erected two guide-standards, 13 13. Between said standards works vertically the tension-bar 14 around with the tenter-hooks 16, whose office is to hook onto the outer end of the fabric as it leaves the needles, and keep the same laterally distended. Said tension-bar is provided at each end with guide-pieces 15 15, which slide upon the standards 13 13. To the lower edge of the tension-bar a cord is attached, which extends down through table 27, and coils onto drum or spool 26 beneath. Drum 26 is actuated to coil the cord 24 by a coil-spring, 25.

In knitting fashioned goods, I prefer to commence at the wide end and progress by narrowing.

The appliances for producing the tension just described also work admirably to regulate and equalize the same, for when the tension-bar is drawn up to hook onto the fabric at the commencement of a new piece the act of drawing up coils up spring 25 tightly, so that it exerts its greatest force. At the same time the tension-bar is hooked onto the fabric at its widest point, where it requires and can sustain the greatest tension. As the knitting progresses and the piece becomes narrower, and therefore requiring less tension, the tension-bar has descended, thus allowing spring 25 to uncoil, and, as a consequence, it becomes weaker. Thus the breadth of the fabric and the strength of spring 25 diminish in nearly equal ratios. Standards 13 13 and guides 15 15 subserve another purpose.

If from accident or any cause the entire fabric becomes detached from the needles by the yarn running out, and, as a result, the knock-over bar casts off the stitch, the tension-bar will descend to its place on table 27 without danger of injury either to the fabric or any part of the machine.

Attached to the frame, at its left end, is the lever 20, having a projecting wing, 20′, the duty of which is to elevate or throw out of engagement both pawls d^4 and e^4. This is done after the completion of each pattern being knit, to allow the pattern-cylinder to rotate back to its starting point, such backward rotation being accomplished through the agency of a coil-spring attached to the interior of the pattern-cylinder at n^4, Fig. 5, and to the stud on which said cylinder revolves, which spring is coiled up by the rotation of the cylinder as the knitting progresses, and uncoils when the pawls are released from the ratchet, as aforesaid, carrying around with it the cylinder to its starting-point, which is determined by a check-pin, 22, inserted in the edge of the said cylinder, and finds abutment against some part

of the frame. Spring 19 is attached to the pivot-hub of lever P, and accomplishes the retractile movement of pawl e^4, which, in turn, is held to its contact with ratchet Q by spring l^4. The forward movement of slides g' g' is accomplished by springs f' f'. The downward movement of slides u^1 u^1 is accomplished by gravity and the action of spring b'', attached to the frame of the machine at its center, and at its extremities to the lower ends of said slides.

The ratchet-slides are prevented from slipping laterally by springs 6 6, attached to their front sides by screws 5 5, the free ends impinging against short loose studs 7 7, which find bearing against the surface of bar 4.

Under certain circumstances plate 10 could be dispensed with. This could be done by adjusting the movements of plates 8 and 9 so that when distended to their greatest limit the inner extremities would still slightly overlap each other.

The following is the operation of the machine: In operating this machine I employ the same system of movable friction rolls or trucks, controlled by a single shipping-bar and narrowing-tackle, as described in Patent No. 198,757, which system provides that when by the action of the shipping-bar the trucks and cams used for knitting are thrown out of action at the same time and by the same means the narrowing trucks and cams are brought into action, and vice versa. Presuming that the machine is running on a stretch of straight knitting and pattern-cylinder S has rotated so as to let pin X drop into one of the holes in its surface, the narrowing-tackle will be brought into play, which will produce or secure a movement of the shipping-bar, thus shipping truck p' from its former position into the position shown in the drawings, in conjunction with cam o'. At the same time, and by same means, truck c' will be shipped off from the cam b^1, (with which it is shown in these drawings to be in conjunction and cooperation,) and thrown out of action entirely. From this point the further rotation of cam o' will cause, through truck p' and lever s', the elevation of vertical slide u^1, and, consequently, the retreat of the forward points of pawls w^1 w^1 on the ratchet-slide x' x' one notch. Slides u^1 commence to descend as the highest point of cam o' passes truck p'. This communicates to pawls w^1 w^1 an advance movement, and they propel slides x' x' along toward each other on bar 4 one or more notches. As a result, plates 40 40′ and thread-guards 11 11, as well as the narrowing-points, are similarly advanced a like distance. This movement occurs when the needle-driving mechanism is thrown back to its utmost limit, and the inward movement imparted to plates 8 and 9 last above described will leave the shank of the outside needle or needles uncovered and out of the path of travel of said plates, as shown at W, Fig. 3, so that when the narrowing is completed and knitting resumed it is resumed only with the needles covered and actuated by plates 8, 9, and 10. Plates 8 and 9, being attached to driving-bar h', perform a double function. The lateral movement given them by the narrowing mechanism leaves out of action the superfluous needles, and they are also the immediate agents to give to the needles their appropriate reciprocatory movements.

This system differs from other machines where loose or independent needles are employed, in that all the needles employed while knitting are moved simultaneously in the same manner as when rigidly attached to a needle-bar, and also in that I utilize the mechanism provided for throwing or leaving out of action all needles which have finished the performance of their functions, for the purpose of giving to all the needles used in the machine their forward movement in the knitting process, the backward movement being produced by the needle-driving bar. Hence

I claim as new and desire to protect by Letters Patent—

1. In fashioning knitting-machines, the combination of the driving-bar h', overlapping driving-plates 8 and 9, needles, and mechanism for rendering said plates laterally adjustable with reference to the needles, substantially as described, and for the purposes set forth.

2. In fashioning knitting-machines, the combination, with the needle-driving bar h', of needle-driving plates 8 and 9 and mechanism for connecting said bar and plates, consisting of the slides 40 40′, working in grooves in said bar h', and sliding ratchet-heads x' x', and mechanism for connecting and operating the same, substantially as described, and for the purposes set forth.

3. In knitting-machines of the character described, the combination, with a needle-driving bar equipped with overlapping needle-driving plates attached and operated as shown and described, of cams on main driving-shaft, elbow-levers, and slides for imparting to the needles in the processes of knitting and narrowing their appropriate reciprocal movements in the sley, substantially as described and set forth.

4. In fashioning knitting-machines, the combination of thread-guards 11 11, attached to movable slides 12 12, with sliding ratchet-heads x' x' and mechanism for connecting the same and imparting to them their appropriate lateral movements, substantially as described, and for the purposes set forth.

5. In knitting-machines of the character described, the sliding ratchet-heads x' x', armed with one set of projections connecting with the overlapping needle-driving plates, and another set of projections connecting with the movable thread-guards, in combination with the mechanism shown for imparting to and controlling the lateral movements of said sliding ratchets, for the purpose of imparting to said overlapping needle-driving plates and

said thread-guards coextensive and synchronous lateral movements in the same direction, substantially as described and set forth.

6. The combination of the cord or chain 3 3 3 with the machine-frame, provided with pins 43 and 44 and the sheaves 2 2′, the sliding head b^6, provided with pin 45, and the draw-lever K, provided with the movable double sheave 42, constructed and arranged to operate substantially as described, and for the purposes set forth.

7. The combination of the incased coil-spring 25 by means of cord or chain 24 with a tension-bar provided with the tenter-hooks, and adapted to be hooked onto the wide end of the fabric, adjusted substantially as described, so that as the knitting and narrowing progresses said spring will uncoil and thereby become weaker, for the purpose of keeping the knit fabric distent and taut until its completion, arranged to operate substantially in the manner described and set forth.

8. The combination of tension-bar 14, provided with the guides 15 15, with the guide-standards 13 13, for the purpose of guiding and securing from injury both the tension-bar and the fabric thereto attached whenever from any cause the cloth becomes detached from the needles, substantially as described and set forth.

9. The combination of the adjustable segmental disks 31 and 32, attached to ratchet Q, with pattern-cylinder S, lifting-bar 17, and pawl e^4, as a means for enlarging the capacity and retarding the motion of pattern-cylinder S, when arranged to co-operate substantially in the manner described and set forth.

10. The combination of lever 20 and pawls e^4 and d^4 with pattern-cylinder S and spring 23, attached as shown, for the purpose of readjusting cylinder S, by causing the same to rotate backwardly to a position ready for commencing a new piece, being arranged to co-operate substantially in the manner described and set forth.

In testimony whereof I have hereto subscribed my name at Bennington, in the State of Vermont, this 20th day of June, A. D. 1878.

ELI TIFFANY.

In presence of—

PHEBE TIFFANY,

FRANKLIN SCOTT.