

E. TIFFANY.

STOP MOTION FOR STRAIGHT KNITTING MACHINES.

No. 521,277.

Patented June 12, 1894.

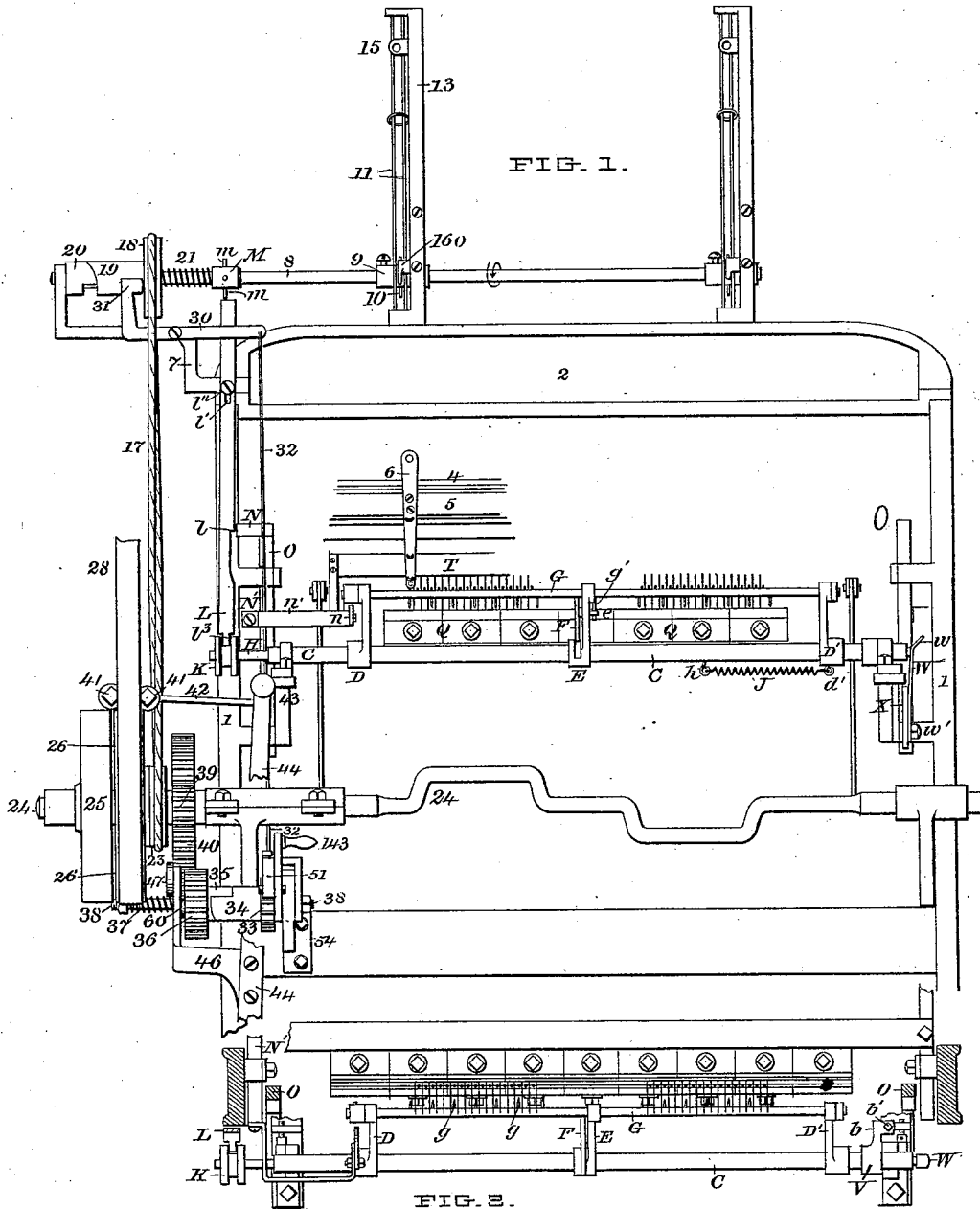


FIG. 2.

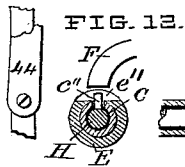


FIG. 12.

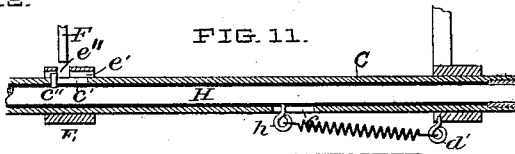


FIG. 11.

WITNESSES:

*Wm. S. Brew*  
*James O. Meagher*

INVENTOR:

ELI TIFFANY,  
 BY *Franklin Scott*, ATTORNEY.

(No Model.)

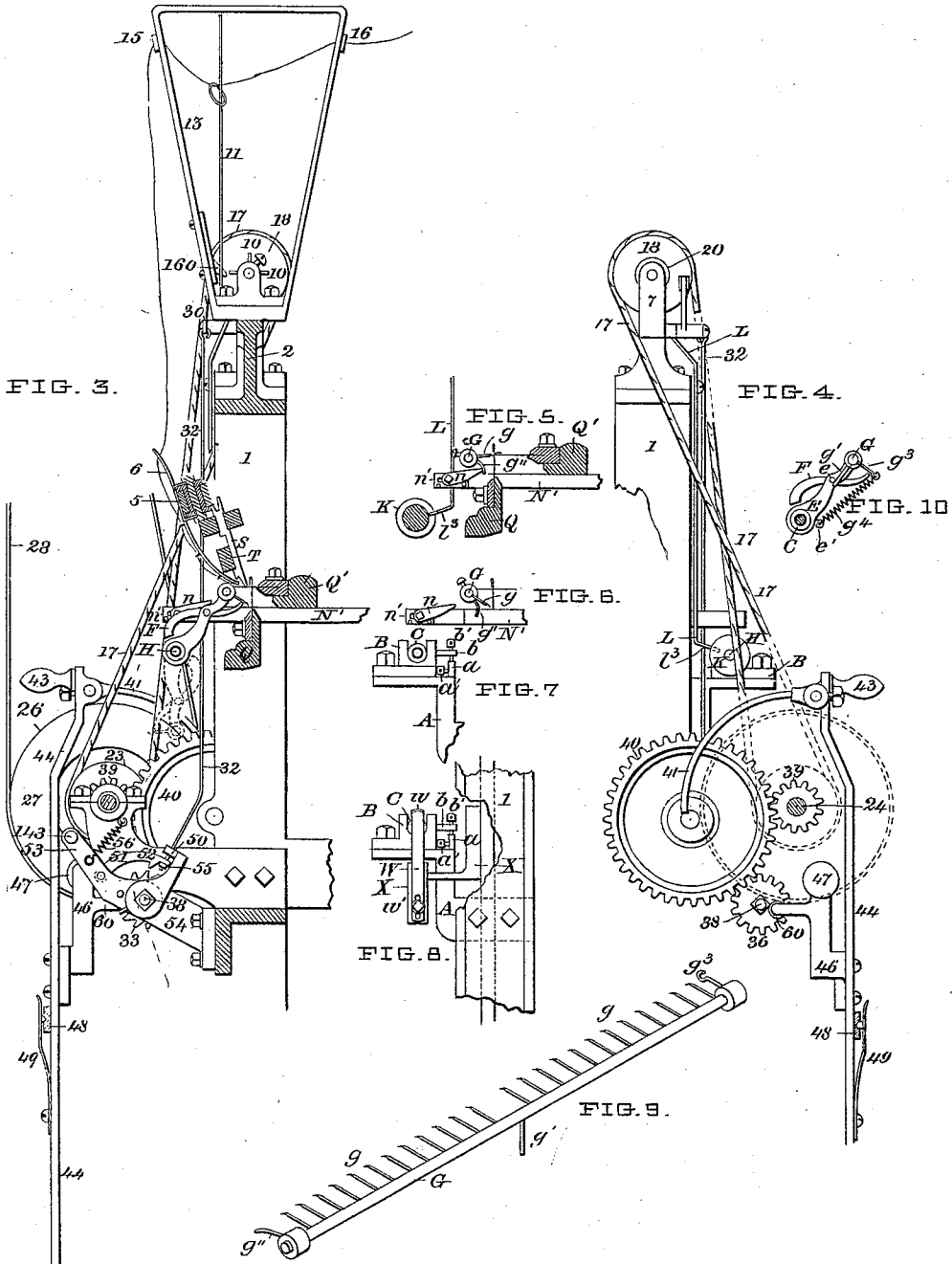
2 Sheets—Sheet 2.

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INVENTOR.

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# UNITED STATES PATENT OFFICE.

ELI TIFFANY, OF BENNINGTON, VERMONT.

## STOP-MOTION FOR STRAIGHT-KNITTING MACHINES.

SPECIFICATION forming part of Letters Patent No. 521,277, dated June 12, 1894.

Application filed September 2, 1893. Serial No. 484,662. (No model.)

*To all whom it may concern:*

Be it known that I, ELI TIFFANY, of the village of Bennington, in the county of Bennington and State of Vermont, have invented a new and useful Improvement in Stop-Motions for Straight-Knitting Machines, of which the subjoined description, in connection with the accompanying drawings, constitutes a specification.

The invention consists in special apparatus designed to be brought into action by the loading up of the needles with yarn from any cause and when so brought into action by appropriate mechanism, to stop the machine.

The construction and operation of the apparatus will first be described, after which the distinctive features of invention will be specifically pointed out in the claims.

The invention is fully elucidated in the drawings, wherein—

Figure 1 exhibits a front elevation of so much of a straight rib knitting machine as is essential to show the connections of my improvements therewith. Fig. 2 shows a plan of the parts lying in the plane of or immediately beneath the horizontal needles. Fig. 3 shows an end elevation of the invention, the standard on the right hand end of the frame being removed. Fig. 4 is an end view of certain parts of the invention as seen at the left hand end of the machine, a portion of the frame and the driving pulleys being removed to expose the parts immediately behind them. Fig. 5 is a detail of the appliances for rocking the feeler bar. Fig. 6 is a view of the same parts in a different position. Fig. 7 exhibits the details for adjusting the bearings of the pipe which carries the feeler bar. Fig. 8 shows the bracket attached to the vertical needle slide which carries a spring for actuating the shifting slide within the pipe. Fig. 9 is a perspective view of the feeler bar detached from the machine. Fig. 10 is a detail showing the relations of the feeler bar, locking dog and the pipe which carries the shifter bar. Fig. 11 is a longitudinal section through a part of the shifter slide pipe showing its relation with the locking dog. Fig. 12 is a transverse section through the shifter slide pipe taken through the slot in which the locking dog plays.

In many straight knitting machines in present use a device has been employed for detecting snarls of yarn which have loaded up on the needles consisting of some sort of a point, hook or other detective device which has been adapted to travel in unison with the yarn carrier to and fro in front of and transversely to one set of the needles, and so constructed and adjusted in connection with other parts that whenever the said device became entangled with such a snarl on the needles it would move, turn or revolve in such a way as to communicate to the stopping devices the appropriate impulse to stop the machine. Such devices possess objectionable features in that some of them will act to stop the machine only when the yarn carrier is moving in the proper direction to do so. In other cases the mechanism necessary to actuate them effectively occupies much space in front of the knitting machinery and is very much in the way. And in all of them their complexity renders them liable to get out of order.

This invention has for its object to obviate all these defects and objections and at the same time to provide a detective apparatus for discovering accumulations of yarn on the needles which shall be certain and prompt in its action, reliable in bringing the machine to a sudden stop without recoil, capable of being wholly withdrawn from the front of the needles whenever it becomes desirable to get at either the needles or the sinkers for repairs or for any other purpose, is simple in construction and easily kept in repair.

This invention relates to devices for detecting snarls or bunches of yarn which have accumulated on the needles and to connections therewith for bringing the stop motion into action. The stop motion itself constitutes the subject matter of the pending application of George E. Parker and myself Serial No. 477,279, and in that application is fully described. Only a brief description of it will here be given, sufficient to exhibit the relation between the two branches of the invention.

Referring to the drawings the uprights of the frame of a knitting machine are shown at 1, 1, and the crosshead at 2. The driving shaft is seen at 24, and 25 and 26 are the loose

and tight pulleys respectively by which the machine is driven. This shaft also carries a sheave pulley 23 which drives a counter shaft 8 at the top of the frame, and also a pinion gear 39 from which through the intermediate gear 40 motion is imparted to all the other parts of the machine. A bracket 54 is attached to the front girt of the machine, to an arm of which the journal stud 38 is bolted and on this stud are pivoted the cam clutch composed of a rotating non-sliding member 34 with which the ratchet 33 is connected, and the sliding rotating member 35 which carries the spur gear 36 which is driven by the intermediate gear 40. The adjacent ends of the hubs of these two members are fitted to each other in the shape of two spiral cam faces which are the actual driving faces of the clutch. Their inclines are so set that when the motion of the driven one is checked the driver by the action of one cam face upon the other will ride over it thereby causing the driven member or the driver as the case may be, to slide along on the stud or shaft as the case may be until such sliding movement through the proper agencies is made effective to stop the machine. Normal contact between the cam faces is maintained by the spring 37. The belt shifting fingers 41 are connected with the lever 44 which is pivoted to some part of the frame and has an arm 46 projecting from it which carries the brake pad 47 and also an arm 60 Fig. 4, against which the clutch member 35 or the gear 36 which is an appurtenance of the clutch member, impinges. Thus when the clutch member 35 is forced to the left it not only brings pad 47 to bear against the pulley 26 but also throws the belt shifter over to the left by the impact of the gear 36 against arm 60. The action of all this stopping apparatus is fully described in the aforesaid pending application.

In the machines in general use a small horizontal bar is provided in front of the front needle bar to support the points of the needles of the back needle bar when they are thrown out to receive the lay of the feed thread. This supporting bar is necessary to resist the downward thrust of the sinkers under the action of the slur cock in sinking the yarn between the needles. In the present machine this bar has been superseded by a small rod or shaft G Fig. 9, which is equipped with a series of pointed spurs or wires  $g$   $g$ , which I term "feelers." These have their points made quite sharp and are slightly bent down as shown so as to give them something of the character of a hook. The rod I have termed a "feeler bar." At one end it is provided with an arm  $g^3$  for the attachment of the retractile spring  $g^4$  Fig. 10, and at the other end with an arm  $g''$  by which the rod is oscillated. This feeler bar is carried in bearings provided therefor in arms D, D' and E which are mounted on a pipe C. When in working position in front of the needles the

feeler bar has a rocking motion from the position of the feelers as seen in Fig. 6 to that shown in Fig. 5 and back again. This oscillation of the bar is effected by the to and fro movement of the back needle bar Q', which is carried by two horizontal slides N' N'. To the left hand of these slides a bracket  $n'$  is attached, Figs. 1 and 2, which carries a push finger  $n$  which, as the slide N' plays back and forth, works against the under side of the arm  $g''$  of the feeler bar. In this way a rocking motion is communicated to the feeler bar and the feeler points are caused to alternately rise and fall; at their up-stroke the points rise to a plane fully opposite or a little above the upper stitch on the front needles, and as closely to the stitch as possible and not catch into it. If any snarls, bunches or other obstructions have accumulated in the needles in front of the feelers or any of them, on the up-stroke the bent down points of the feelers will ride over such obstruction without engaging it, but on the down stroke, which is effected only by the retractile force of spring  $g^4$ , the hooking point of the feeler engages with the snarl and rests there, and this arrest of its downward motion effects the stoppage of the machine in the manner and by the means hereinafter explained. The limit of the upstroke of the feelers is regulated by the position of the push finger  $n$  which may be adjusted by means of the elongated slot in the bracket  $n'$  seen in Figs. 5 and 6 and the set screw which passes through the push finger and this slot. The down throw of feelers is determined by the arm  $g'$  Fig. 10 striking a pin  $e$  which projects from the side of the bracket arm E, Fig. 1. As the accumulation of yarn on the needles is seldom confined to a single needle only a limited number of these feelers are provided; one for every fourth or fifth needle is sufficient.

Two supporting brackets A A are attached to the upright side pieces of the knitting frame each of which carries an adjustable bearing for a pipe C. The position of this bearing may be adjusted by means of the adjusting screw  $a'$  toward and from the front needle bar and is secured to the bracket A by a bolt, which passes through an elongated slot in the bearing stand. The pipe C which is carried in the bearings has an adjusting arm V at the right hand end rigidly attached to it in the outer end of which is an adjusting set screw  $b'$  the point of which abuts on ledge  $a$  of the bracket A. By turning this screw one way or the other the elevation of the points of the feelers is adjusted. The bearings in which the pipe rests are open at the top so that the pipe with all its attachments can be lifted bodily out of its position and removed for any desired purpose. When so removed the way is clear for access to the needles and the sinkers for repairs or otherwise.

The pipe C carries within it the sliding shifting bar II which slides in bearings fitted for it in each end of the pipe. This shifting

bar H carries a grooved button K at the left end which takes in a projecting tongue 13 at the lower end of the check slide L. This check slide L has a slot  $l'$  by which it is hung on the pin  $l''$  so that it can both vibrate and slide upwardly. It has a notch  $l$  on one edge with which the lifting arm N, a projection from the front needle arm slide O, co-operates to lift the slide L. The purpose of lifting the check slide is to throw its top end into the path of revolution of the fingers on the spider M, by which means revolution of the shaft 8 and cam clutch 20 is arrested. The oscillation of the check slide L on its pivot  $l''$  is effected by a reciprocating movement of the shifting slide H. This reciprocation is effected by the alternate action of the two springs J and W. Spring J is attached at one end to the eye  $h$  connected with the slide H, and the other end is attached to the eye  $d'$  connected with the pipe. The retraction of this spring draws the slide H within the pipe toward the spring W, the effect of which is to swing the shoulder notch  $l$  of the check slide L over the top of the lifting arm N of the needle bar slide O, the effect of which would be if the parts were left in that position while the slide O was being elevated that the arm N would lift the check slide and thus stop rotation of shaft 8, thereby setting the stop motion in operation. The return stroke of the shifting slide is effected by means of the spring W at the right hand end of the slide H which is attached to a bracket X connected with the front needle bar slide O in its rear and rises and falls with that slide. The spring W is a moderately stiff one and has an inclined lip at its top  $w$  which serves to throw the slide H back to its normal position when the slide O rises by its impact with the end of such slide H. Spring W is attached to its bracket by an adjusting bolt  $w'$  and an elongated slot in the spring  $w$ . At some point in the length of the slide H is a pin  $c''$  Fig. 11, which moves in a slot  $c'$  in the pipe C and the length of this slot limits the length of the stroke of the slide H. The middle arm E is located on the pipe so that its hub covers this slot as seen in Fig. 12, and the hub has a longitudinal groove in its inside to provide for the motion of the pin  $c''$  of the slide H. This hub is also transversely slotted as at  $e''$  to permit the blocking dog F to drop into it across the path of the pin  $c''$  as it reciprocates to and fro. When the pin  $c''$  is thrown to the right of slot  $e''$  and the dog F is dropped into the slot  $e''$  it prevents the slide H from making its stroke to the left and by means of the grooved button K holds the slide or check lever L with its shoulder  $l$  over the lifting arm N of the back needle bar slide so that at its next upward stroke slide L will be lifted to a point where its upper end will block further revolution of the spider M and shaft 8. And here it may be parenthetically remarked that the slide L may be arranged to co-operate with either cam clutch 20 or 34, in the latter case it is only necessary to sup-

ply the hub of 34 with fingers analogous to the fingers  $m$  of the spider M to accomplish the same result. Whenever the dog F blocks the slide H and the slide O, to which the bracket X is attached, rises, the lip  $w$  of spring W slides over the end of slide H, the spring yielding for that purpose. If the slide H is not blocked the action of the lip  $w$  is to crowd the slide H back so as to throw the notch  $l$  of the check slide L away from the path of the lifting arm N.

The blocking dog F is pivoted to the middle arm E on the pipe C as seen in Figs. 3 and 10 and the end toward the needles lies in the path of one of the feelers or in the path of an arm attached to the feeler bar for that purpose so that when the feeler bar is rocked the descent of the feeler in contact with the end of the dog will depress that end of the dog and raise its opposite end out of the slot  $e''$  and out of the path of travel of the pin  $c''$  on the slide H. This rise and fall of the blocking dog F occurs at each stroke of the back needle bar and is only interrupted when some one of the feelers becomes engaged with a snarl of yarn on the needles and the oscillation of the feeler bar thus is arrested.

If for any reason it becomes necessary to have access to the needles, sinkers or any other part of the machine behind the feeler bar the pipe C can be rolled in its bearings to the front when it will hang down in the position shown in dotted lines in Fig. 3. And if necessary the pipe with all its attachments may be lifted bodily out of its bearings and be set aside, thus leaving the whole needle front exposed to view and access for alterations, repairs or inspection. This is a feature of great value and greatly facilitates cleaning, inspecting, and repairing any of the parts.

The time and order of the successive movements of the various parts are as follows:— Assuming the knitting to be progressing normally and the yarn carrier to be in the middle of its stroke the back needle bar will then be thrown forward with its needles resting on the feeler bar. The push finger being out of contact with arm  $g''$  the retraction of spring  $g^4$  will hold the feeler points down, one of which will act on the dog F and hold it above the slot  $e''$  out of the way of pin  $c''$ . The front needle bar being up at this stage, spring W holds shifting slide H to the left thus keeping shoulder  $l$  out of the way of lifting arm N. Next, the yarn carrier having made its traverse of the needles, the back needle bar begins its retreat by which movement it brings the push finger against the arm  $g''$ , thereby raising the feeler points and allowing the dog F to fall toward or into the notch  $e''$ . Concurrent with this movement the front needle bar commences its descent whereby spring W is dropped so that its lip moves down out of the way of the right hand end of the shifting slide H leaving the re-

tractile spring J to act to draw the slide H to the right thus setting the notch *l* of check slide L over the lifting arm N. At the finish of the down stroke of the front needle bar the dog will have dropped behind the pin *c''* or on the left side of it so that except it be lifted out of that position before the back stroke of the slide H commences it would be locked in that position. But now the back needle bar commences its advance-stroke and in doing so the push finger retreats and lets the feeler bar rock down into its first position which movement lifts the dog F out of its locking position and thus the obstacle to the back stroke of the shifting slide H is removed, succeeding which the front needle bar commences its ascent bringing lip *w* of spring W against the end of the shifting slide H and sliding it to the left the button K at its other end swings the check slide L aside out of reach of engagement by the lifting arm N of the needle bar slide N' thus restoring all the parts to their first position ready for the next stroke of the yarn carrier.

The operation of the parts to stop the machine is as follows: Assuming the knitting to be progressing as above described, a bunch of yarn begins to load up one or more of the front needles. When it reaches a condition that any of its loops, or protruding threads come in the way of one of the feeler points, such point on its down stroke catches into it and is held up or suspended by it thus failing to lift the dog F out of its locking position on the left of pin *c''* of the shifting slide H. This being the case when the front needle bar commences its next ascent the spring W fails to push the slide H back so as to throw the check slide L out of the way of the lifting arm N of the slide N', and the spring W yields to the end of slide H and is by it pushed aside. Thus the notch *l* of the slide L being left in the path of the lifting arm N when the front needle bar finishes its ascent the arm N engaging the shoulder *l* raises the check slide L to a point where its top enters the path of the fingers *m m* of the spider M. Thus obstructed the revolution of shaft 8 and of clutch member 20 is stopped, and so stopped the continued revolution of its fellow member 19 causes the same to be forced toward the spider M, carrying pulley 18 driven by belt 17 with it and the tappet 31 of the lever 30 following the side of the pulley with which it maintains contact by reason of the weight of the drop rod 32 which hangs from the other end of it, causes rod 32 to be dropped so that the clawker 51 which rests on the nut at the lower end of the rod, falls, and tooth 52 engaging one of the teeth of the ratchet 33 stops it and the clutch member 34 as well. Being so stopped its fellow member 35 driven by gear 36 of which it is a part, is forced along on its axis to the left and by its connections shifting the belt from the driving to the loose pulley, but also forcing the brake pad 47 against the brake flange 27 of the driving pul-

ley brings it to a sudden stop, leaving the two squared faces of the clutch members standing end to end, thus locking the brake.

I therefore claim as my invention, and desire to secure by Letters Patent, the following:

1. A feeler point arranged in front of the needles of a straight knitting machine, adapted to reciprocate in a vertical direction opposite the stitches formed on said needles, means for reciprocating the same, a belt shipping device, and mechanism between said feeler point and the belt shipping device in virtue of which the latter is caused to be operated, substantially in the manner described and for the purposes set forth.

2. A series of feeler points arranged on a support in front of the needles of a straight knitting machine, and adapted to reciprocate in a vertical direction opposite the stitches formed on said needles, a support on which said points are borne, means to reciprocate said support, a belt shipping device, and mechanism between said feeler points and the belt shipping device in virtue of which the latter is caused to be operated, substantially in the manner described and for the purposes specified.

3. The combination with the needles of a straight knitting machine, of the described feeler points and means connected therewith substantially as shown, for imparting to them a vertically reciprocatory movement substantially as specified.

4. The combination with the needles of the described feeler points, mounted on an oscillating bar and means connected with said bar for oscillating the same, substantially as specified.

5. The feeler bar mounted in bearings carried on a movable support which is adapted by its movement to shift the feeler bar entirely out of and away from its working position in front of the needles so as to permit free access to the needles substantially in the manner and for the purposes specified.

6. The combination of the horizontal needle bar carrying the push-finger, with the feeler bar and arm against which the push-finger acts substantially as specified.

7. The feeler points and support upon which they are borne, in combination with a frame upon which said feeler bar is mounted, and provisions in virtue of which said frame is adapted to withdraw said feeler bar and points from their working position in front of the needles to render said needles and adjacent parts of the machine more accessible, substantially as and for the purposes specified.

8. The combination of the shifting slide with the feeler points, means substantially as shown, for imparting vertical movement to said points in front of the needles, and a device interposed between the points and the shifting slide which is actuated by the alternate rise and fall of the points for locking

and unlocking said slide, substantially as specified.

9. The combination with the shifting slide H provided with the locking pin *c''*, the locking dog F, the supporting arm E, the feeler bar and means for operating it, and the spring J, with the front needle bar, spring W, the belt shifter and means interposed between

the shifting slide H and the belt shifter for actuating the same, substantially as specified. 13

In witness whereof I have hereto subscribed my name this 13th day of June, A. D. 1893.

ELI TIFFANY.

In presence of—

FRANKLIN SCOTT,  
A. H. WINSLOW.