

(No Model.)

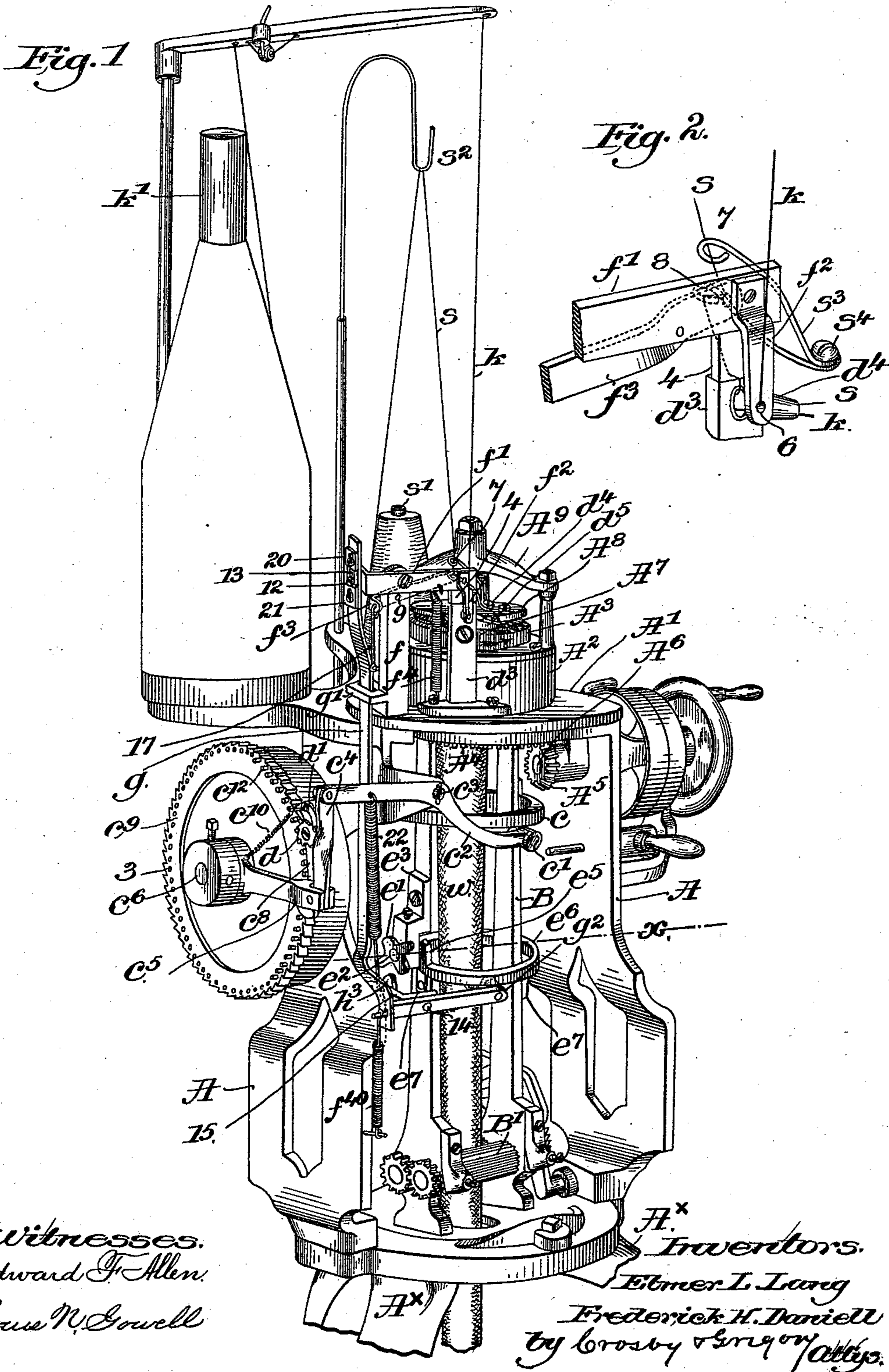
3 Sheets—Sheet 1.

E. L. LANG & F. H. DANIELL.

THICKENING THREAD MECHANISM FOR KNITTING MACHINES.

No. 527,019.

Patented Oct. 2, 1894.



Witnesses.  
Edward F. Allen.  
Louise N. Lowell

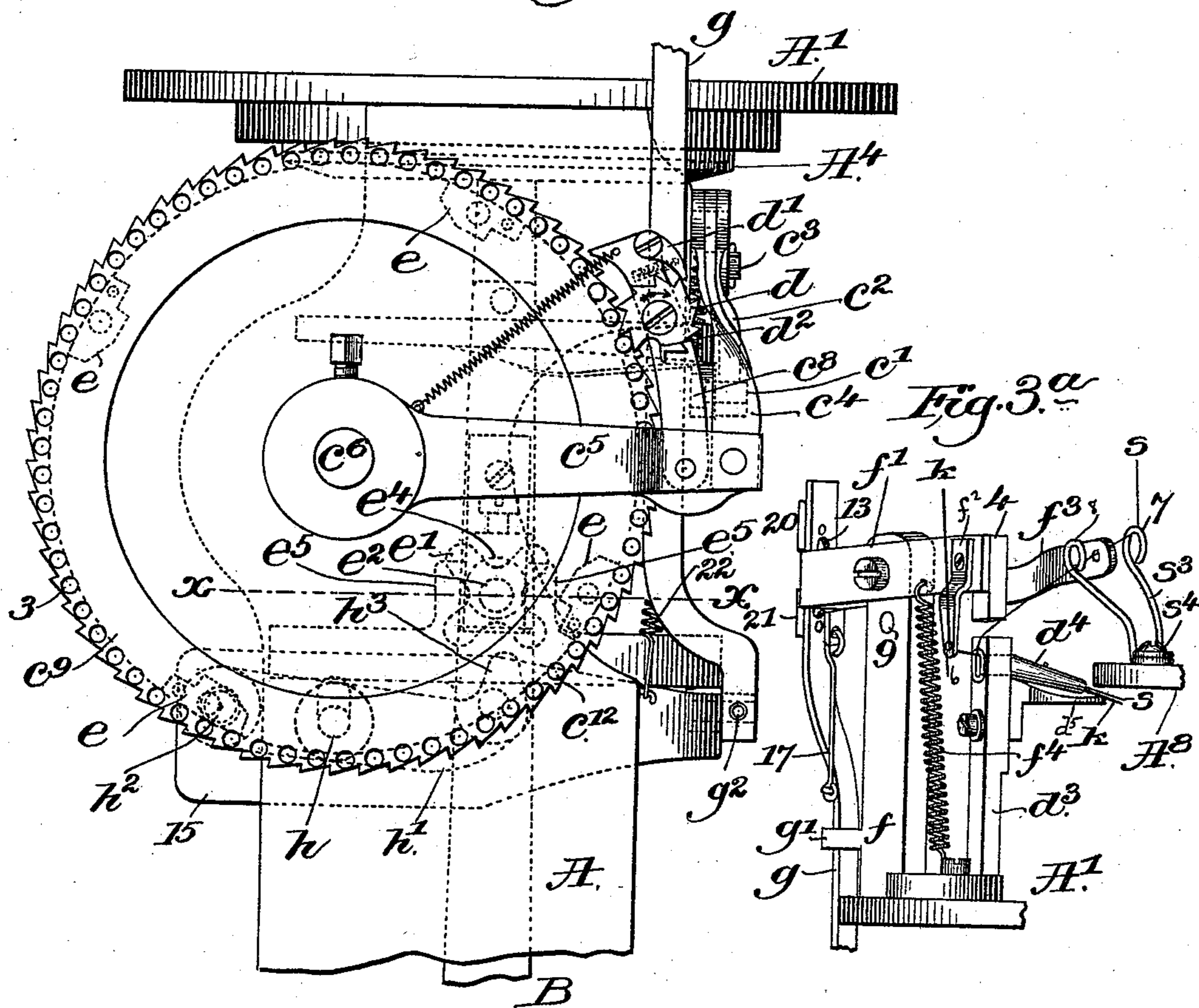
Inventors.  
Elmer L. Lang  
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by Crosby & Brown, Attys.

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3 Sheets—Sheet 2.

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Fig. 3.



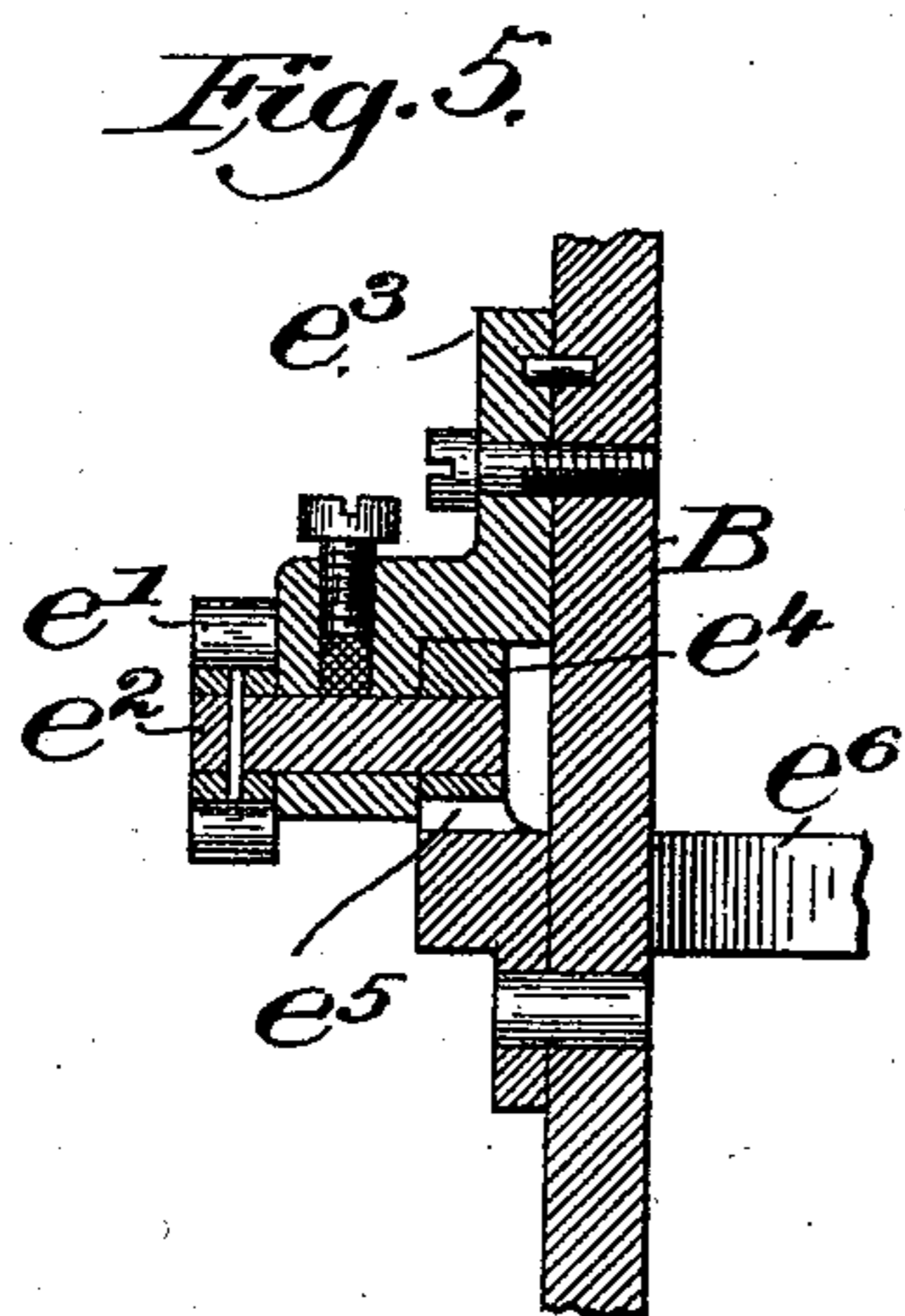
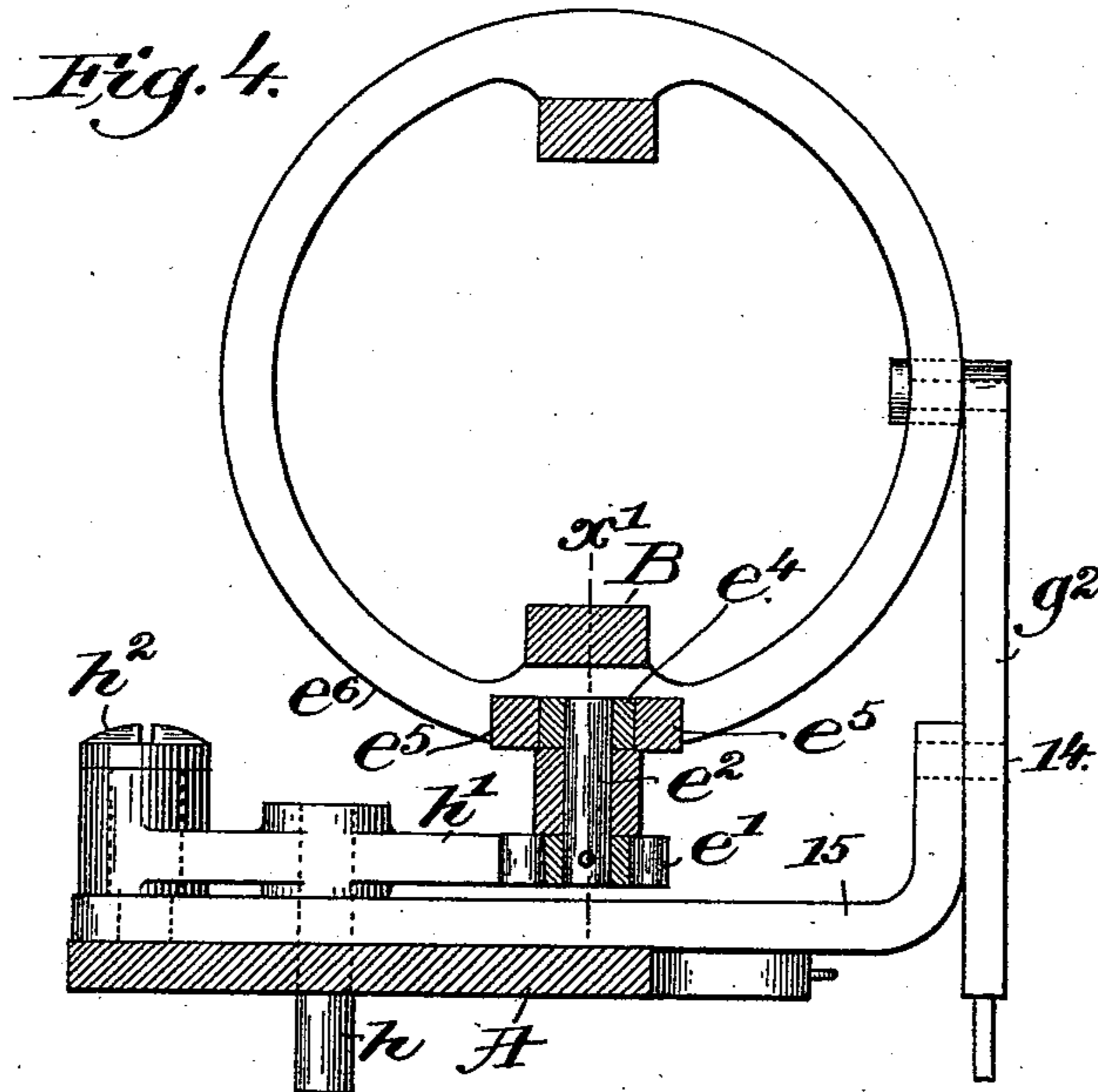
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# UNITED STATES PATENT OFFICE.

ELMER L. LANG AND FREDERICK H. DANIELL, OF FRANKLIN FALLS, ASSIGNORS TO SULLOWAY MILLS, OF FRANKLIN, NEW HAMPSHIRE.

## THICKENING-THREAD MECHANISM FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 527,019, dated October 2, 1894.

Application filed February 6, 1893. Serial No. 461,232. (No model.)

*To all whom it may concern:*

Be it known that we, ELMER L. LANG and FREDERICK H. DANIELL, of Franklin Falls, county of Merrimac, State of New Hampshire, have invented an Improvement in Thickening-Thread Mechanism for Knitting-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

It is a great desideratum in certain classes of knitted goods to reinforce the same at weak places or points subject to considerable wear, with an extra thread, and considerable attention has been given to the production of mechanism whereby a thickening thread may be inserted at stated points.

In this our invention, we have provided novel mechanical devices whereby a thickening thread may be thrown in at any desired point, and it may be run upon any desired number of needles in the cylinder, equal to or less than one-half; the introduction of the thickening thread being controlled by a pattern device. Herein the main thread is fed continuously to the latched needles of the rotary-cylinder and dial plate through a stationary tube-like thread guide, said thread guide also serving to carry the thickening thread to the needles, the main thread acting frictionally against the thickening thread to cause it to travel with it to the needles, except when the thickening thread is held by the clamping device, to be described.

The clamping device consists of a lever having its fulcrum on a stand erected on the stationary head plate of the machine, it coming down upon the thickening thread suitably supported on a stationary surface, preferably the upper end of the post supporting the tubular thread guide, and holding said splicing thread so that the needles, in the further rotation of the needle cylinder, break the thread.

The clamping device is so located with relation to the needles and the thread guide referred to, that a considerable amount of the thickening thread at and near its free end is always retained within the said thread guide ready to be taken up unerringly and carried into the machine by the main thread

whenever the thickening thread is released by the clamp referred to.

Co-operating with the clamping device is a suitable thread pull-off to furnish slack in the thickening thread so that the main thread, to take the thickening thread with it, has only to draw the weight of the end of the thickening thread with it to the needles.

We have herein chosen to embody our invention in connection with that form of circular knitting machine of the rib variety, it having cylinder and dial needles mounted to reciprocate in a rotating needle-bed and dial plate, said machine being one especially devised for the manufacture of rib tops or cuffs for shirts, drawers, stockings, &c.

Figure 1, in perspective shows a sufficient portion of a knitting machine embodying our improvements. Fig. 2, is an enlarged detail to be described. Fig. 3, is an enlarged detail at the left of Fig. 1. Fig. 3<sup>a</sup>, is a detail to be described showing the thread guide from the right of Fig. 2, but with the thread nipper open. Fig. 4, is a partial section below the line  $x$ , Figs. 1 and 3. Fig. 5, is a section in the line  $x'$ , Fig. 4.

Referring to the drawings, A represents the frame-work of the knitting machine, said frame-work being, in practice, mounted upon suitable legs A<sup>x</sup>, but partially shown, the frame-work being terminated at its top by a head-plate A' supporting a stationary cam cylinder A<sup>2</sup>, within which is mounted a rotating needle cylinder A<sup>3</sup> suitably grooved for the reception of the cylinder needles, partially shown in Fig. 1, said needle cylinder being provided at its under side in usual manner with a bevel toothed ring A<sup>4</sup> engaged by a beveled pinion A<sup>5</sup> on a suitable shaft A<sup>6</sup>, which in practice may be driven by any usual pulley system, or rotated by hand, as commonly practiced in knitting machines.

The needle cylinder has co-operating with it a dial needle plate A<sup>7</sup> grooved at its upper side in usual manner for the reception of dial needles, which, in practice, will be actuated by the cams at the under side of a dial cam-plate A<sup>8</sup>, the dial cam-plate being held in position by a suitable spindle extended through the arm A<sup>9</sup>.

Suspended from and rotating in unison with the rotating needle cylinder, is a take-up frame or cage B, which, in practice, will be provided at its lower end with usual take-up rollers B' to take up the knitted web *w*.

The parts so far referred to are and may be all as common.

The cage has mounted upon it a cam *c*, which, as herein constructed, acts once during each rotation of the cage upon a roller or other stud *c'* of a lever *c<sup>2</sup>* pivoted at *c<sup>3</sup>*, said lever having pivoted to it at its outer end a link *c<sup>4</sup>* attached to an arm *c<sup>5</sup>* having its fulcrum on a stud *c<sup>6</sup>* supported in one of the side frames of the machine.

The lever *c<sup>5</sup>* has mounted upon it near its outer end, and near the link *c<sup>4</sup>* a pawl *c<sup>8</sup>*, see Fig. 1, said pawl being acted upon by a spring *c<sup>10</sup>* to normally keep said pawl pressed toward and so as to engage ratchet teeth of the pattern wheel *c<sup>9</sup>* mounted loosely upon the stud *c<sup>6</sup>* referred to.

The pattern wheel has upon its outer face a series of removable studs *c<sup>12</sup>*, which, during the reciprocation of the pawl *c<sup>8</sup>*, are acted upon by the teeth of an auxiliary ratchet wheel *d*, the said ratchet wheel being rotated in the direction of the arrow thereon Fig. 3, by contact with the said studs during the downward movement of the pawl *c<sup>8</sup>*, the said ratchet wheel being prevented from rotating in the reverse direction during the upward movement of the pawl, by means of an auxiliary pawl *d'* carried by the main pawl *c<sup>8</sup>*. This auxiliary ratchet wheel and auxiliary pawl determine the time at which the main pawl may engage a tooth of and rotate the pattern wheel. As, for instance, the auxiliary ratchet wheel has one deep notch *d<sup>2</sup>*, which, once during each rotation of the ratchet wheel meets one of the pins *c<sup>12</sup>* of the pattern wheel *c<sup>9</sup>*, then, and only then, the acting end of the main pawl *c<sup>8</sup>* can engage the ratchet teeth of the pattern wheel, and in the upward movement of the pawl rotate the pattern wheel one step.

If the pins *c<sup>12</sup>* should be omitted, then the end of the pawl *c<sup>8</sup>* would act at each upward thrust to move the pattern wheel one step. By arranging the pins *c<sup>12</sup>* in the holes 3 at proper intervals any desired intermitting or step by step motion of the pattern wheel *c<sup>9</sup>* may be provided for.

The main pattern wheel has at its inner side several cam projections or lumps *e*, herein shown, see Fig. 3, by dotted lines, and four in number, said lumps acting one after another on a projection *h* of a pawl *h'* pivoted at *h<sup>2</sup>*, and having at its end a hook *h<sup>3</sup>*, the lumps lifting the pawl and causing the hook *h<sup>3</sup>* to engage, one after another, one of the projections of what we call a star-wheel *e'* fast on the outer end of a short cam shaft *e<sup>2</sup>* having its bearing in a stand *e<sup>3</sup>*, see Figs. 1 and 5, fast on the cage B, said cam shaft having at its inner end an eccentric *e<sup>4</sup>* which acts between the arms of a bifurcated ear *e<sup>5</sup>*

of a cam ring *e<sup>6</sup>* represented as having two depending lugs *e<sup>7</sup>* suitably pivoted to the cage, so that as the said cam rotates between the arms of the ear *e<sup>5</sup>*, the ring *e<sup>6</sup>* will be tipped in one or the other direction from horizontal position, and thus make its lower edge lowest at one or the other side of the cage according to whether the splicing thread, to be described, is to be put into the front side of the stocking or web, or the back side thereof, or the said ring may be kept in true horizontal position, as when the splicing thread is to be kept entirely out of the fabric.

The head-plate A' has erected upon it a stand *d<sup>3</sup>*, to which is attached a long tubular thread guide *d<sup>4</sup>*, see Fig. 3<sup>a</sup>, and near the thread guide the said stand has attached to it a latch opener *d<sup>5</sup>*.

The shape of the opening in the thread guide is preferably somewhat oblong, so that at the entrance into said guide, the knitting thread *k* coming from a suitable bobbin *k'* may be kept from rubbing against the splicing thread *s* coming from a suitable bobbin *s'*.

The guide tube is long enough to enable an inch or two of the splicing thread to remain in it after the splicing thread has been broken off by the strain of the needles and rotating cylinder on it, said thread being so broken off whenever the thread clamp or nipper, to be described, acts to restrain the free delivery of the splicing thread.

As practiced in earlier machines, the splicing thread is drawn through the tubular thread guide by the friction against it of the main thread, but during circular knitting, when the splicing thread is not being knitted into the fabric, the rubbing of the main thread on the splicing thread is apt to wear away or whip it out, so that the splicing thread escapes from the entering end of the thread guide and is not in position in the tube to be caught up by the main thread.

The head-plate has erected upon it a second stand *f*, on which is mounted the lever *f'* having the movable member 4 of the splicing thread clamp, a surface at the upper end or top of the stand *d<sup>3</sup>* or other stationary part immediately above the entering end of the thread guide serving as the second member of said clamp.

The lever *f'* has a main-thread placer *f<sup>2</sup>* attached to or depending from it, said placer having an eye 6 for the main thread, the said eye being so located with relation to the opening in the tubular thread guide that when the clamp is closed on the splicing thread, the main thread will be put into the lower part of said opening, as in Fig. 2, and so that it will not be drawn hard against the splicing thread, but when the lever *f'* is lifted to unclamp the splicing thread, that it may be fed to the needles, the said placer *f<sup>2</sup>* lifts the main thread and puts it in contact with the splicing thread so that the main thread will instantly take the splicing thread with it to the needle. See Fig. 3<sup>a</sup>.

The splicing thread is led from its bobbin over a finger  $s^2$ , thence through an eye 7 in a wire or device  $s^3$  attached to the stationary dial cam plate by a screw  $s^4$ , said wire or device having a second eye 8 located at a lower level and somewhat behind it in the direction of rotation of the needle cylinder, said thread supporting and guiding eyes 7 and 8 having arranged between them a pull-off shown as a lever  $f^3$  pivoted at 9 on the stand  $f$  just below the pivot for the lever  $f'$ . See Fig. 1.

The lever  $f'$  has attached to it a suitable spring  $f^4$  which acts normally to depress the inner end of said lever and put the clamp 4 on the splicing thread lying on the rest or support over which it is to travel or be drawn on its way into the thread guide  $d^4$ . The rear end of the lever  $f'$  has a projection 12 shown as a screw which is extended through a slot 13 in a link  $g$  adapted to slide in a suitable guide, as  $g'$ , the lower end of the link being jointed to a lever  $g^2$  having its pivot 14 on a stand 15 secured to the frame-work A, the inner end of said lever having a suitable roller or other stud which is held against the under side of the ring cam or splicing thread cam  $e^6$  by the stronger spring  $f^{40}$ .

The rear end of the pull-off device  $f^3$  is shown as jointed by link 17 to the link  $g$ , so that when the clamp 4 comes down on the splicing thread, the inner end of the pull-off descends far enough below the supporting eyes 7, 8, to act on and pull from the bobbin  $s'$  enough of the splicing thread, so that the main thread, when the clamp 4 is lifted, to act on the splicing thread to carry said splicing thread with it, need not pull the splicing thread from the said bobbin, but will rather make the needles pull the splicing thread from the bobbin  $s'$ .

The pull-off having acted to pull off splicing thread rises and the eye thereof is put substantially in line with the eyes 7 and 8 as or before the clamp begins to rise, thus avoiding all unnecessary friction on the splicing thread.

This invention is not limited to the exact devices shown for moving the pull-off.

The link  $g$  has secured to it above and below the slot 13, adjusting devices 20, 21, shown as slotted blocks secured in place by suitable screws, the adjustment of said blocks to shorten or lengthen the slot 13 affording opportunity to regulate the number of needles less than one-half thereof which are to receive the splicing thread and the particular needle to which the splicing thread shall be first supplied.

The spring  $f^4$  keeps the projection 12 connected with the lever  $f'$  normally against the block 20, and the block 20 may be so adjusted as to act on the splicing thread sooner or later as the bar  $g$  is drawn down, and the said block by its position may determine the force with which the clamp may rest upon the splicing thread when the bar  $g$  is raised. The block 21 acts positively to put the clamp-

ing device onto the splicing thread in case for any reason the spring  $f^4$  should not work.

By adjusting the blocks 20 and 21 on the bar  $g$  one with relation to the other, the length of the slot 13 in which the projection 12 stands may be made greater or less, and the exact location of the said blocks so as to constitute the effective upper and lower ends of the slot may be determined, so that the lever  $f'$  may be moved at just the proper time to insure the quick clamping or unclamping of the splicing thread without lost motion, and thus enable the thread to be introduced at the desired needle and to be broken off at the desired needle.

The spring 22 acting on lever  $c^2$  keeps the roll  $c'$  against the cam  $c$ .

Referring to the drawings Figs. 1 and 2, the splicing thread clamp 4 is represented as closed upon the splicing thread, so that that thread is not being delivered and the cam ring  $e^6$  is in its horizontal or normal position, and the hook  $h^3$  is down away from the star wheel  $e'$ .

In the operation of the machine, so long as the cam ring  $e^6$  is kept in its horizontal position, so as not to vibrate the lever  $g^2$ , just so long the clamp 4 will continue to hold the splicing thread and it will not enter into the fabric but whenever the hook  $h^3$  is elevated, as it may be, that depending altogether upon the arrangement of the pins  $c^{12}$  in the pattern wheel, and the lumps  $e$  then the said hook engages the star wheel and turns it to tip the ring  $e^6$  so that it will act as a cam. As soon as this cam ring is so tipped the stronger spring  $f^{40}$  acting on the lever  $g^2$  lifts its inner end to follow the cam ring, and in so doing the clamp 4 rises, frees the splicing thread, and lets the main thread take it with it to the needles, and if said ring is kept in this position the splicing thread will be put into the knitted fabric for a portion of each circular course of the tube or web being knitted, the side of the tube into which said splicing thread is so introduced, depending upon which direction the said cam ring  $e^6$  was tipped, and when the star wheel is moved sufficiently to cause the eccentric to tip the ring  $e^6$  in the opposite direction, then the thickening thread will be put in at the opposite side of the fabric and thus it will be seen that the said thickening thread may be made to appear at either side of the fabric, as desired, at different portions of its length but for only one-half about, or less than one-half about the fabric.

Herein we use the term "side of the fabric" to represent, for instance, the front and foot part of the leg of the stocking which is to be thickened at the knee, and the other side as the "rear side of the tube" which it may be desired to thicken at the calf or at the ankle part.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a knitting machine the following instrumentalities:—viz, a needle cylinder, a dial plate, a thread guide adapted to receive both the main or knitting thread and a splicing thread, a clamp for the splicing thread, a splicing thread controlling cam, devices to tip the said cam in one or the other direction, and devices intermediate said cam and the said clamp to operate the same, whereby the thread clamp may be made to clamp the splicing thread substantially as described, with relation to the operation of the needle actuating cams to put the splicing thread into one or the other half or side of the web or tube being knitted, substantially as described.

2. In a knitting machine, a needle cylinder, a dial plate, a splicing thread clamp, and a main thread lifter, combined with a thread guide adapted to conduct to the needles of the machines both the main thread and the splicing thread, the opening in the said thread guide being of such size with relation to the diameter of the main and splicing threads to enable the main thread to run freely without injuriously fraying the splicing thread, the upward movement of the lifter, when the clamp is being opened to release the splicing thread, putting the main thread in contact with the splicing thread to carry it with it to the needles, substantially as described.

3. In a knitting machine, a thread guide

adapted to receive both the main and splicing threads, a splicing thread clamp, a rest for the splicing thread on its way into the said thread guide, a lever to which the said clamp is secured, a splicing thread actuating cam, devices intermediate said cam and said lever, and adjusting devices carried by said intermediate devices to afford more or less lost motion between the said actuating devices and the lever carrying the said clamp, to thus adapt the machine for the reception of the splicing thread upon a greater or less number of needles to thus regulate the width of the re-inforce made by the splicing thread, substantially as described.

4. In a knitting machine, the combination with the rotating cage, of a pivoted splicing thread actuating cam, a pawl, a shaft having an eccentric and a star wheel, a pattern cylinder, and intermediate devices to control the position of said pawl to move the said shaft and its eccentric and tip the said cam at the desired times during its rotation, substantially as described.

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

ELMER L. LANG.

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Witnesses:

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