

J. G. POWELL.

EXTRA THREAD FEEDING DEVICE FOR KNITTING MACHINES.

No. 523,866.

Patented July 31, 1894.

FIG. 1.

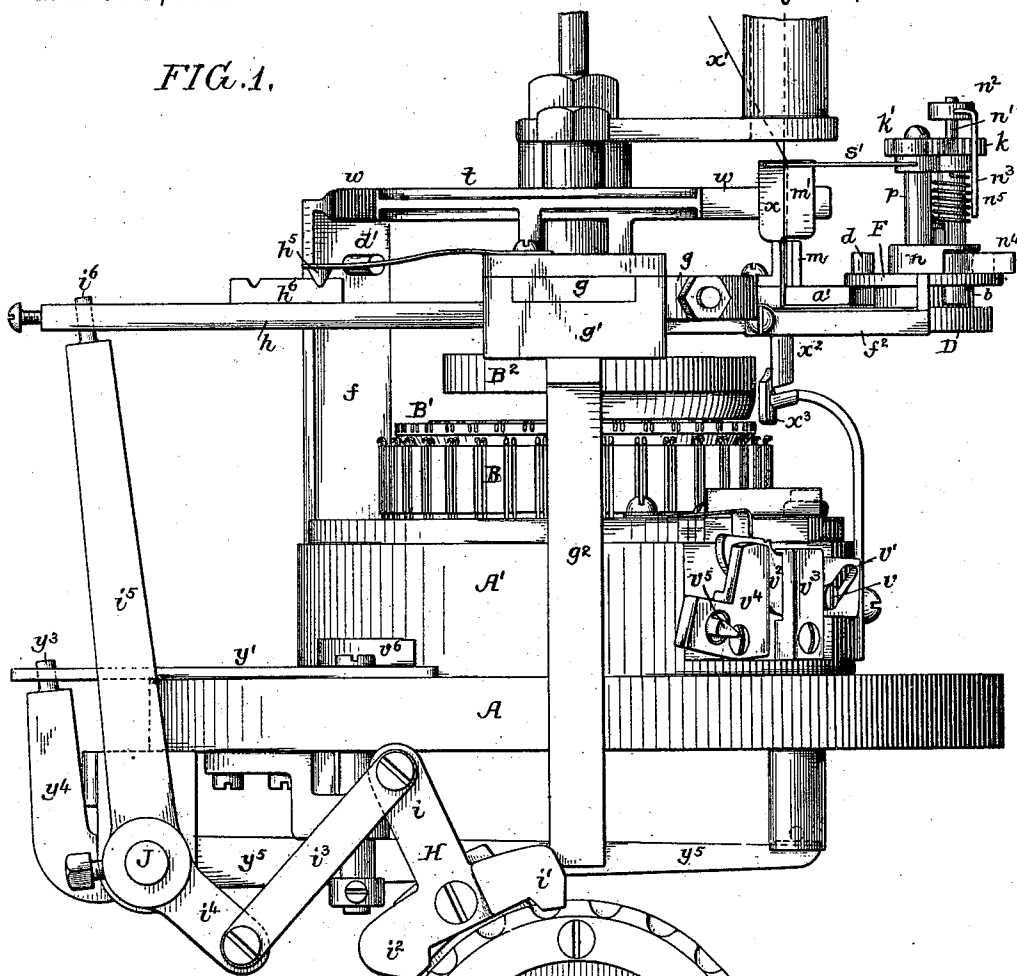
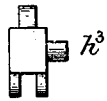


FIG. 11.



FIG. 12.



Witnesses:

Hamilton D. Turner
Murray C. Boyer

Inventor:

John G. Powell
by his Attorneys
Horton & Horton

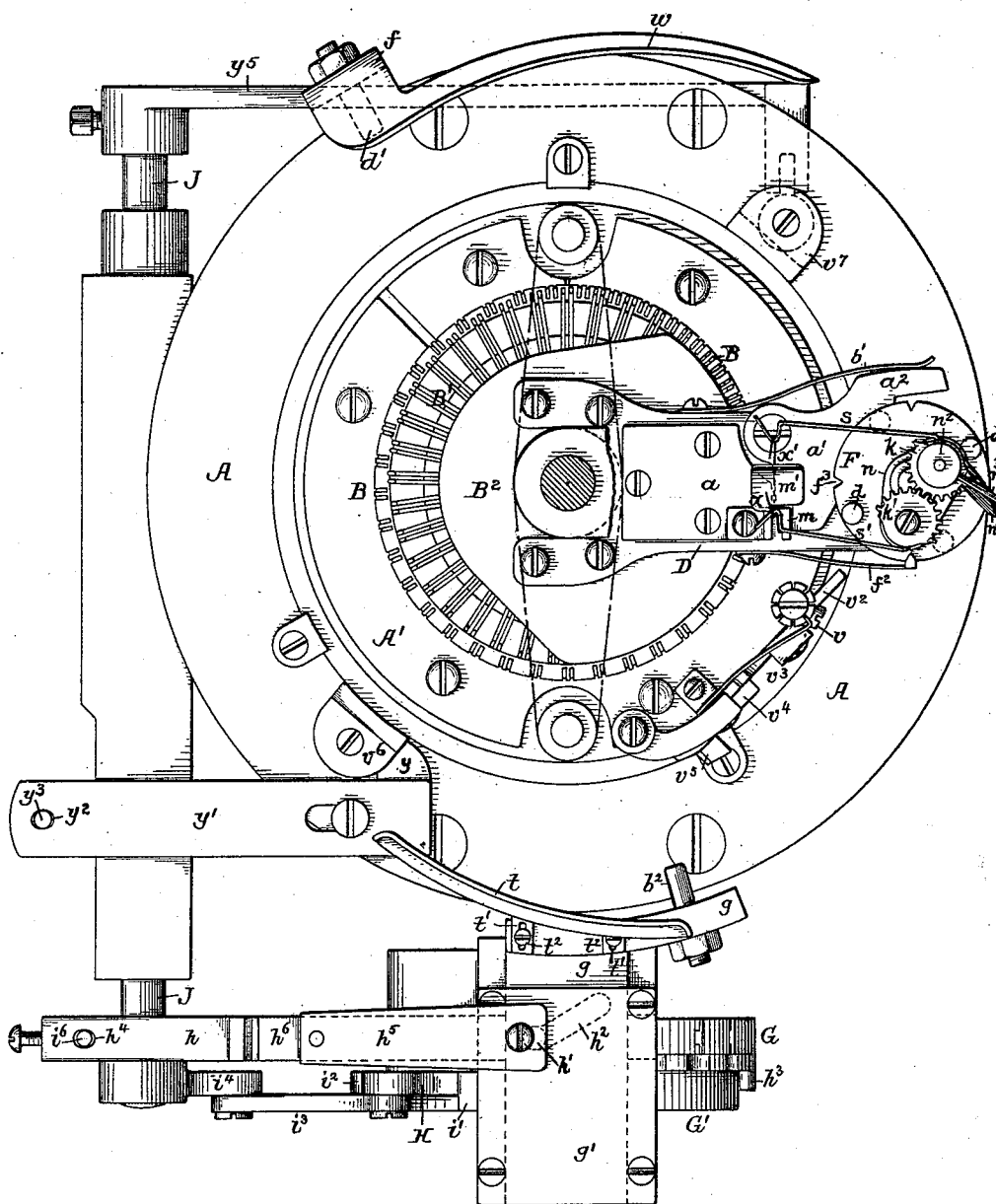
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FIG. 2.



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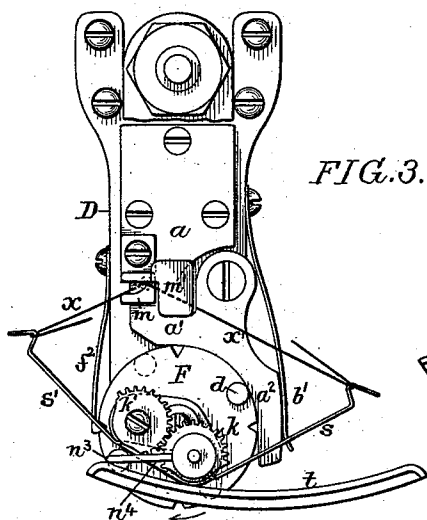


FIG. 3.

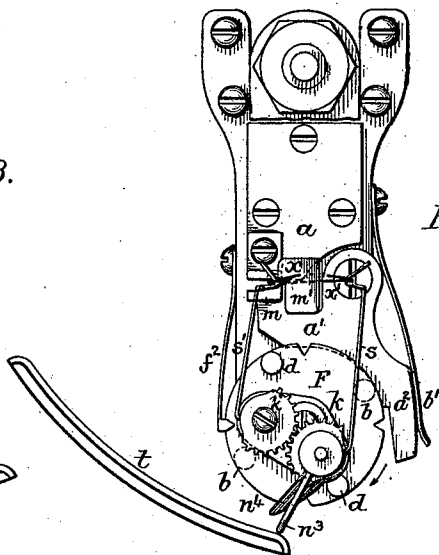


FIG. 4.

FIG. 9.

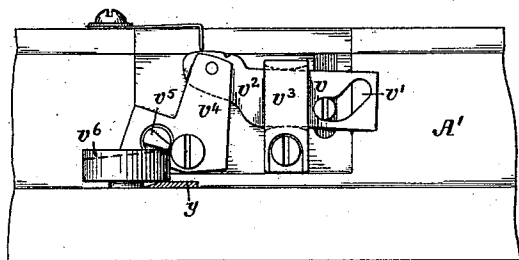
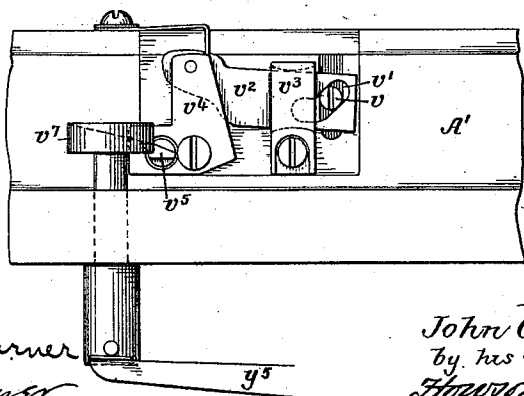


FIG. 10.



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Horton Horton

(No Model.)

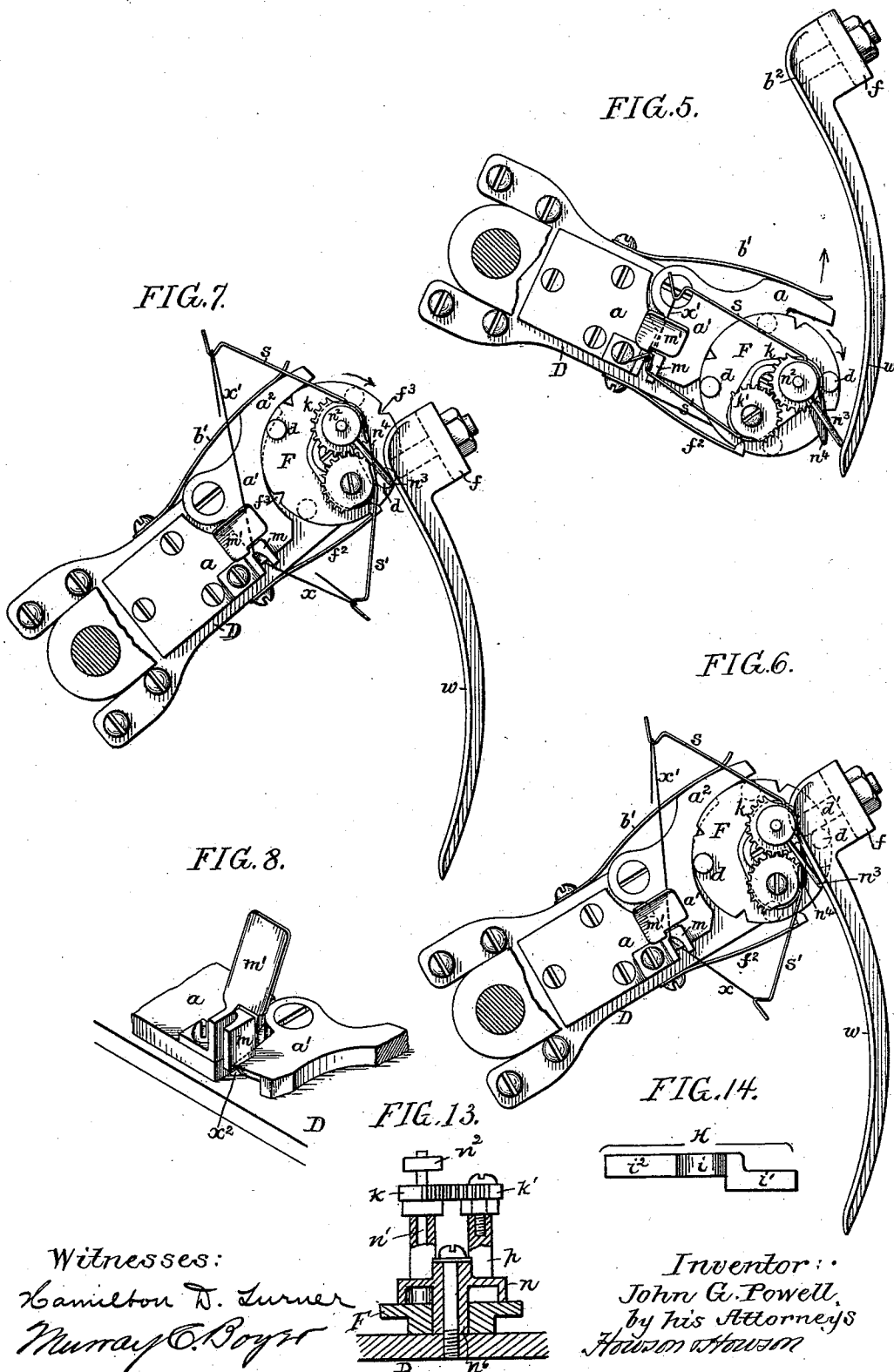
4 Sheets—Sheet 4.

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(No Model.)

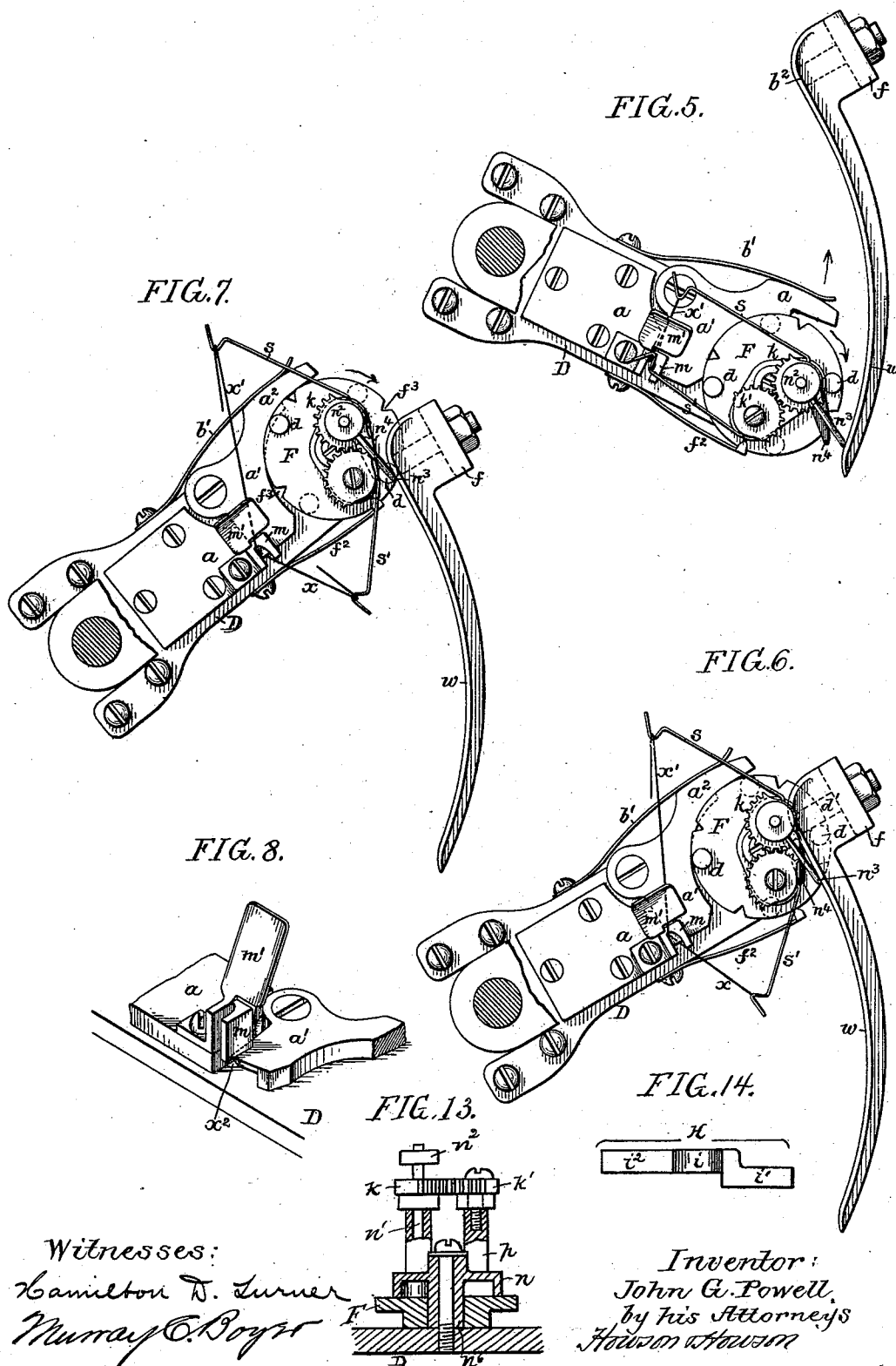
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UNITED STATES PATENT OFFICE.

JOHN G. POWELL, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF
AND EDWARD POWELL, OF SAME PLACE.

EXTRA-THREAD-FEEDING DEVICE FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 523,866, dated July 31, 1894.

Application filed July 5, 1892. Serial No. 438,995. (No model.)

To all whom it may concern:

Be it known that I, JOHN G. POWELL, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Extra-Thread-Feeding Devices for Knitting-Machines, of which the following is a specification.

My invention relates to that class of knitting machines which are provided with means whereby a reinforcing or thickening thread is introduced throughout one-half or other fractional part of each of a certain number of the courses of knitting so as to thicken certain portions of the knitted tube, as for instance the knees of stockings, the object of my invention being to so construct the mechanism which governs the introduction of the reinforcing thread that the same will be rendered positive and accurate in its operation and will thus insure the production of knitted tubes having the thickening thread uniformly disposed therein throughout a sharply defined area.

In the accompanying drawings I have illustrated my invention as applied to a cylindrical machine for producing ribbed fabric, but it will be understood that the invention is applicable to machines for producing plain knitted tubes as well as to the rib machine shown.

In the drawings:—Figure 1, is a side view of sufficient of the machine to illustrate those parts to which my invention particularly relates: Fig. 2, is a plan view of the machine with some of the upper fixtures removed or broken away in order to more clearly represent the parts beneath. Figs. 3, 4, 5, 6, and 7, are plan views illustrating successive steps in the operation of the parts to which my invention relates. Fig. 8, is a perspective view of part of one of the devices forming the subject of my invention. Figs. 9 and 10, are side views of another part of the machine also constituting one of the features of my invention. Figs. 11 and 12, are detached views of parts of a pattern chain used on the machine; and Figs. 13 and 14, are detached sectional views illustrating special details of construction of parts of the machine.

A represents the base of the machine carrying the cylindrical cam box A', which is

provided internally with cams for operating the needles of the vertical cylinder B with which co-operate the needles of the dial B', said dial needles being actuated by the cams of a dial cam plate B² which is carried by the usual arch mounted upon the cam cylinder A' and shown by dotted lines in Fig 2, so that the cylinder cam box and dial cam plate rotate together.

Mounted upon and rotating with the dial cam plate is a radially projecting arm D constituting a carrier for a fixed jaw *a* and a pivoted jaw *a'*, the latter having an arm *a*² which is acted upon by pins *b* on the under side of a rotating disk F mounted at the outer end of the arm D, the action of either pin *b* upon the arm *a*² serving to open the jaw *a'* and said jaw being closed by the action of a spring *b'* as soon as either of the pins is withdrawn from contact with the arm *a*².

The disk F has upon its upper face other pins *d* and intermittent movements of partial rotation are imparted to the disk F by reason of the contact of one or other of the pins *d* with a pin *d'* projecting from a standard *f* at one side of the base A, or by reason of the contact of one or other of the pins *b* with a pin *b*² projecting inward from a slide *g* mounted and free to move radially in the slotted head *g'* of a standard *g*² also projecting upward from the base of the machine, the pins *b*² and *d'* occupying such circumferential relation to the needle cylinder and dial of the machine as may be required by the desired extent of thickened portion to be formed upon the tube produced by the machine.

The slide *g* can be moved in or out by means of a transverse slide *h* which has a pin *h'* adapted to an inclined slot *h*² formed in the slide *g*, as shown by dotted lines in Fig. 2, reciprocating movement being imparted to the slide *h* at proper intervals by means of pins *h*³ upon a pattern chain G adapted to a wheel G' below and at one side of the base A of the machine, the pins being of different lengths as shown in Figs. 11 and 12, and the long pins acting upon one arm *i'* and the short pins upon another arm *i*² of a three armed lever H, the arm *i'* being laterally offset so as to carry it out of the path of the short pins as shown in

Figs. 1, 2 and 14. The third arm i of the lever H is connected by a link i^3 to an arm i^4 on a rock shaft J which turns in bearings in brackets on the under side of the base A, said shaft having an arm i^5 provided at the upper end with a pin i^6 adapted to a slot h^4 in the slide h . As the chain G moves, therefore, the long pin or pins h^3 acting on the arm i^7 of the lever H cause such operation of said lever, and its connected parts as will thrust the slide h forward and withdraw or move outward the slide g , while the action of the short pin or pins h^3 upon the arm i^2 of the lever H causes such operation of the latter and its connected parts as will effect the withdrawal or backward movement of the slide h , and hence a projection or thrusting inward of the slide g .

Accidental movement of the slide h from either of its extreme positions is prevented by means of a spring catch or clip h^5 which engages with one or other of two notches formed in a block h^6 on the top of the slide h as shown in Fig. 1.

When the slide g is moved inward the pin b^2 is in position to act in succession upon the pins b of the disk F and thus cause the intermittent turning of said disk as the latter is carried around with the arm D, but when the slide g is moved outward the pin b^2 is out of the path of the pins b and hence exercises no control over the disk F which therefore remains stationary in the position to which it was last adjusted by contact of the fixed pin d' with one of the upper pins d of the disk.

The reinforcing thread x' is fed between the jaws a a' and thence passes through a suitable eye x^2 in the arm D on its way to the thread guide x^3 and to the needles of the machine; hence as long as the jaws a a' are open the reinforcing thread can be drawn through the same so as to be knit into the fabric, but when said jaws are closed, the further forward movement of the reinforcing thread is prevented and the thread will be broken at some point between the needles and jaws, the loose end of the reinforcing thread being drawn in again by the main knitting thread x when the jaws are once more opened, as will be explained hereinafter.

Each movement of the disk F is to the extent of one-fourth of a turn and such movement is sufficient either to cause one of the pins b to act on the arm a^2 of the jaw a' and thus open the same, or to carry the pin b out of contact with said arm a^2 so as to permit the jaw to close under the influence of the spring b' , and as one movement of the disk is effected by contact of one of the pins b with the pin b^2 , and the other movement by contact of one of the pins d with the pin d' it follows that the reinforcing thread will be fed to the needles while the disk F is traveling from one pin to the other and the jaws are open, and will be broken off so as to cause the feed of the main knitting thread alone to the needles while the disk is traveling through

the remaining segment of the circle, and the jaws are closed. In the present instance there is, above the jaws, a grooved guide or trough m mounted upon the fixed jaw a and above said trough m is an inclined shield or deflector plate m' under which the reinforcing thread x' passes on its way to the jaws and by which said reinforcing thread is caused to lie at all times in the base of the grooved guide m .

The main knitting thread x is also caused to pass down through the grooved guide m during the time that the jaws are open, so as to insure the drawing in of the end of the supplementary knitting thread during such time, the frictional contact of the main knitting thread with the supplementary knitting thread at the base of the grooved guide being amply sufficient to insure the prompt and steady feeding of said supplementary thread to the machine so long as both threads occupy the base of the groove. Before the jaws a a' are closed, however, the main knitting thread x is withdrawn from the grooved guide and from between the jaws so that, when the latter close, they nip and cause the breaking of the supplementary thread x' only, the main thread continuing to be fed through the eye x^2 and thence to the thread guide x^3 and needles of the machine.

The means for carrying the main knitting thread into and out of the grooved guide and jaws and also certain means employed for forming slack in the supplementary knitting thread and delivering the same at the proper time, are shown in Figs. 1 to 7, and are as follows:

On the arm D is a boss or projection n having a central hub or stud n^6 , upon which the disk F turns, as shown in Fig. 13, this projection providing a bearing for a spindle n' , which has at the upper end a head n^2 from which projects an outwardly and downwardly bent finger n^3 as shown in Fig. 1, the lower portion of said shaft or spindle n' also having a toe n^4 .

To the spindle n' is secured a spur segment k which meshes with a like segment k' having a hub and mounted upon the upper end of a stud p likewise projecting above the bearing n so that any movement imparted to the spindle n' will be transmitted to the spur segment k' .

Projecting from the hub of the spur segment k or from any other available part of the spindle n' is an arm s hooked at the outer end so as to serve as a guide for the reinforcing thread x' and from the hub of the spur segment k' projects a like hooked arm s' which serves as a guide for the main knitting thread x .

The toe n^4 of the spindle n' projects into the path of the pins d on the upper face of the disk F and when said disk is moved so as to cause one of said pins to bear upon the toe n^4 as shown for instance in Fig. 3, the spur segments k and k' are retained in such

position as to hold the thread guiding fingers $s s'$ in their outward positions, as also shown in said Fig. 3, but as soon as the pin d is moved away from the toe n^4 by contact of the pin b^2 with one of the under pins b of the disk F, the spur segments k and k' are so moved under the influence of a torsion spring n^5 acting on the hub of the spur segment k as to cause the arms $s s'$ to approach each other as shown in Fig. 4, this movement, however, being a gradual one owing to the fact that as soon as the toe n^4 is released from the control of the pin d the finger n^3 of the shaft n' comes under the influence of a cam segment t mounted on the slide g , the inner face of said cam segment being eccentric in respect to the path of the disk F; hence as the said finger n^3 travels along the gradually receding surface of the cam segment t the spring n^5 is caused to gradually bring the hooked outer ends of the arms $s s'$ inward or toward each other, the effect of which is to lay the main knitting thread x into the base of the grooved guide m and between the jaws $a a'$ and at the same time to deliver the slack of the supplementary knitting thread as shown in Fig. 4, so that the end of the supplementary thread which runs down through the groove guide to the jaws is left perfectly loose and free to be drawn down by the main knitting thread through the open jaws and thence to the thread guide and needles of the machine, it being understood, of course, that the same action of the disk F which released the toe n^4 caused the opening of the jaw a' by the action of one of the pins b upon the arm a^2 of said jaw.

Before the machine completes the desired fraction of its rotation during which time the supplementary thread is to be fed to the needles, the finger n^3 of the shaft n' comes under the influence of a second cam segment w mounted upon the upper end of the standard f , this cam segment being also eccentric in respect to the path of travel of the disk F, but the eccentricity being the reverse of that of the cam t , so that said cam w acts upon the finger n^3 to cause movement of the spur segments k and k' in a direction the reverse of that permitted by the cam t . In other words, the hooked arms $s s'$ are, by the action of the cam w upon the arm n^3 , caused to gradually recede from each other as shown in Figs. 5 and 6, the effect of this movement being to carry the knitting thread x out of the groove m and from between the jaws $a a'$ and to form slack in the supplementary knitting thread x' to be afterward delivered in the manner above set forth. The parts are held in this position by reason of the contact of one of the pins d with the toe n^4 as said pin leaves the pin d' , after having caused the turning of the disk F so as to permit of the closing of the jaws $a a'$, (see Fig. 7.)

A spring catch f^2 serves, by engagement with notches f^3 in the disk F, to retain said disk in its successive positions of adjustment

and to prevent any accidental movement of the disk therefrom, the hold of the spring catch upon the disk however, not being sufficient to prevent positive movement of the disk by reason of the contact of the pins $b d$ with the pins $b^2 d'$.

By means of the devices described the feeding of the supplementary knitting thread to the thread guide and needles is started and stopped at substantially the same point in each rotation of the machine so that the thickened portion of the stocking, due to the introduction of the supplementary knitting thread, has sharp and well defined edges, the supplementary thread being introduced for any desired number of successive courses, or in other words, as long as the slide g with its pin b^2 is allowed to remain in the inner position, the operation of the disk F being arrested as soon as the slide g is withdrawn so as to carry the pin b^2 out of the path of the pins b .

The grooved guide m which receives the main and supplementary knitting threads, before the latter reach the jaws, provides extended frictional contact between the continuously traversing main thread and the loosely hanging end of the supplementary thread and thus renders certain the carrying forward of said end of the supplementary thread as soon as the main thread is laid into the groove so that the supplementary thread is introduced into every course in which it is desired and throughout practically the same extent in each successive course, thus overcoming the objection of uncertainty of action which has been, so far as I am aware, a defect in previous devices intended for the same purpose as those forming the subject of my invention.

It is advisable to lengthen the stitches in that portion of the knitted tube into which the supplementary thread is introduced in order that this portion of the tube may not be deprived of elasticity due to such introduction of the supplementary thread, it being apparent that if the length of stitch in the tube is uniform throughout the whole tube that portion of said tube in which the extra thread is employed, will be stiffer in texture than the remaining or single thread portion and will hence be deficient in elasticity as compared with said single thread portion. I therefore provide for depressing the drawing down cam in the needle cam box A' and for holding the same in such depressed position during the time that the extra thread is being fed to the needles, the drawing down cam being then permitted to rise to its normal position so as to draw the shorter normal stitch during the time that the single thread only is being fed to the needles. The mechanism for effecting this result is as follows: The drawing down cam is of the usual character, but has a projecting pin v which extends through a slot in the cam box and enters an inclined slot v' in the slide v^2 guided

in a bearing v^3 on the side of said cam box, this slide being connected to one arm of a lever v^4 hung to the cam box. The other arm of the lever v^4 has a projecting lug v^5 which is adapted to be acted upon by two cams v^6 and v^7 mounted on the base of the machine, the cam v^6 being adapted to act upon the lug v^5 so as to lift the same and cause a forward movement of the slide v^2 so as to pull down the drawing cam, while the cam v^7 acts to depress the lug v^5 and thus pull back the slide v^2 in order to lift said drawing cam.

The cam v^6 is under control of a wedge y carried by a bar y' which slides on the base A, the outer end of said bar having a slot y^2 for the reception of a pin y^3 at the upper end of an arm y^4 secured to the rock shaft J; hence as said rock shaft is caused to vibrate under the action of the pattern chain G and lever H the bar y will be moved in and out and will thus either withdraw the wedge y from under the cam v^6 and permit the latter to drop or else will insert said wedge beneath the cam v^6 and elevate the latter.

When the cam v^6 is down the lug v^5 passes above the same without being operated by it, but when said cam v^6 has been elevated it acts upon said lug v^5 so as to push forward the slide v^2 and cause the pulling down of the drawing cam of the cam box.

The cam v^7 is constructed so as to act upon and depress the lug v^5 when said cam is elevated as shown in Fig. 10, the lug passing above the cam without being actuated thereby when said cam is depressed. The cams v^6 and v^7 are raised and lowered simultaneously, the stem of the cam v^7 being acted upon by an arm y^5 on the rock shaft J at the same time that the arm y^4 acts upon the wedge bar y' .

When the cams v^6 and v^7 are elevated the drawing down cam will pull long stitches during that half turn of the machine in which the supplementary thread is being fed to the needles and shorter stitches during the remaining half turn when the needles receive only the single thread and when both cams are depressed the drawing down cam of the cam box A' will remain continuously in the elevated position, and the shorter or normal stitches will be drawn throughout the entire circuit of the tube.

In the machine illustrated the cam segments t and w are used simply to cause a gradual movement of the thread controlling arms s and s' and where such gradual movement is not of importance, said cam segments may be dispensed with, the movement of the arms in one direction being caused by the action of either of the pins d upon the toe n^4 of the shaft n' , and the movement of said arms in the opposite direction being caused by the spring n^5 when the pin d is moved out of engagement with said toe.

Various modifications of the means employed for operating the slide g and cams v^6 and v^7 will also suggest themselves to those

familiar with the class of machinery to which my invention relates; hence said invention is not, so far as most of my claims are concerned, limited to the devices shown and described for the purpose, and the same is true of the other details of minor importance in the machine. The cam v^7 might, for instance, be fixed in the position shown in Fig. 10, so that the lug v^5 would be acted upon and depressed thereby when it had previously been lifted by the cam v^6 , but would at other times, pass beneath the said cam v^7 without being acted upon.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination, in extra thread feeding devices for knitting machines of a pair of jaws, a grooved guide through which the main and supplementary threads pass before reaching said jaws, a movable guide whereby the main thread is laid in or withdrawn from the grooved guide and jaws, and means for independently operating said jaws, and the movable guide, substantially as specified.

2. The combination, in extra thread feeding devices for knitting machines of a pair of jaws, a grooved guide through which the main and supplementary threads pass before reaching the jaws, a shield or deflector whereby the supplementary thread is retained in the base of the groove, a movable guide for laying the main thread in and withdrawing it from the grooved guide and jaws, and means for operating said jaws and the movable guide, substantially as specified.

3. The combination, in extra thread feeding devices for knitting machines, of the jaws for nipping the supplementary knitting thread, a rotating carrier for said jaws, an arm for forming slack in said thread, a shaft carrying said arm, a toe on said shaft, a disk having pins or projections for bearing upon said toe, and means for intermittently moving said disk, substantially as specified.

4. The combination in extra thread feeding devices for knitting machines, of the jaws for nipping the supplementary thread, a guide through which the main and supplementary threads pass before reaching the jaws, an arm for laying the main thread into and carrying it from said guide and jaws, a shaft carrying said arm, and means for imparting movement of partial rotation to said shaft, substantially as specified.

5. The combination in extra thread feeding devices for knitting machines, of the jaws for nipping the supplementary knitting thread, a grooved guide through which the main and supplementary threads pass before reaching the jaws, an arm for laying the main knitting thread into and carrying it out of said guide and jaws, an arm for forming slack in the supplementary knitting thread, and means for simultaneously operating said main and supplementary thread controlling arms, substantially as specified.

6. The combination, in extra thread feeding devices for knitting machines, of the rotating carrier having a shaft with projecting arms forming a thread guide, a finger projecting from said shaft, a spring for moving the shaft in one direction, and a cam segment controlling the position of said finger during a portion of the rotating movement of the carrier so as to impart a gradual movement to the thread guiding arm, substantially as specified.

7. The combination, in extra thread feeding devices for knitting machines, of the rotating carrier, a shaft mounted thereon and having a projecting thread guiding arm, a finger projecting from said shaft, a cam segment against which said finger bears during a portion of the rotation of the carrier so as to cause movement of partial rotation of the shaft, and a spring for holding said finger in contact with the cam, substantially as specified.

8. The combination in extra thread feeding devices for knitting machines, of the rotating carrier, a shaft mounted thereon and having a projecting thread guiding arm, a projecting finger on said shaft, a cam segment for acting on said finger, and imparting movement of partial rotation to the shaft, a spring for moving the shaft in the reverse direction, a movable stop and means carried by the shaft for engaging said stop, thereby preventing such reverse movement of the shaft while said stop is in position, substantially as specified.

9. The combination in extra thread feeding devices for knitting machines, of a rotating carrier, a shaft mounted thereon and having a projecting thread guiding arm, a projecting finger on said shaft, a spring acting to turn the shaft and two cam segments acting in succession on said finger as the carrier is rotated, one cam governing the movement of the shaft in one direction and the other cam causing the movement of said shaft in the opposite direction, substantially as specified.

10. The combination in extra thread feeding devices for knitting machines, of a rotating carrier having a shaft and hub, one having a projecting guide arm for the main thread and the other a projecting guide arm for the supplementary thread, gearing connecting said shaft and hub, a finger projecting from the shaft, and means for acting on said finger as the carrier rotates so as to impart movement of partial rotation to the shaft, substantially as specified.

11. The combination, in extra thread feeding devices for knitting machines, of the rotating carrier having a shaft and hub one having a projecting guide arm for the main thread, and the other a projecting guide arm for the supplementary thread, gearing connecting said shaft and hub, a finger project-

ing from the shaft, a cam segment for acting on said finger as the carrier rotates, and a spring for maintaining said finger in contact with said cam segment, substantially as specified.

12. The combination in extra thread feeding devices for knitting machines, of a rotating carrier having a shaft and hub, one having a projecting guide arm for the main thread, and the other a projecting guide arm for the supplementary thread, gearing connecting said shaft and hub, a finger projecting from said shaft, a spring acting to turn the same, and two cam segments acting on said finger as the carrier rotates, one segment governing movement of the shaft in one direction and the other causing movement in the opposite direction, substantially as specified.

13. The combination in extra thread feeding devices for knitting machines, of a rotating carrier, a shaft mounted thereon and having a projecting thread guiding arm, a projecting toe on said shaft, a disk also mounted on the carrier and having pins or projections for acting on said toe, and means for moving the shaft when it is released from the control of said pins or projections, substantially as specified.

14. The combination in extra thread feeding devices for knitting machines, of the rotating carrier having a shaft and hub, one with a projecting guide arm for the main knitting thread, and the other with a projecting guide arm for the supplementary thread, gearing connecting said shaft and hub, a projecting toe on the shaft, a disk also mounted on the carrier and having projecting pins for acting on said toe, means for imparting intermittent movements of partial rotation to the disk, and means for moving the shaft when the toe has been released from the control of the pin on the disk, substantially as specified.

15. In a machine provided with means for feeding an extra thread to the needles during a partial turn of the machine, the combination of such means with the drawing down cam in the cylinder cam box, cam shifting devices mounted upon and rotating with said cam box, two cams adapted to engage with said shifting devices as the cam box is rotated, one of said cams being constructed to move the shifting device in one direction, and the other being constructed to move said device in the opposite direction, and means whereby said cams are rendered operative on the starting into action of the extra thread feeding devices, and inoperative on the cessation of said extra thread feed, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN G. POWELL.

Witnesses:

WILLIAM D. CONNER,
HARRY SMITH.