

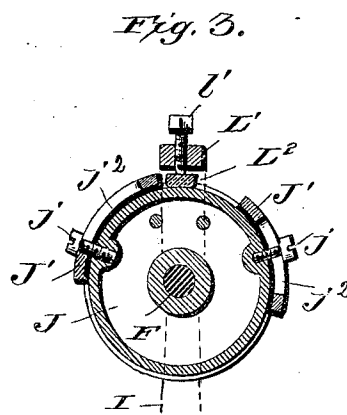
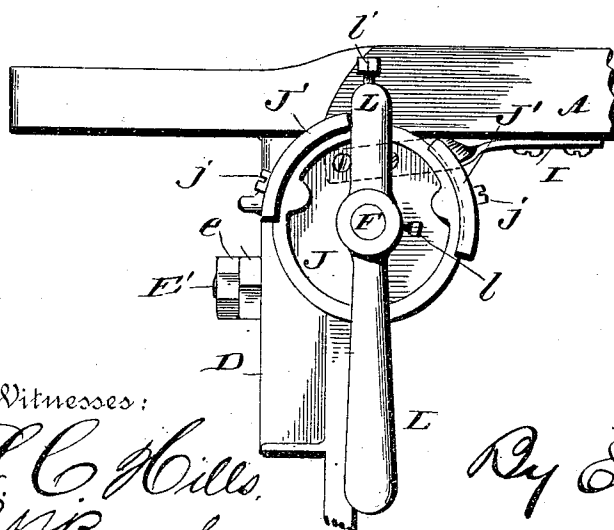
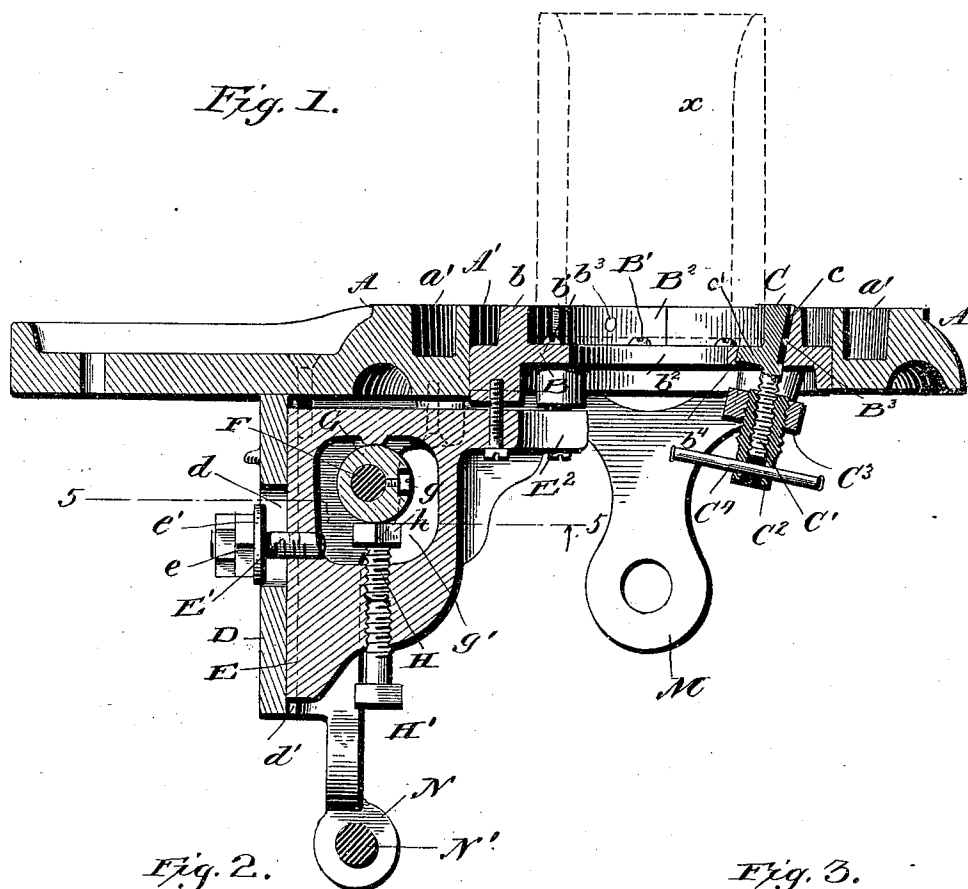
(No Model.)

4 Sheets—Sheet 1.

E. A. HIRNER.
KNITTING MACHINE.

No. 552,438

Patented Dec. 31, 1895.



Inventor,

Emil A. Hirner;

By *E. B. Stocking*
Attorney

Attorney

Witnesses:

L. C. Hills.
C. R. Bond

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Fig. 4.

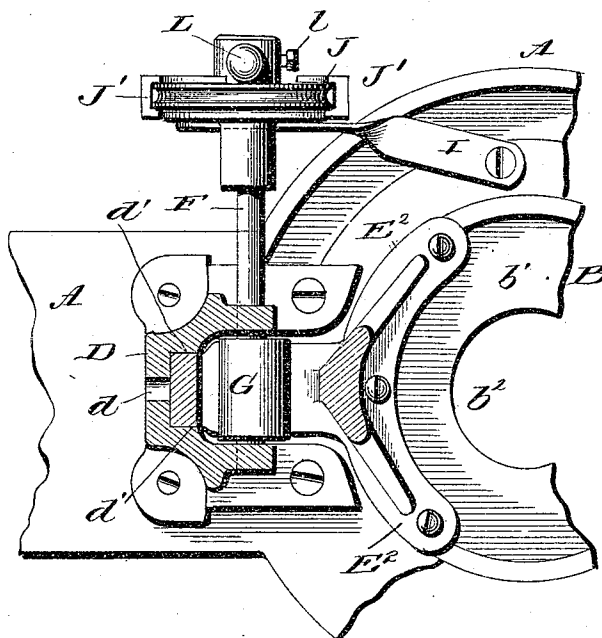
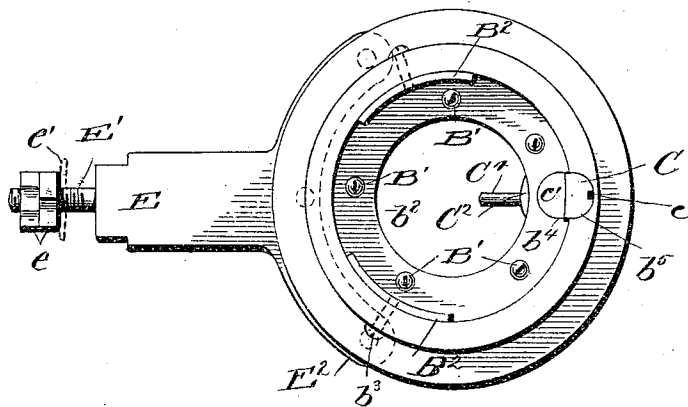


Fig. 5.

Witnesses:

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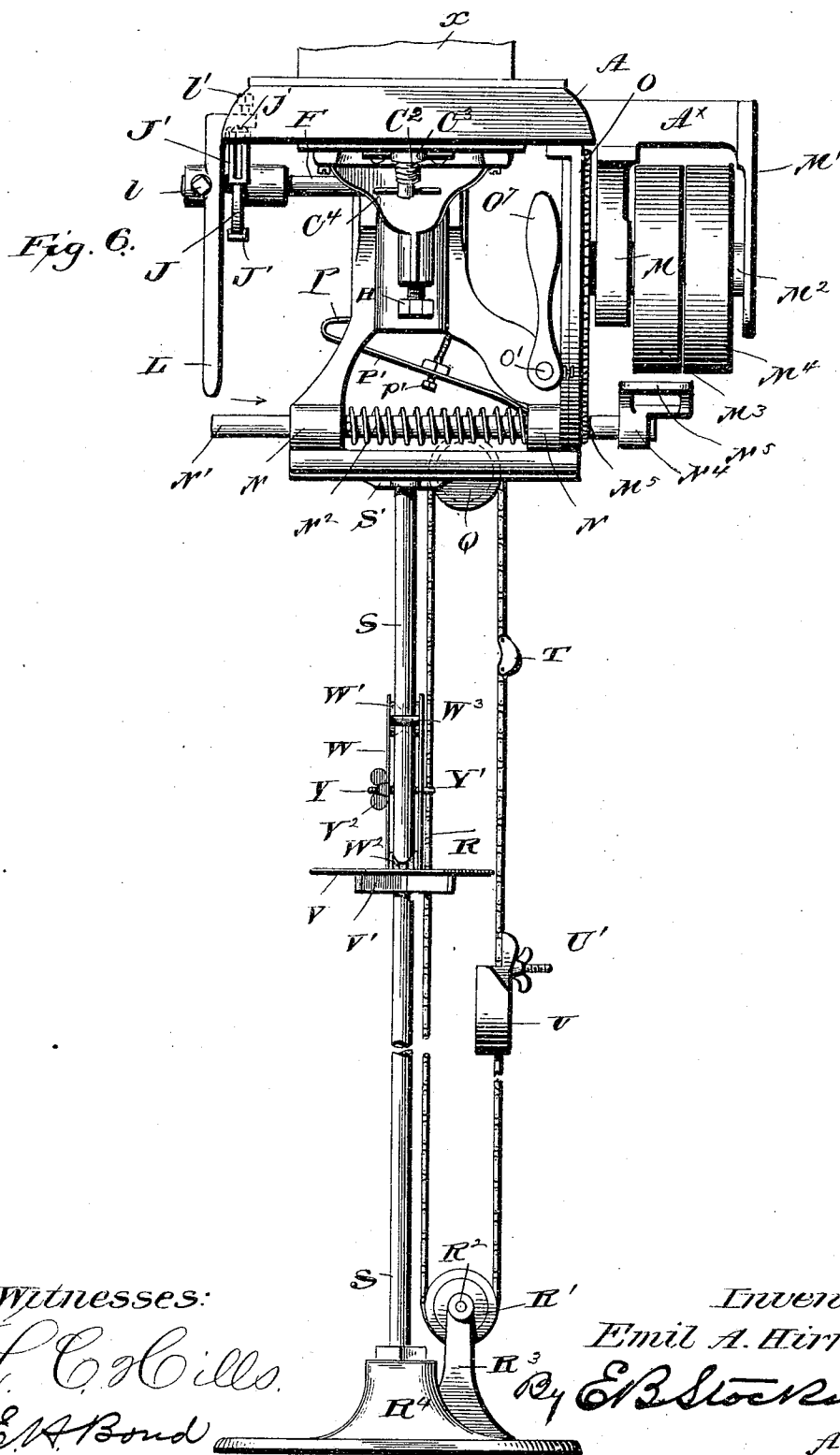
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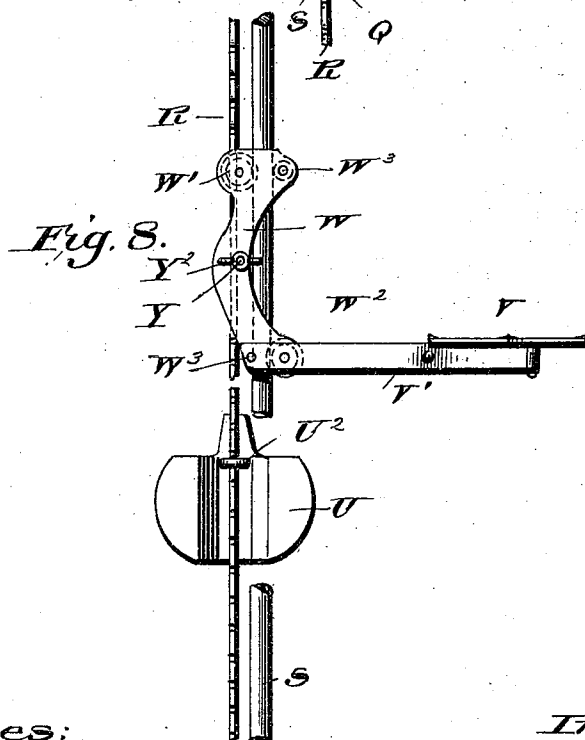
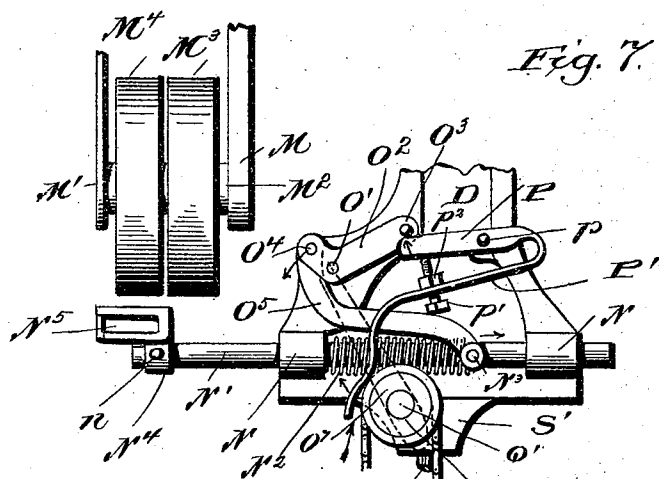
(No Model.)

4 Sheets—Sheet 4.

E. A. HIRNER.
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No. 552,438.

Patented Dec. 31, 1895.



Witnesses:

L. C. Hills.
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UNITED STATES PATENT OFFICE.

EMIL A. HIRNER, OF ALLENTOWN, PENNSYLVANIA.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 552,438, dated December 31, 1895.

Application filed May 2, 1895. Serial No. 547,875. (No model.)

To all whom it may concern:

Be it known that I, EMIL A. HIRNER, a citizen of the United States, residing at Allentown, in the county of Lehigh, State of Pennsylvania, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to knitting-machines, and more particularly to means for holding and binding the needle-cylinder in its ring, and for regulating the height of needle-cylinder to produce closer or not-so-close knitting. I provide a binding-ring having an opening for the passage of the fabric and a recess to receive the needle-cylinder and provided also with clamping-jaws, all of which are adjustable, but two of which are designed to be stationary, while the other is provided with means for moving it up or down to clamp or loosen the needle-cylinder, the movable jaw acting like a cam and serving to always draw the cylinder down into the recess and firmly bind it there. I employ a ring and a left-hand screw, together with a stem on the jaw, for this purpose to attain a maximum of movement of the jaw by a minimum movement of the operating handle or lever. I provide a tension-bracket with an extension which is connected with the binding-ring and mounted for actuation by an eccentric actuated by a lever, adjustable stops being provided for co-operation with this lever, so that when the stops are set according to the tension the operator is to knit, the operator will produce uniform stocking in tension both in the leg and heel and toes.

Still a further object is to provide mechanism for automatically stopping the machine when the stocking has acquired its proper length and reversing the operative mechanism to start another stocking.

Other objects and advantages of the invention will hereinafter appear, and the novel features thereof will be specifically defined by the appended claims.

The invention is clearly illustrated in the accompanying drawings, which, with the letters of reference marked thereon, form a part of this specification, and in which—

Figure 1 is a substantially central vertical

section through a portion of a knitting-machine with my improvements applied in position. Fig. 2 is a side elevation of the lever for actuating the eccentric and its disk with its adjustable stops. Fig. 3 is a vertical sectional elevation through the parts seen in Fig. 2, the section being taken through the center of the groove of the disk. Fig. 4 is a top plan of the binding-ring removed from the machine. Fig. 5 is a horizontal section on the line 5 5 of Fig. 1, looking in the direction of the arrows. Fig. 6 is a front elevation showing the automatic stop and reversing mechanism. Fig. 7 is a view looking at the opposite side to that shown in Fig. 6, showing the belt-shifting devices. Fig. 8 is a view at right angles to Fig. 6, showing the shelf and the chain, portions being broken away.

Like letters of reference indicate like parts throughout the several views.

As much of a knitting-machine forms no part of this invention and the parts thereof have no intimate relations thereto, I have shown only such parts as are necessary to a proper understanding of my present invention and its operation. Those parts not shown, and those shown and not particularly described, may be of any well-known or approved form of construction.

Referring then to the details of those parts which are shown, by letter, A designates the base of the machine, designed to be secured in position in any of the known ways, and provided with the groove a' for the cam-cylinder (not shown) and the circular opening A' , which the binding-ring is designed to fit, and in which it is to be adjusted vertically in a manner which will hereinafter be explained.

B is the binding-ring. It is formed with the annular raised flange b , within which the needle-cylinder x is designed to fit, as indicated by dotted lines in Fig. 1, and the inwardly-extending horizontal flange b' , which is provided with an opening b^2 for the passage of the fabric, and the upper face of this horizontal flange may be provided with a plurality of screws B' , as seen in Figs. 1 and 4, upon which the needle-cylinder may rest, and by means of which its position vertically within the said ring may be regulated.

B^2 are clamping-jaws concentric with the annular flange b of the ring and arranged

within the same, as seen in Fig. 4, being designed to remain stationary, but capable of adjustment to and from the axis thereof, when necessary, by the screws b^3 , by which they are held in position. These jaws are designed to bear against the outer periphery of the needle-cylinder when the latter is in position within the flange b of the ring. At a point substantially diametrically opposite the space between the adjacent ends of these jaws B^2 the horizontal flange b' of the ring is provided with a circular opening b^4 , and the vertical wall is provided with a coincident curved channel or recess b^5 , the outer wall of which is provided with an inwardly-extending pin or projection B^3 , which works in the vertical groove or channel c of the jaw C , which is curved to conform to the curvature of the channel b^5 , the said channel being inclined slightly from a perpendicular, as seen best in Fig. 1, the incline being from the top downward and inward to form a sort of cam-surface for a purpose which will soon appear. This jaw C has an offset at c' , as seen in Figs. 1 and 4, and the portion below said offset corresponds with the opening b^4 of the horizontal flange of the binding-ring, as seen in Figs. 1 and 4. This jaw has a shank C' , which is provided with a right-hand screw-thread and which engages a screw-threaded opening in the tube or elongated collar C^2 , which is provided exteriorly with left-hand screw-threads to fit the nut C^3 , which is secured to the under side of the binding-ring in any suitable manner, the tube C^2 being provided with some suitable means, as a handle C^4 , by which it may be turned when desired. The operation of this part of the invention will be readily understood. The jaw C is raised so that the end of the needle-cylinder can be inserted within the flange b of the ring, and then the handle C^4 is turned to draw the jaw C downward, it being held against rotation by the projection B^3 working in its groove, and as the jaw acts like a cam it will firmly bind the needle-cylinder in position. The jaws B^2 may be adjusted outward to accommodate a smaller cylinder if necessary.

D is a bracket depending from or secured to the under side of the base A , as seen in Fig. 1, and its vertical portion is provided with a slot d , as seen best in Fig. 1, and with guide-flanges d' , as seen in Figs. 1 and 5, for the vertical guidance of the tension-bracket extension E , which has a lateral screw-threaded extension E' which works through the slot d and is provided with the nuts e and a washer e' , as shown, to guide it and prevent displacement thereof. This bracket E has the curved extension E^2 , which is secured to the under face of the binding-ring, as seen in Figs. 1, 4 and 5, so that the said ring must move with the said extension-bracket as the latter is moved.

F is a horizontal shaft journaled in the side portions of the bracket D , and between the said portions has secured thereto, as by a

screw g , an eccentric G , as seen in Figs. 1 and 5, which eccentric is located within a chamber or recess g' in the bracket E , as seen best in Fig. 1, and adapted to bear upon the under face of the top of the bracket E to raise the said bracket and the binding-ring, and in depressing the same it bears upon the head h of a screw H which is tapped into the lower portion of the bracket E and is adjusted and retained in its adjusted position to limit and regulate the throw of the eccentric by a screw H' which is screwed into the bracket from the under side and bears against the end of the said screw H , as shown in Fig. 1.

It will be readily understood that the throw of the eccentric may be varied by moving the screw H in or out, as may be desired, and then adjusting the screw H' to bear against the end of the screw H in its adjusted position, the screw H being adjusted up to shorten the throw of the eccentric and downward to increase the amount of movement thereof.

I is an arm secured to the under side of the bed or base A , as seen in Figs. 2 and 5, and secured to its outer end is a wheel or disk J , the periphery of which is grooved, as seen in Figs. 3 and 5, and adjustably secured to the periphery of this disk are the stops J' , which are in the form of segments or arcs of a circle, held to the disk by screws j , as seen best in Figs. 2 and 3, and provided with longitudinal slots j^2 , as shown in Fig. 3, whereby they may be adjusted around the periphery of the disk.

L is a lever fast upon the shaft F at the outer end thereof being held thereto in any suitable manner, as by a set-screw l , as seen in Figs. 2 and 5, and having one end bent at a right angle, as seen at L' , through which passes a set-screw l' , as seen in Figs. 2 and 3, and which bears upon a brake L^2 of leather or any other suitable material and which works in the groove of the disk J , as shown in Fig. 3.

The operation is as follows: The needle-cylinder being fast in the binding-ring the operation of knitting proceeds in the usual way. When it is desired to change the tension the lever L is moved to throw the extension tension-bracket up or down according to the way it is desired to regulate the tension. In knitting the leg of a stocking the eccentric is turned so as to lower the extension-bracket, and consequently the binding-ring and needle-cylinder, causing the machine to knit tight and close; but when it is desired to knit coarser or looser, as at the heel, where a coarser yarn or thread is used, the lever is turned to cause the eccentric to move to raise the binding-ring and its needle-cylinder and the machine will not knit so close or tight. By adjustment of the stops J' any required tension may be provided, and when the two stops or slides have been once adjusted the operator has only to throw the lever in the proper direction till it is stopped by the stop or slide, when the proper tension will be produced. The overturned end of the lever with

its brake working in the groove of the disk serves as a friction device to hold the parts in their adjusted position.

In case the needle-cylinder, by constant or continued use, becomes a little worn or out of true, by releasing the jaws and by loosening the screws that hold the jaws B² in place and putting a liner of paper or other substance back of them, the needle-cylinder can be readily set in the center of the ring.

Referring now to Figs. 6, 7 and 8, M is a bearing or hanger depending from the lateral extension A X of the base, and in this bearing or hanger and in a corresponding bearing or hanger M' depending from the other side of said extension is a shaft M², on which are the fast and loose pulleys M³ M⁴, and on this shaft M² is the gear M⁵ by which motion is imparted to the cam-cylinder through intervening mechanism of known construction and not necessary to show or describe in this particular. Mounted in suitable bearings N on the lower end of the depending bracket D is a sliding shaft N' around which is a coil-spring N² confined between the said bearings, as seen best in Fig. 6, and designed to be compressed as the shaft is moved in the direction of the arrow in Fig. 6, by means of the stud or pin N³ which passes through the said shaft and against which said spring finds a bearing, as shown in Fig. 6. The inner end of this sliding shaft carries an arm N⁴ extended at right-angles thereto and adjustably held in position, as by a set-screw n, and the outer end of this arm N⁴ constitutes a belt-shifter N⁵, as seen in Figs. 6 and 7, through which the belt is designed to pass, and so constructed that when the shaft N' is moved endwise it shifts the belt from the loose to the fast pulley, or vice versa, according to the direction in which the said shaft is moved. Any suitable means may be provided for aiding and steadying and guiding this arm N⁴ in its movements if such further guidance is necessary.

The plate or disk O, which forms a cover or casing for the beveled gear M⁵, is provided upon its inner face with a lug or bearing in which is supported one end of the shaft O', the other end of which has a bearing in the bracket D, as seen in Fig. 7, and this shaft extends through the bearing, and upon its extended end is fast a bell-crank arm or lever O², the free end of the longer arm of which is provided with a laterally-projecting stud O³, while the other end is pivotally connected, as at O⁴, with the curved link O⁵, the other end of which is mounted upon the stud N³ on the shaft N', and against which stud one end of the coil-spring N² finds its bearing, as above explained. The stud O³ of the bell-crank lever O² projects over and is designed to engage upon the inwardly-extending arm P, pivotally mounted at p on the bracket D and having a curved portion P', which arm is curved downwardly and inwardly, as shown, and near its free end formed upon a compound curve and extended over the grooved pulley Q, mounted

upon the shaft Q', having a bearing in a suitable lug or portion of the bracket D or a part secured thereto. Over this pulley passes the endless chain R, which passes also around the pulley R' on a shaft R², supported in an upwardly-extending bracket or arm R³ on the standard or base R⁴, all as clearly shown in Fig. 6. S is a rod or post, supported at its lower end in said base and at its upper end in a socket or suitable bearing S', depending from the lower portion of the bracket D or a part secured thereto. The chain R has one of its links formed in the shape of a cam T, as seen in Fig. 6, which cam is designed at a predetermined interval to pass beneath the free curved end of the portion P' of the arm P and raise the same, as will hereinafter appear. The said inclined part P' is provided with a screw or bolt p', passing therethrough, as seen in Figs. 6 and 7, and provided with a jam-nut p², as seen in said views, for adjustment to regulate the tension of the spring-arm P', as occasion may require. The chain R carries a weight U, as seen in Figs. 6 and 8, which is made adjustable thereon by means of the bolt and thumb-screw U' and the eye or analogous construction U², which embraces the chain and which is drawn thereagainst by the thumb-screw, as will be understood, and thus the weight may be adjusted nearer to or farther from the cam T, as circumstances may require. This weight serves to return the parts to their normal position after the cam has acted to shift the belt, as will hereinafter appear.

V is a shelf carried by the lateral arm V', said shelf being adapted to receive a weight, (not shown,) which is attached to the stocking after the same has been partially knit, and which serves to carry down the shelf and the stocking with it as the knitting progresses. This arm is attached to a bracket W, as seen best in Fig. 8, and which bracket is sleeved upon and mounted to slide on the rod S, being provided at its upper end upon one side of the rod with a grooved antifriction-roller W', and upon the opposite side of the rod near its lower end with a smaller grooved antifriction-roller W². Upon the sides opposite these rollers are the pins W³, which serve to connect the side bars of the bracket or guide W and also to steady the same in its movement and prevent twisting or binding thereof, so that the said guide or bracket will move easily and without friction upon its rod S.

Y is a rod having an eye Y' at one end to embrace the chain R, as seen in Fig. 6, so as to bind the same to the guide, so that the latter will move with the chain, the other end of this rod being screw-threaded, as seen in Fig. 6, and provided with a thumb-screw Y², as shown in Figs. 6 and 8, for binding the parts together. The operation of this part of the invention is as follows: As soon as the stocking has been knit enough for it to project through the cylinder a weight (not shown) is attached thereto and the said weight placed

upon the shelf V, the handle O' which is fast upon the shaft O', as by a set-screw, (shown in Fig. 6,) is turned so as to throw the parts into the position in which they are shown in Fig. 6.

5 7. the stud N³ compressing the spring as the shaft N' is moved endwise in a direction opposite to that indicated by the arrow in Fig. 7, and the stud O³ resting upon the upper end of the arm P, all as indicated in said Fig. 7. Now

10 as the knitting progresses the shelf V, the guide W and the parts connected therewith, are gradually moved downward against the influence of the weight U until the cam T is brought into such position as to enter under

15 the curved end of the arm P', as indicated by the arrow in Fig. 7, when continued downward movement of the shelf V brings the said cam in contact with the under face of this curved arm which is moved upward on its

20 pivot, thus forcing the free end of the arm P against the stud O³ and throwing the bell-crank lever O² in the direction indicated by the arrow in Fig. 7, throwing it off its center, when the spring N² immediately returns the

25 parts to the position indicated in Fig. 6, and shifts the belt from the fast pulley to the loose pulley, it being understood of course that the shaft N' is moved in the direction of the arrow in Fig. 7. As soon as the parts have been returned to their former position the weight U

30 returns the shelf and its guide to its uppermost position ready to receive the weight on another stocking. The shelf as well as the weight U are adjusted in accordance with the length or weight or other characteristic of the

35 stocking to be made.

Modifications in detail may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages.

40 What I claim as new is—

1. The combination with the base, of a binding ring adapted to receive the needle cylinder, horizontally adjustable clamping jaws, and a vertically adjustable cam jaw carried

45 by said ring, as and for the purpose specified.

2. The combination with the binding ring, of laterally-adjustable jaws thereon, and a vertically adjustable jaw mounted on said ring, as set forth.

50 3. The combination with the binding ring, of a vertically-adjustable cam-jaw thereon, as set forth.

4. The combination with the base, of a binding ring mounted for vertical movement therein, lateral clamping jaws on the inner periphery of the ring, and a vertically-adjustable clamping jaw also within the periphery of said ring, as set forth.

5. The combination with the base and the

60 binding ring mounted therein for vertical movement, of a clamping jaw mounted for vertical movement in said ring with its outer face upon an inclined plane to give to the same a cam action, substantially as specified.

65 6. The combination with the binding ring, of a jaw mounted therein for vertical movement and having its outer face on an incline

to correspond with an inclined cooperating wall of the recess in the ring in which the said jaw works, as set forth.

7. The combination with the binding ring having a vertically disposed opening with inclined wall and a lateral projection, of a jaw mounted for vertical movement in said opening and having a vertical groove to receive

75 said projection, as set forth.

8. The combination with the binding ring, of a clamping jaw mounted for vertical movement therein and having a screw threaded shank, a fixed nut, and an oppositely-threaded

80 sleeve engaging the said nut and shank and provided with means for turning it substantially as and for the purpose specified.

9. The combination with the binding ring having lateral flange with opening and coinciding opening in the adjacent wall of the ring with an inclined outer face having

85 projection, of a jaw mounted for vertical movement in said openings and having inclined outer wall with vertical groove to receive said

90 projection, and means for moving said jaw vertically, as set forth.

10. The combination with a binding ring mounted for vertical movement and provided with a vertically adjustable cam jaw, of means

95 for raising and lowering the same to regulate the tension, as set forth.

11. The combination with a binding ring carrying the needle-cylinder and provided with a vertically adjustable cam jaw, of a

100 vertically-movable bracket carrying the said ring, and means acting upon said bracket to move the ring vertically, substantially as specified.

12. The combination with a binding ring

105 carrying the needle-cylinder and a cam jaw mounted for vertical adjustment on said ring, of a bracket carrying the said ring and mounted for vertical movement, and an eccentric mounted to act upon said bracket, as set forth.

13. The combination with a binding ring mounted for vertical movement and carrying the needle-cylinder and a cam jaw vertically adjustable on said ring, of a bracket mounted

115 for vertical movement and connected with said ring, and an eccentric mounted to work in an opening in said bracket and acting thereon to raise and lower the same, as set forth.

14. The combination with the binding ring

120 and the bracket connected therewith and mounted for vertical movement, of a transverse shaft, an eccentric thereon, a lever on said shaft and adjustable stops for said lever, as set forth.

15. The combination with the transverse shaft and its eccentric, of the grooved disk loose on said shaft, the lever fast on said shaft, and the adjustable stops about the periphery

125 of said disk, substantially as specified.

16. The combination with the base and the depending bracket, of the extension bracket mounted for vertical movement, the adjustable screws in the extension bracket, and the

130

eccentric mounted to bear upon the uppermost of said screws, as set forth.

17. The combination with the grooved disk, of the lever on the shaft of the disk and having its end at right angles to its length, the set screw in said end and the brake in the groove of the disk and against which said set screw bears, substantially as specified.

18. The combination with a bell crank lever, the inwardly extending arm, the horizontal shaft, the spring and the curved link of a movable stocking support and a device movable therewith and comprising a cam for cooperating with the inwardly extending arm, substantially as described.

19. The combination with a movable stocking support, of a chain connected therewith, a cam carried by the chain, a counterbalance weight on the chain and a belt shifter and intermediate mechanism actuated by said cam, substantially as described.

20. The combination with a belt shifter, of a vertically movable support and endless chain connected therewith, a cam on the chain, a counterbalance weight also carried by said chain with means for its adjustment and intermediate devices between the cam and the belt shifter for actuation by the former, substantially as described.

21. The combination of a sliding belt shifter rod, a spring around the same, a bell-crank

lever and connection between the same and the rod to compress the spring, a pivoted arm with a spring portion, a stocking support and its chain, and a cam carried by the chain to engage said spring portion, substantially as described.

22. The combination of a sliding belt shifter rod, a spring around the same, a bell-crank lever and connection between the same and the rod to compress the spring, a pivoted arm with a spring portion, a stocking support and its chain, a cam carried by the chain to engage said spring portion, and a counterbalance for the support also carried by said chain, substantially as described.

23. The combination of a sliding belt shifter rod, a spring around the same, a bell-crank lever and connection between the same and the rod to compress the spring, a pivoted arm with a spring portion, a stocking support and its chain, a cam carried by the chain to engage said spring portion, and means for adjusting said spring portion, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EMIL A. HIRNER.

Witnesses:

HEATH SUTHERLAND,
HENRY HILLS.