(No Model.) 3 Sheets—Sheet 1.

H. E. HARBAUGH.

CIRCULAR KNITTING MACHINE.

No. 564,176. Patented July 14, 1896.

Fig. 1.

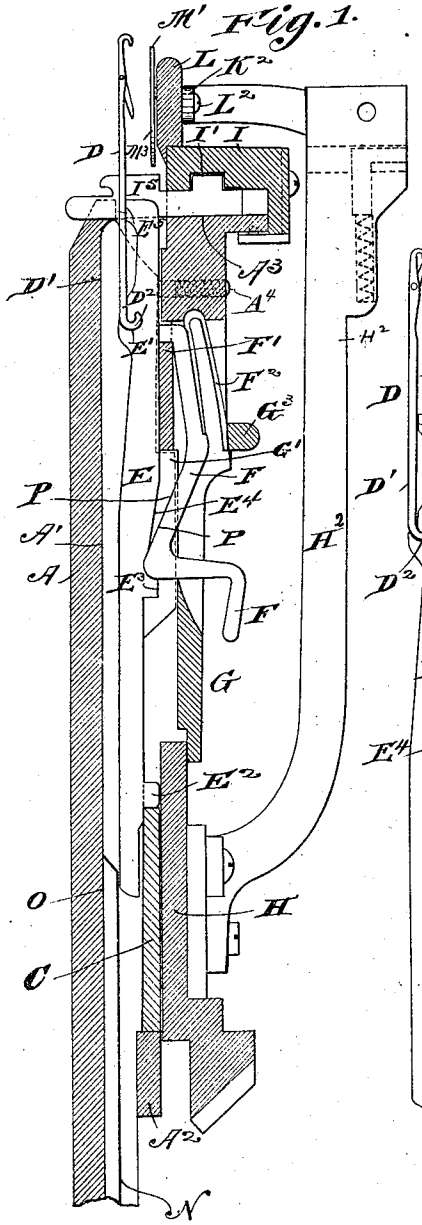


Fig. 2.

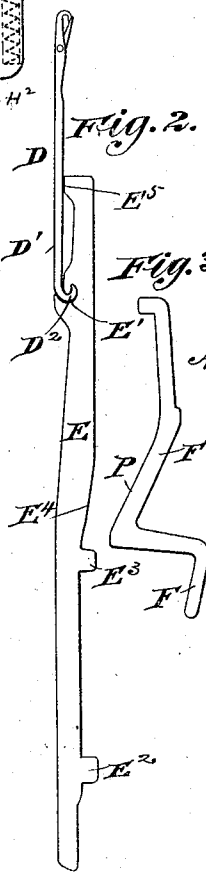


Fig. 3.

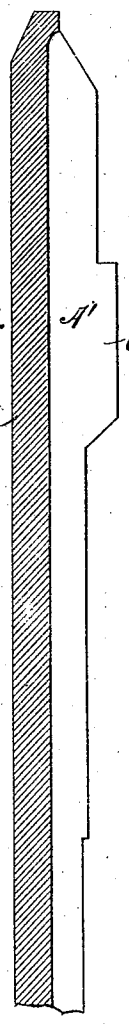
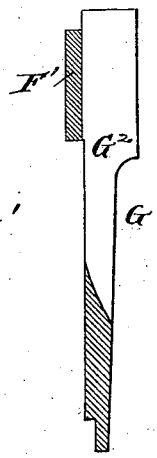


Fig. 4.

Fig. 5.



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(No Model.) 3 Sheets—Sheet 2.

H. E. HARBAUGH.

CIRCULAR KNITTING MACHINE.

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Fig. 6.

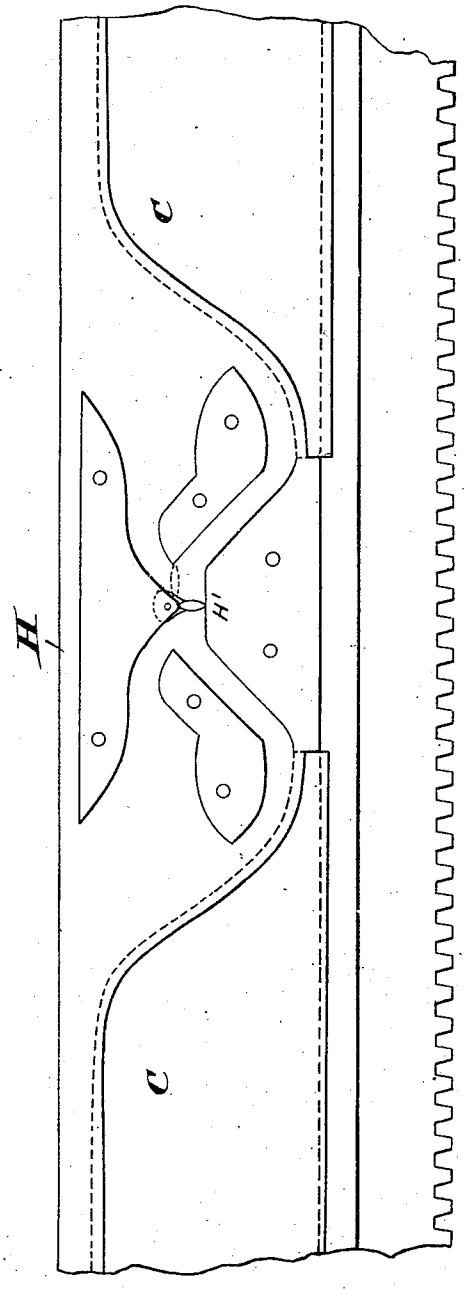
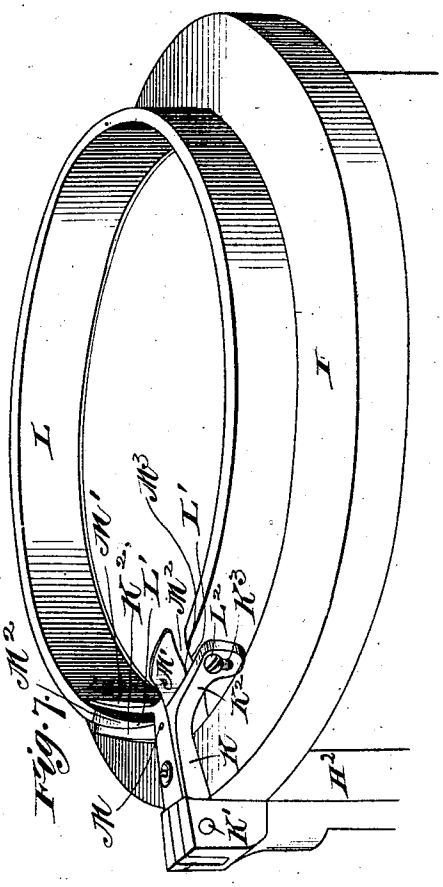


Fig. 7.



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H. E. HARBAUGH.

CIRCULAR KNITTING MACHINE.

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Fig. 8.

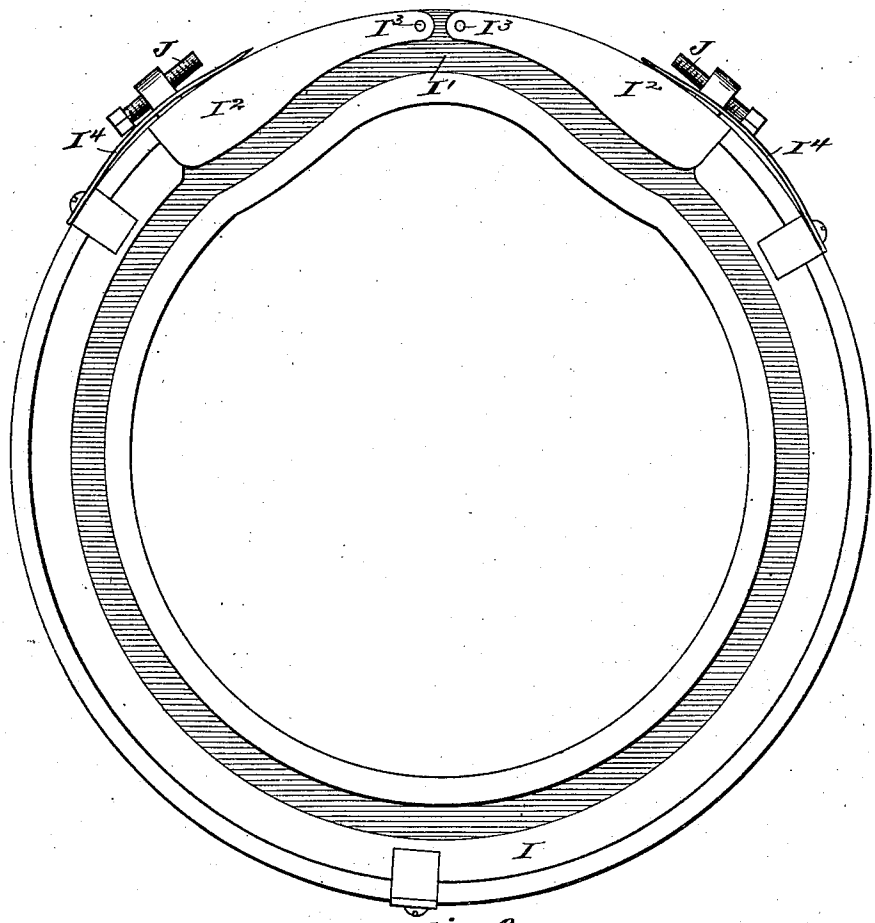
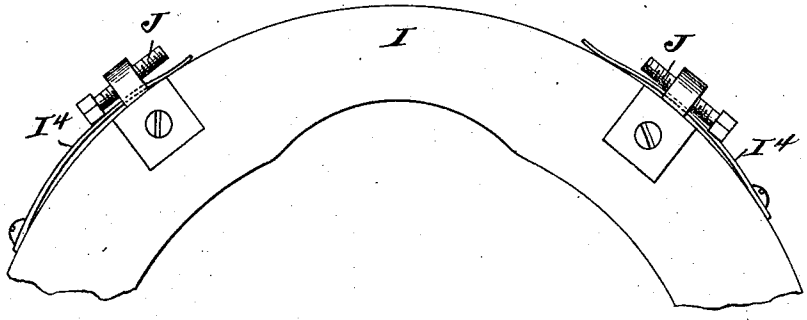


Fig. 9.



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UNITED STATES PATENT OFFICE.

HOWARD E. HARBAUGH, OF KENOSHA, WISCONSIN, ASSIGNOR TO THE CHICAGO-ROCKFORD HOSIERY COMPANY, OF SAME PLACE.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 564,176, dated July 14, 1896.

Application filed September 15, 1894. Serial No. 523,167. (No model.)

To all whom it may concern:

Be it known that I, HOWARD E. HARBAUGH, a citizen of the United States, residing in the city and county of Kenosha, in the State of Wisconsin, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a specification.

The object of my invention is the improvement of the knitting-machine shown and described in the specification and drawings of Letters Patent of the United States No. 482,173, granted to myself September 6, 1892; and it consists of certain new and useful features of construction and combinations of parts hereinafter fully described, and specifically pointed out in the claims.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is one side of a vertical section of a knitting-machine containing my improvements. Figs. 2 to 5, inclusive, are views of detailed parts shown in operative relation and connection in Fig. 1. Fig. 6 is an interior view of the operative parts of the cam-cylinder of the machine. Fig. 7 is a view of the head of the machine minus its interior parts. Fig. 8 is a bottom plan view of the sinker-slide cam-ring. Fig. 9 is a top plan view of a fragment of the same.

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

A is a needle-cylinder having a series of vertical radial grooves A′ therein corresponding with the number of needles in the machine and provided with a horizontal annular bearing A^2 and a circular horizontal sinker-slide bed and sinker cam-ring bearing A^3, which is supported by a part G, to be described hereinafter, and prevented from turning on said needle-cylinder by means of a set-screw A^4.

C are needle-elevating cams which are supported by and are freely rotatable on the bearing A^2, which is driven upon and thereby rigidly connected with the needle-cylinder A.

D is a needle, the shank D′ whereof terminates in a hook D^2.

E is a needle-slide having a matrix E′ therein—the counterpart of the hook D^2 on the shank of the needle D, which it receives—and provided with a lug E^2, a stop E^3, an inclined friction-stop E^4 adjacent to the stop E^3, and a needle-bearing E^5, the functions whereof will be fully explained hereinafter.

The construction of the hook D^2, the matrix E′, and the bearing E^5 so locks the hook into the matrix that the needle D has rigid connection with the needle-slide E when pressed toward the outer edge thereof—that is, toward the part G.

F is a combined presser and stop having a bearing F′ on the part G, resting on the needle-cylinder A, and to be described hereinafter, whereon it may be oscillated.

F^2 is a spring normally impelling the combined presser and stop F into engagement with the stop E^3 and adjacent friction-stop E^4.

G is an annular support for the combined presser and stop F and its spring F^2. The support G rests on the annular projection G′ on the needle-cylinder A, and has a series of vertical grooves G^2 therein corresponding in number and coinciding with the needle-slide grooves A′ in the needle-cylinder A.

G^3 is a ring for securing the springs F^2 in the slots G^2 in the annular support G. The springs F^2 are not attached to any of the parts composing the machine, but are simply held loosely in the slots G^2 by means of the ring G^3.

H is a cam-cylinder, having a stop-cam H′, rigidly connected therewith. The stop-cam H′, while compelling the needle-elevating cams C to rotate synchronously with the cam-cylinder H, allows them to travel up and down with the needle-cylinder A, as indicated by dotted lines in Fig. 6. The object of the construction just described is to cause the stop E^3 on the needle-slide E to travel upward into engagement with the combined presser and stop F at every revolution of the cam-ring H.

H^2 is a standard for supporting the yarn-carrier and other parts of the machine.

I is a sinker cam-ring, having a sinker-slide groove I′ therein, and provided with sinker-slide cams I^2, pivoted thereto at I^3.

I^4 are springs normally impelling the sinker-slides I^5, through the sinker-slide cams I^2, against the work in the machine.

J are adjustable projections, screws being

shown, one of which the standard H^2 always engages when it rotates to operate the machine.

K is an arm jointed by one end, by means of a pivot K', to the standard H^2 and terminating in a double-armed bracket K^2, having vertical slots K^3 in the free ends of the double-armed bracket K^2, one of said slots K^3 only being shown, Fig. 7.

L is a needle-latch-controlling ring-segment resting rotatably on the sinker cam-ring I, the ends whereof are provided with opposite inclines L'.

L^2 are screws inserted through the slots K^3 in the bracket K^2 and set into the ring-segment L, which construction permits the ring-segment L to be freely raised and lowered and still requires it to rotate synchronously with the standard H^2.

M is a yarn-carrier, from which project needle-latch openers M' integral or rigidly connected therewith.

M^2 are ways, formed by the opposite inclines L' on the ring-segment I and the counterpart opposite inclines M^3 on the lower edges of the needle-latch openers M'.

N is a slide for maintaining the needle D in action.

Fig. 1 represents the parts of the machine in proper position to knit around and around to form the legs and feet of stockings. As the machine starts in to knit the heel or toe of a stocking, the slides N descend out of engagement with the needle-slides E. The springs F^2, operating through the combined pressers and stops F, will throw the lower end of the needle-slides E over to O and about half of the needles D of the machine will go out of action, and while these needles remain out of action the inclined friction-stops E^4 will rest upon the corresponding inclined adjacent surfaces P on the combined pressers and stops F, and thereby maintain said needles, through their slides E, suspended until they again go into action. Obviously the stops E^3 will prevent the needles D from traveling any farther upward in the machine than indicated in Fig. 1.

The ring-segment L prevents the latches of the needles D from closing when the machine is knitting and the needles are in the position shown in Fig. 1, which is the highest point that they can reach in the machine. When the machine is running idly, the latches of the needles are often wholly or partially shut, in which event, as the needles reach the needle-latch openers M', they are opened thereby and pass down through the ways M^2.

The needle-cylinder A has vertical adjustment to cause the machine to knit its work more or less loosely, as may be desired, in which adjustment the needle-elevating cams C, resting on the bearing A^2, rigidly connected with the needle-cylinder A, the sinker cam-ring I, and the ring-segment L participate. The slot-and-screw connection between the ring-segment L and bracket K^2 permits the yarn-carrier M to always remain at the same elevation.

I claim—

1. In a knitting-machine, in combination, a needle having a shank terminating in a hook, and a needle-slide, furnished with a needle-bearing, on its inner edge, and provided with a matrix, the counterpart of the hook on the needle-shank, said needle-bearing and matrix affording provision for locking said hook into the needle-slide, substantially as and for the purpose specified.

2. In a knitting-machine, in combination, a needle cylinder or bed, a needle-slide provided with a lug, a stop, and an inclined adjacent friction-stop, and a combined oscillating presser and stop having a bearing on said needle cylinder or bed and engaging the stops on the needle-slide, and a spring normally impelling the combined oscillatory presser and stop into engagement with the stops on the needle-slide, substantially as and for the purpose specified.

3. In a knitting-machine, in combination, the cam-cylinder, the needle-slides, the combined pressers and stops and their actuating-springs, the needles, the needle-elevating cams vertically movable in the cam-cylinder, and the needle-cylinder provided with a horizontal bearing for supporting and elevating said cams and needles, substantially as and for the purpose specified.

4. In a knitting-machine, in combination, the needles, a needle-cylinder, a needle-latch-controlling ring-segment, the ends whereof are provided with opposite inclines, the combined yarn-carrier and needle-latch openers located between the inclined ends of the ring-segment and forming with them ways down which the latches of the needles travel after being opened by the latch-openers, substantially as and for the purpose specified.

5. In a knitting-machine, in combination, the needle-cylinder provided with a bearing for a sinker cam-ring, a sinker cam-ring, resting thereon, a needle-latch-controlling ring-segment resting on the sinker cam-ring, and a bracket connected with the ring-segment to drive the same, and also having provision to permit it to move vertically, independently of said bracket, substantially as and for the purpose specified.

HOWARD E. HARBAUGH.

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