

J. D. HEMPHILL.

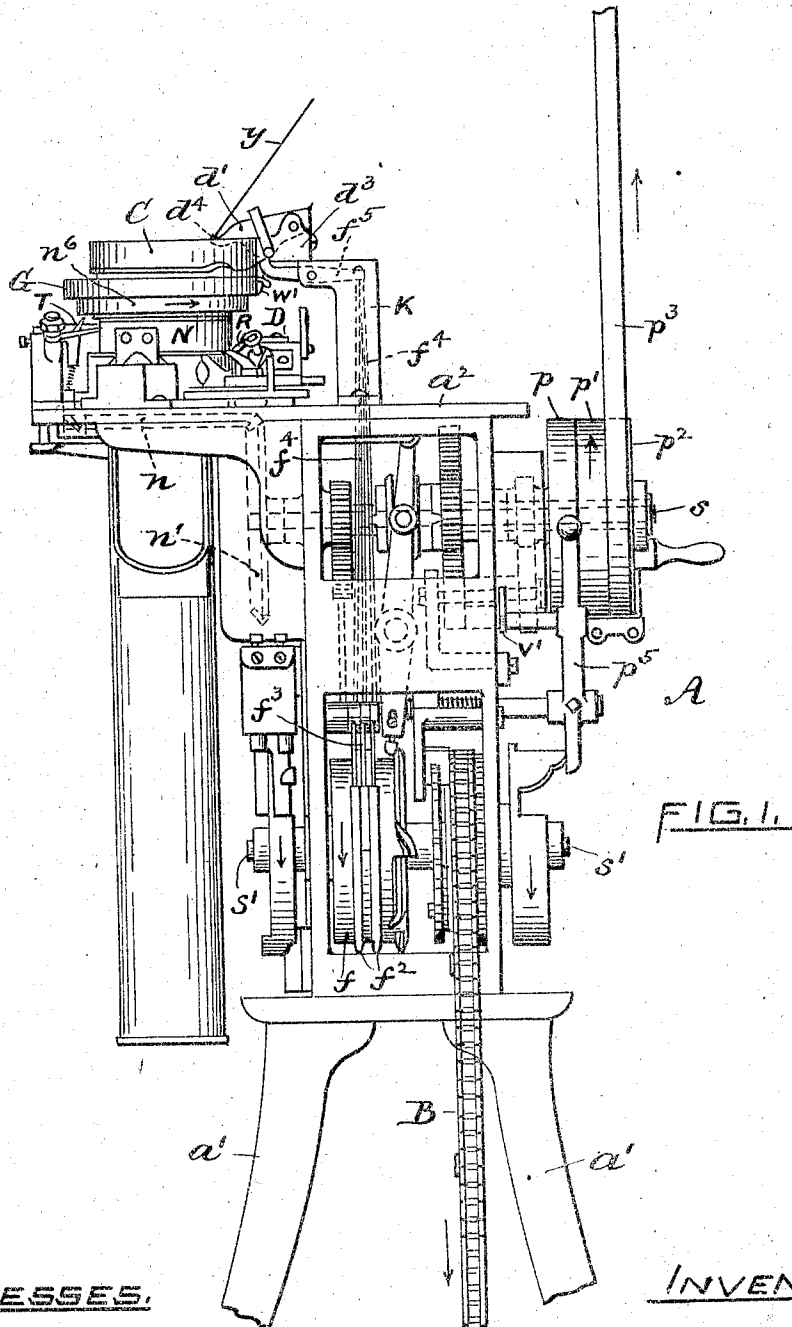
SINKER ACTUATING MEANS FOR REVOLUBLE CYLINDER KNITTING MACHINES.

APPLICATION FILED FEB. 1, 1907. RENEWED MAR. 16, 1909.

1,015,733.

Patented Jan. 23, 1912.

4 SHEETS—SHEET 1.



WITNESSES:

J. D. Hannigan
Calvin H. Brown

INVENTOR.

Joshua D. Hemphill.
By Geo. H. Remington.
Att'y

J. D. HEMPHILL.

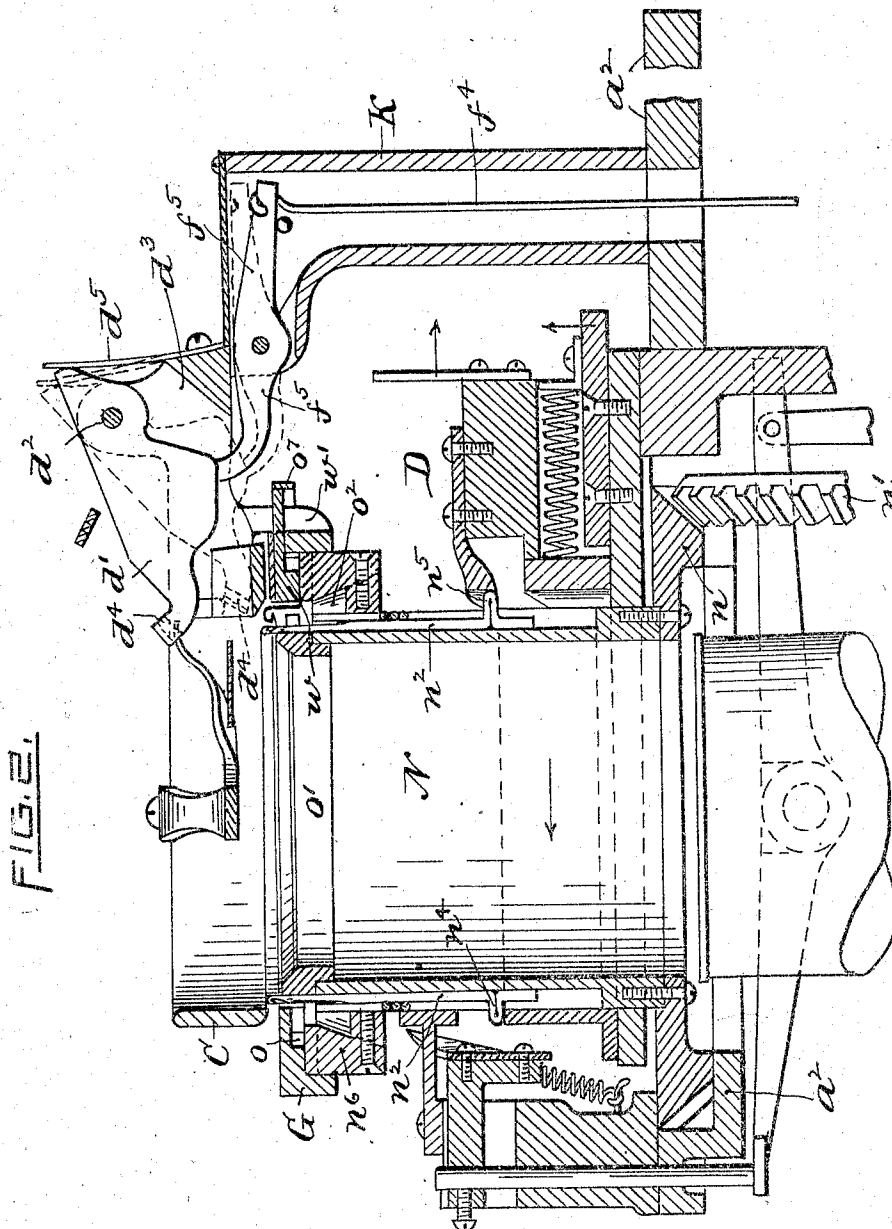
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WITNESSES,

C. J. Hannigan
Calvin H. Brown

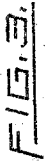
INVENTOR,

Joshua D. Hemphill.
By G. H. Remington.
Atty.

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Calvin H. Brown

Joshua D. Hemphill.
By Geo. A. Remington.
Att'y.

J. D. HEMPHILL.

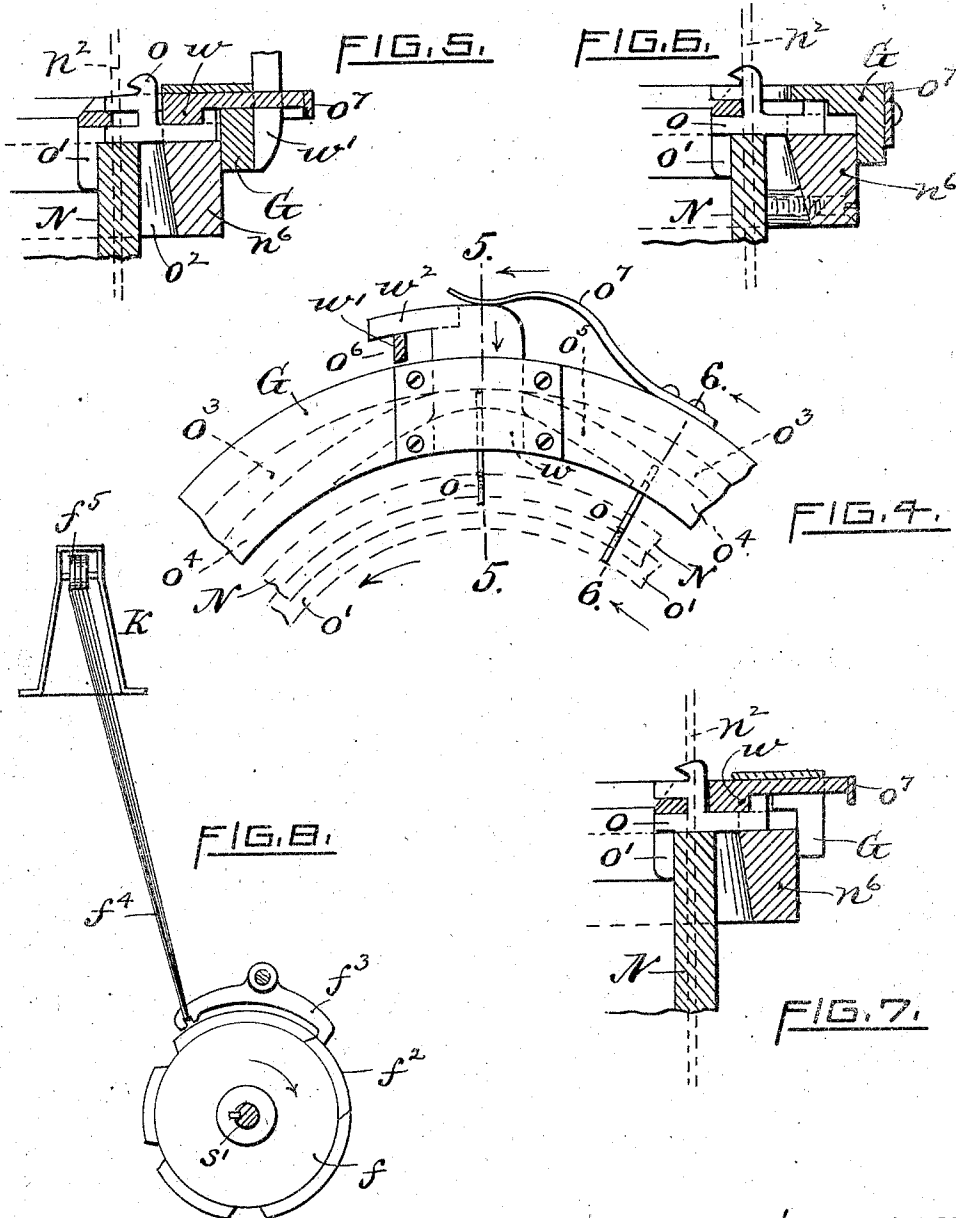
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4 SHEETS—SHEET 4.



WITNESSES:

C. J. Hannigan.
Calvin H. Brown

INVENTOR.

Joshua D. Hemphill.
By *G. J. Livingston.*
Atty.

UNITED STATES PATENT OFFICE.

JOSHUA D. HEMPHILL, OF CENTRAL FALLS, RHODE ISLAND.

SINKER-ACTUATING MEANS FOR REVOLUBLE-CYLINDER KNITTING-MACHINES.

1,015,733.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Original application filed March 26, 1906, Serial No. 308,106. Divided and this application filed February 1, 1907, Serial No. 355,236. Renewed March 16, 1909. Serial No. 483,866.

To all whom it may concern:

Be it known that I, JOSHUA D. HEMPHILL, a citizen of the United States of America, and a resident of Central Falls, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Sinker-Actuating Means, &c., for Revolvable-Cylinder Knitting-Machines, of which the following is a specification.

In a co-pending application for patent filed by me in the United States Patent Office, Serial Number 308,106, I have shown and described an organized circular knitting-machine for automatically producing fashioned tubular articles.

My present invention relates to improvements in knitting-machines of the class or type just referred to and more especially to improvements in the sinkers and correlated parts, and it consists essentially in the novel construction, arrangement and means for actuating said members, all as more fully hereinafter described and claimed.

The object I have in view is to provide knitting-machines of the circular type with means for automatically moving the sinkers into and out of action with relation to the needles.

A further object of the invention is to provide knitting-machines with means for successively advancing and retracting the sinkers as in normal knitting, and means operatively connected with the sinkers for simultaneously rendering them inoperative.

A further object of the invention is to provide knitting-machines with means for automatically rendering the sinkers temporarily inoperative in advance of the "topping" operation.

By means of this invention the act of lifting the latch-ring, so-called, after stopping the machine as at the completion of a stocking, operates through intervening devices to automatically move the corresponding sinkers out of the normal working position, all the sinkers then lying in a substantially true circular path and being inoperative. Now, upon applying the transfer-ring to the needle-cylinder preparatory to the "topping" operation the points of said ring readily position themselves at the rear of the respective needles. While the sinkers, &c., are in this position the cylinder with the transfer-ring thereon may be read-

ily rotated at will in either direction by the attendant without liability of injury to the transfer-points by the sinkers; this feature I consider of especial practical value.

In the four accompanying sheets of drawings, Figure 1 represents, in front elevation, portions of an automatic circular knitting-machine having a revolvable needle-cylinder and embodying my present invention, the yarn-holding bobbins and supports therefor being omitted. Fig. 2 represents a vertical sectional view, in enlarged scale, taken through the center of the cylinder and adjacent parts. Fig. 3 represents a corresponding plan view. Fig. 4 is a partial plan view of the cap-ring, showing the sinker-cam, &c., when in the normal operative position. Fig. 5 is a transverse section taken through the upper part of the cylinder, &c., on the central line 5 5 of Fig. 4, showing the sinkers in the normal operative position. Fig. 6 is a similar view taken on line 6 6 of Fig. 4, showing the normally inoperative position of the sinkers. Fig. 7 is a sectional view similar to Fig. 5, but showing the wedge-pin withdrawn and the sinker-cam with its sinkers advanced to the inoperative position, and Fig. 8 is an end view of the yarn-changing cam, &c., in reduced scale.

I would state in advance of a more detailed description of the novel features of the invention that in the automatic stocking knitting-machine A, represented in Fig. 1, the knitting or needle-carrying cylinder N is mechanically revolvable. The pattern-chain B, as well as the wheels, &c., mounted on the main or cam-shaft s^1 , are adapted to be intermittently rotated at predetermined intervals and in one direction only by means of controlling mechanism operatively connected with devices through the medium of which the cylinder is rotated at a relatively increased rate of speed while plain or continuous circular knitting is being produced and revolved at a greatly reduced speed while being actuated in a rotary-reciprocating manner during the formation and production of the heel and toe portions of the stocking.

The power used for running the machine is transmitted through or by a belt p^2 traveling in one direction only and at a substantially uniform speed; the arrangement being such that when the belt is shifted onto

the pulley p the speed of the cylinder is relatively increased and when in engagement with the pulley p^1 the speed is materially reduced, the machine automatically stopping and locking itself in position when the belt is shifted back onto the idle pulley p^2 . It may be added that the driving-shaft s has a miter-gear n^1 secured to its inner end intergearing with a fellow gear n secured to the lower end of the cylinder N thereby correspondingly rotating the latter.

The frame or housing a of the machine and supported by legs a^1 is designed to inclose practically all or at least the major portion of the working parts except the needle-cylinder and other members supported by the top or table a^2 of the frame.

The needle-cylinder N , see Fig. 2, is tubular, its periphery being provided with uniformly spaced longitudinal grooves for guiding the movable latch-needles n^2 mounted therein. Usually about one-half of the total number of needles have what are termed "long-butts" n^3 , the remaining needles having "short-butts" n^4 .

The needle-cylinder, as drawn, is provided at the top with a fixed inner ring member o^1 having radial grooves formed in its upper and lower portions and alternating with said needle-supporting grooves formed in the cylinder proper. The outer edge of the ring projects above but does not, however, extend laterally beyond the bottom of the said cylinder-grooves. A laterally extending flange n^5 , termed the sinker-ring, encircles the upper outer part of and extends a short distance above the cylinder barrel, the same having radial grooves registering with those of said ring o^1 and in which are seated and supported the thin horizontal endwise movable sinkers o , the function of the latter being in general substantially the same as that of sinkers as usually employed. The inner wall of the sinker-ring is cut away so as to form a continuously open enlarged annular clearance space o^2 between it and the adjacent outer surfaces of the wall of the cylinder for the free escape of lint, &c. The ring is rigidly secured to the cylinder by means of screws, all as clearly shown in Figs. 2 and 6. The sinker-carrying ring portion of the revoluble needle-cylinder is surmounted by a recessed stationary cap-ring G ; the latter being supported by said member n^5 and held in the horizontal position against rotation by suitable means connected therewith and with the standard c^1 in which latter is pivoted the latch-ring C . See Fig. 3. The under side of the cap-ring is provided with a fixed cam o^3 , Fig. 4, and concentric groove o^4 in operative engagement with the outer end portion of the said supported sinkers, whereby the latter are reciprocated in their seats, while at the same time being carried bodily around and in-

actively in said concentric groove o^4 by the revolving cylinder. The ring G , see Figs. 2 and 5, is further provided with a suitably mounted normally stationary horizontal cam w , also located in the path of the sinkers and at the usual knitting or stitch-forming portion. The construction and employment of the last-named cam is novel: It extends through the side of the cap-ring and terminates in a bent arm w^2 arranged to form a space or opening o^6 between it and the adjacent peripheral surface of the ring, the arrangement being such that a downwardly extending dog or finger w^1 fixed to the under side of the latch-ring member and positioned in said opening maintains the cam in the normal retracted or operative position to properly actuate the sinkers in a successive manner. Upon stopping the machine, as at the completion of the work, the act of lifting the latch-ring withdraws said finger w^1 from the cam, a push-spring o^7 at the same time automatically advancing the latter inwardly to its limit thus temporarily and simultaneously moving the corresponding sinkers thereon out of the normal working position, see Fig. 7, all the sinkers then registering or lying in the circular path and being inoperative. By means of this device the points of the transfer-ring readily position themselves back of the respective needles when the operator applies it to the cylinder preparatory to the "topping" operation. After the topping process has been effected the act of returning the latch-ring to the normal position reintroduces the said finger w^1 into the open space o^6 and automatically forces the cam w and the sinkers thereon back to the operative position immediately preceding the resumption of knitting. See Figs. 4 and 5.

The following describes means for feeding the yarn y to the needles after it is conducted from any suitable supply or source to and threaded into the eye d^1 of the guide d^2 : To the shaft s^1 is secured a drum f having, as drawn, (Figs. 1 and 8) a plurality of interrupted peripheral cam-ribs f^2 , each having the front end of a swinging lever f^3 in sliding frictional contact therewith. The rear end of the lever is attached to an upwardly extending connection f^4 , of wire, which in turn is hooked into the rear end of a swinging horizontally arranged fellow lever or finger f^5 mounted to swing in the upper end of and inclosed in the hollow standard K secured to the top plate or table a^2 . See also Figs. 2 and 3. The other portion of said yarn-feeding means is attached to and movable with the swinging latch-ring C , the latter having a horizontal double-arm or extension d^3 in alinement with the center of the needle-cylinder. In the free end of said arm are pivoted, at d^2 , the three small swinging yarn-guides d^4 , normally

resting upon and supported by the free ends of the respective levers f^5 . A spring d^5 maintains each pair of members, d^1 and f^5 , in normal contact. The outer end of said extension d^3 is adapted to rest upon said support K thereby at the same time positioning the ring C. The inner or free end of each of said guides d^1 is drilled at d^4 to receive the knitting-yarn and is located contiguous to the upper end of the needles, the arrangement being such that when the ring C is dropped to its normal level position, the cylinder then being in action or revolving, the members f^5 and d^1 will then be in the normal depressed position, indicated by dotted lines in Fig. 2, whereby the feed yarn (not shown) is properly introduced into the then open hooks of the needles preparatory to being inclosed therein and knitted into the fabric as they (the needles) are successively depressed by members of the cam-block D, in a well-known manner. It may be added that said levers, &c., are depressed only when the free end of the corresponding lever f^3 has dropped from the cam f^2 onto the plain or barrel portion of the drum f . When the members f^3 and f^2 are in engagement the corresponding yarn-guide d^1 will then be elevated, thus throwing its yarn out of position with respect to the circular path of the traveling needles. The relative position of the said members is represented in Fig. 8, the corresponding position of the yarn-guide being shown by full lines in Fig. 2. Or in other words, the yarn will then be projected inwardly past the back of the needles and out of action.

It is deemed unnecessary to this specification to describe in detail speed-changing and needle-actuating devices, &c., as means for such purposes are well-known. It may be stated, however, that suitably constructed and actuated narrowing-picks R and widening-picks T are indicated in Figs. 1 and 3, the functions of which also are well-known.

The following is an abridged description of the general operation of a stocking knitting-machine embodying my improvements, the machine being adapted say for the production of half hose: After lifting the latch-ring C (the machine then being temporarily stopped) together with the yarn-guides and pin w^1 connected therewith the spring o^1 instantly acts to move the cam w and its sinkers toward the center thus placing the sinkers in the inoperative position; at substantially the same time the attendant presses downwardly the few needles then remaining elevated at the knitting point to the level of the other needles, followed by placing the transfer-ring, with the stitches or loops of the previously knitted "top" mounted as usual on its grooved points or "quills," in the proper position on the upper end o^1 of the needle-cylinder, the said

points then registering with the respective needles. Immediately thereafter the attendant revolves the cylinder &c., one complete turn by hand thereby through the medium of suitable cams, &c., moving all the needles upwardly a short distance into the transfer-ring's points, followed by simultaneously pulling the "top" downwardly and removing the ring. The result of this action is to slide all the stitches down over the needles and to open any closed latches, all the latter then being open and in contact with the respective loops of the "top." The operator next swings the latch-ring downwardly to its normal or level position thereby carrying with it the yarn-guides d^1 ; the latter, assuming the several members f , f^2 , f^3 , f^4 and f^5 to be properly arranged and adjusted, dropping to the dotted line position shown in Fig. 2 to successively introduce the yarn into the then open hooks of the needles upon starting the machine. The latch-ring in its movement automatically introduces the wedge-pin w^1 into the space o^6 thus forcing the cam w outwardly from the concentric or inoperative position to the normal working position, the cam at the same time carrying with it the several sinkers thereon and forming with the cams o^5 the cam-shaped path o^5 , see Figs. 2, 4 and 5. It is at or contiguous to this part of the machine that the stitches are formed. Now upon lifting the latch v^1 , Fig. 1, the spring-pressed shipper-arm p^5 moves inwardly thereby automatically shifting the driving-belt from the idle pulley p^2 past pulley p^1 and onto the quick-speed pulley p thereby starting the machine. The coöperation of the now revolving cylinder N, the sinkers o , the needles n^2 vertically actuated by suitable cams mounted in the cam-block D, &c., and the said positioned sinker-actuating cam w cause the needles to successively receive in the then open hooks thereof the suitably tensioned yarn passing through the eye d^4 of the said depressed guide, thus converting the yarn into new loops or stitches and knitting them into the loops of the "top" and immediately thereafter casting them off from the top of the needles in the usual manner (the latches then being closed) into the "top" or web revolving with the cylinder. A detailed description of the manner of forming the heel and toe pockets of the stocking may be found in my said companion application, No. 308,106, patented September 7, 1909, No. 933,443. The mechanism is so arranged, positioned and timed that the yarn-guide d^1 is automatically elevated (by means of said members f , f^2 , f^3 , f^4 and f^5) thereby placing the knitting-yarn, or yarns, out of knitting action with respect to the hooks of the needles. The continued one or two revolutions of the cylinder, &c., operates to successively elevate

all the needles through the last formed loops to the upper normal level thereby freeing said loops from the hooks and opening the latches, the bottom or free ends of the latter then being above the loops, the final action successively depressing the needles through the loops, closing the latches and casting the loops off over the top end of the then closed hooks, thereby automatically stripping the thus completed stocking from the needles, the work still being connected with the knitting yarn. At substantially the same instant the shipper p^5 is mechanically actuated and shifts the continuously running driving-belt back onto the idle pulley p^2 , thus stopping the machine. Upon elevating the latch-ring C, thereby withdrawing the pin w^1 , the action of spring o^7 forces the cam w , together with the sinkers supported thereon, inwardly to its limit (see corresponding sectional view, Fig. 7) thereby automatically moving the said sinkers to the inoperative position. The cam is returned to its normal operative position, shown in Figs. 4 and 5, by means of said pin or member w^1 of the latch-ring upon dropping the latter, together with the yarn-guides d^1 mounted thereon, to the normal horizontal position represented in Figs. 1, 2 and 3.

I claim as my invention:—

1. In a knitting-machine provided with a revoluble knitting-cylinder having needles and sinkers mounted therein, a stationary cap-ring for guiding the sinkers in a concentric path, a normally stationary cam located in said path for successively actuating the sinkers in an endwise direction while they are revolving in unison with the cylinder as in knitting, and means for bodily moving the cam and the sinkers thereon endwise or transversely of the cap-ring.

2. In a knitting-machine of the character described, the combination with a revoluble cylinder and suitably mounted needles and sinkers revoluble in unison therewith, of a stationary sinker-cap-ring for guiding the sinkers in a true path, a sinker-controlling cam mounted in the ring and located in said path whereby the sinkers in passing under and in engagement with it are automatically retracted and advanced with respect to the needles, and means for advancing the cam from its normally stationary working position to the inactive position, whereby all the sinkers in the ring are then automatically positioned and free to revolve in either direction with the cylinder in advance of the "topping" operation.

3. A knitting-machine of the character described provided with a non-revoluble cap-ring, a sinker-actuating cam bodily movable transversely of said ring, means for automatically advancing the cam inwardly from its operative position to render in-

operative the sinkers thereon, and means for repositioning the cam and the sinkers on it preliminary to knitting.

4. In a knitting-machine of the character described, the combination with a suitably grooved revoluble cylinder, and independently movable needles and sinkers mounted in said grooves, of a non-revoluble recessed cap-ring having the upper end of the cylinder mounted in said recessed portion, a spring-pressed bodily movable cam member w mounted in and supported by said ring and located with respect to the sinker-path, and means for automatically retracting the cam and maintaining it in the corresponding operative position.

5. In a knitting-machine of the character described, the combination with a revolubly mounted cylinder having needles and sinkers movably mounted therein, of a normally stationary sinker-cam arranged to be advanced toward the center of the cylinder, thereby moving the corresponding sinkers prior to the "topping" operation and while the machine is temporarily stopped, a swinging latch-ring, a device connected with said ring for automatically retracting the cam to its limit or sinker-operating position while said ring is being dropped to its normal position over the cylinder in advance of restarting the machine.

6. A knitting-machine provided with a stationary cap-ring G, a spring-pressed sinker-cam w slidably mounted therein, and means operatively connected with a movable part of the machine to retract the cam from the inoperative to the operative position.

7. In a knitting-machine of the character described, the combination with a revoluble cylinder, movable needles and sinkers mounted therein, a non-revoluble or stationary sinker-cap-ring located at the top of the cylinder, a spring-pressed sinker-cam mounted in said cap-ring arranged to impart endwise movement to the sinkers, a swinging normally stationary latch-ring positioned close to the cap-ring adapted to encircle the needles, and a dog or finger movable with the latch-ring arranged to automatically return the sinker-cam to its normal working position concurrently with the act of dropping the latch-ring into the operative position.

8. In a knitting-machine provided with a revoluble cylinder having needles and sinkers movably mounted therein, the combination with a stationary cap-ring and a sinker-actuating cam w bodily movable in said ring, of a swinging latch-ring, means carried by the latter to automatically retract said cam from the inoperative to the normal working position, and yarn-guides carried by the latch-ring for automatically positioning the yarns with respect to the

needles when the latch-ring is dropped to its normal position.

9. In a knitting-machine of the character described provided with a needle-cylinder 5 having a sinker-ring secured thereto and needles and sinkers movably mounted in said cylinder and ring members, a cap-ring located contiguous to and concentric with the sinker-ring; a normally stationary 10 sinker-cam *w* arranged transversely of and slidable in the cap-ring for imparting end-wise movement to the traveling sinkers, and means to automatically advance the cam from the operative to the inoperative 15 position.

10. In an automatic stocking-knitting-ma-

chine provided with a knitting cylinder and independently movable needles and sinkers a suitably mounted bodily movable sinker-cam, for normally changing the position of 20 the sinkers thereon with respect to the needles, means for moving the cam from its normal position to render its sinkers temporarily inoperative during the topping operation, and means for returning the cam and 25 its sinkers to the normal working position.

Signed at Providence, R. I., this 30th day of January, 1907.

JOSHUA D. HEMPHILL.

Witnesses:

GEO. H. REMINGTON,
CALVIN H. BROWN.