

J. D. HEMPHILL.

YARN FEEDING AND YARN CHANGING DEVICE FOR KNITTING MACHINES.

APPLICATION FILED APR. 29, 1907. RENEWED MAR. 16, 1909.

934,969.

Patented Sept. 21, 1909.

5 SHEETS—SHEET 1.

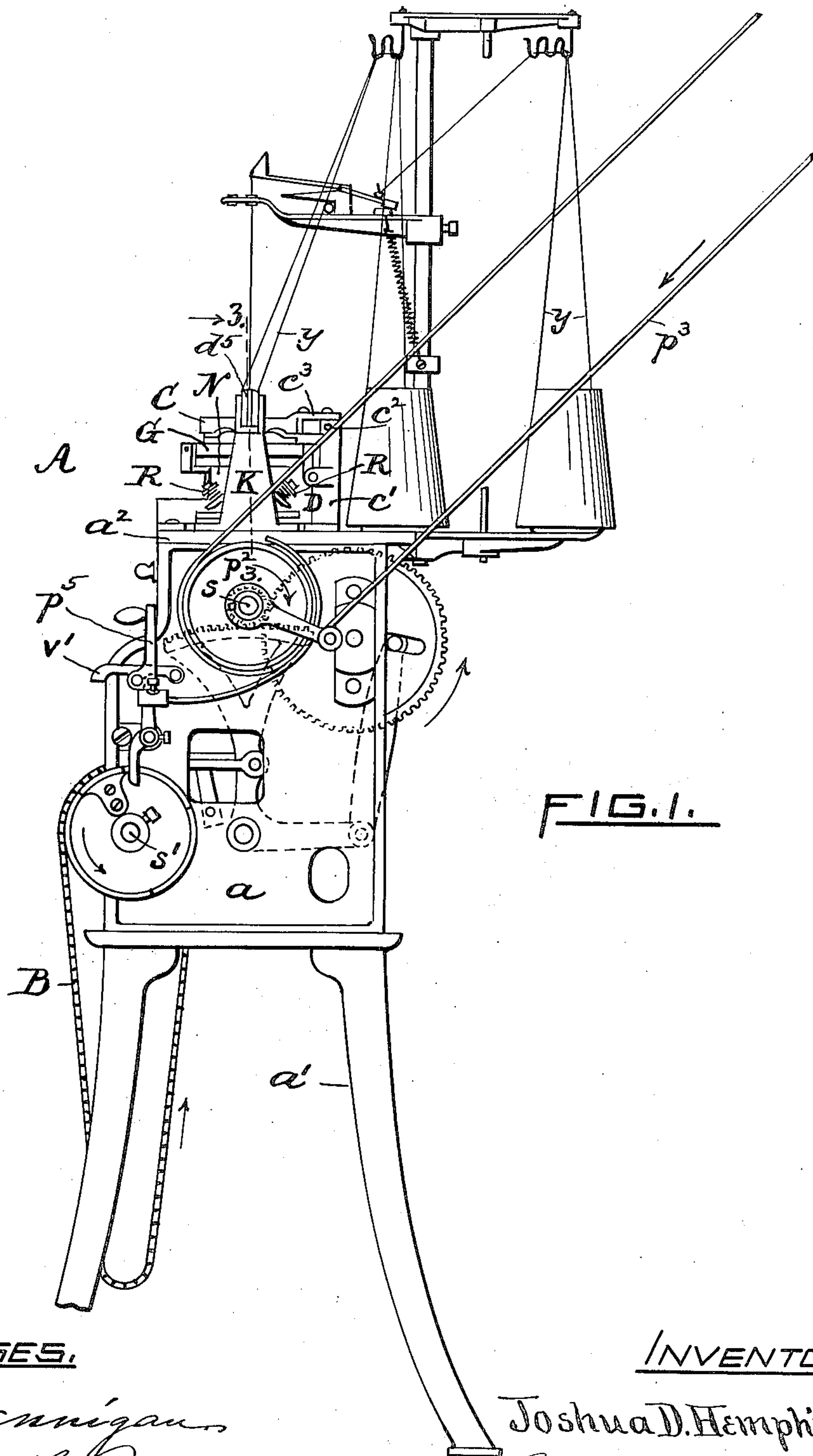


FIG. 1.

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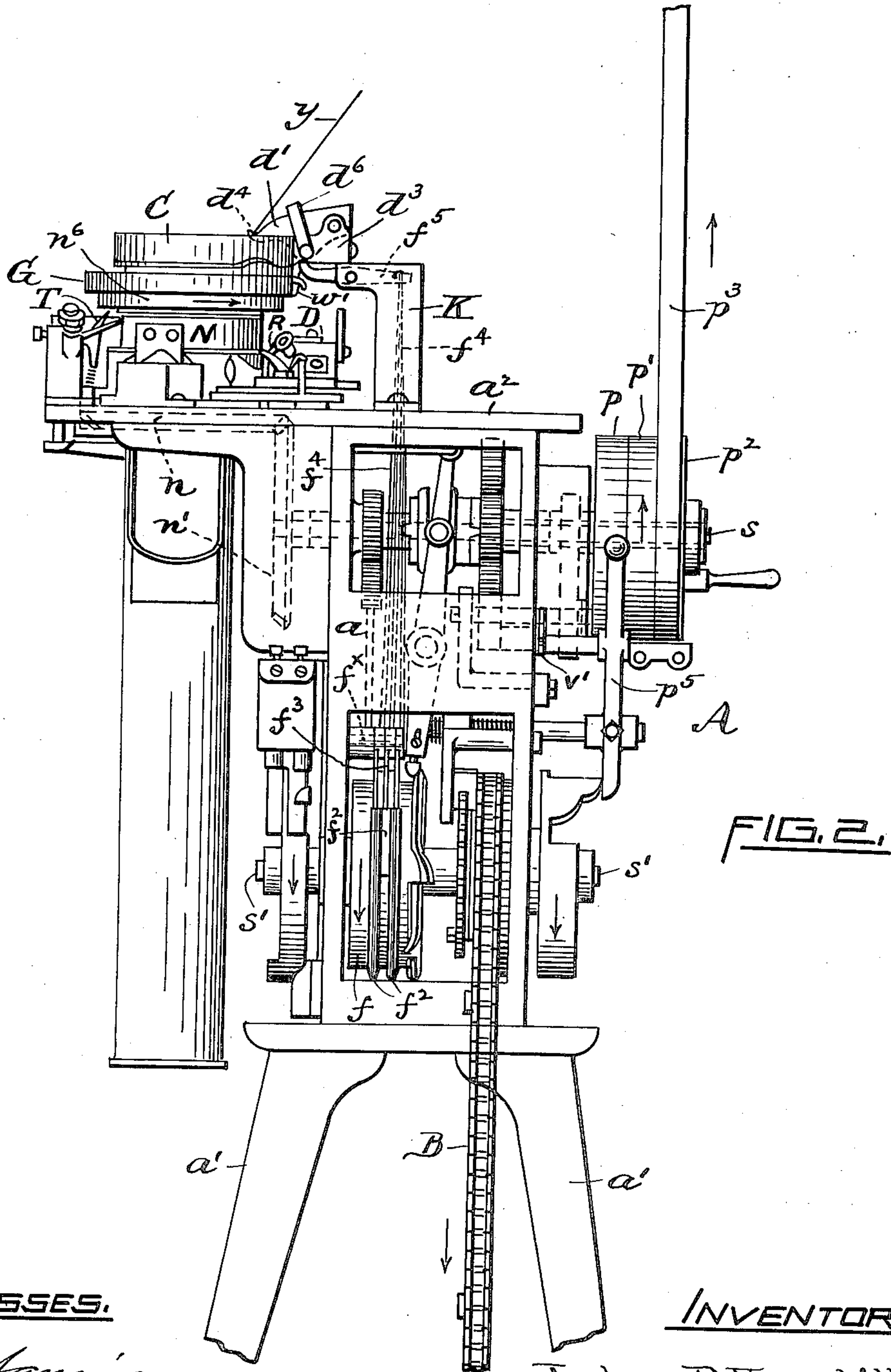


FIG. 2.

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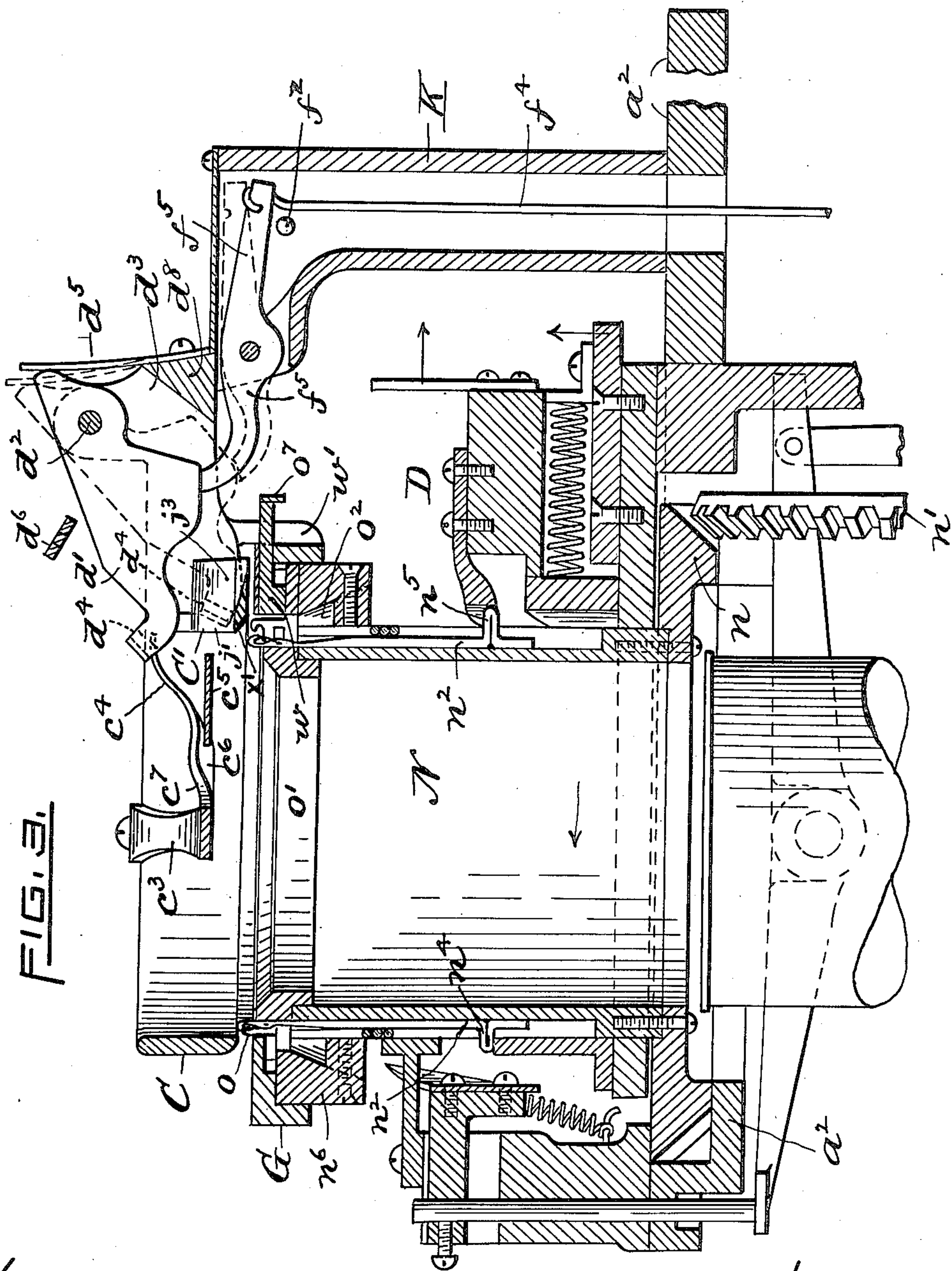
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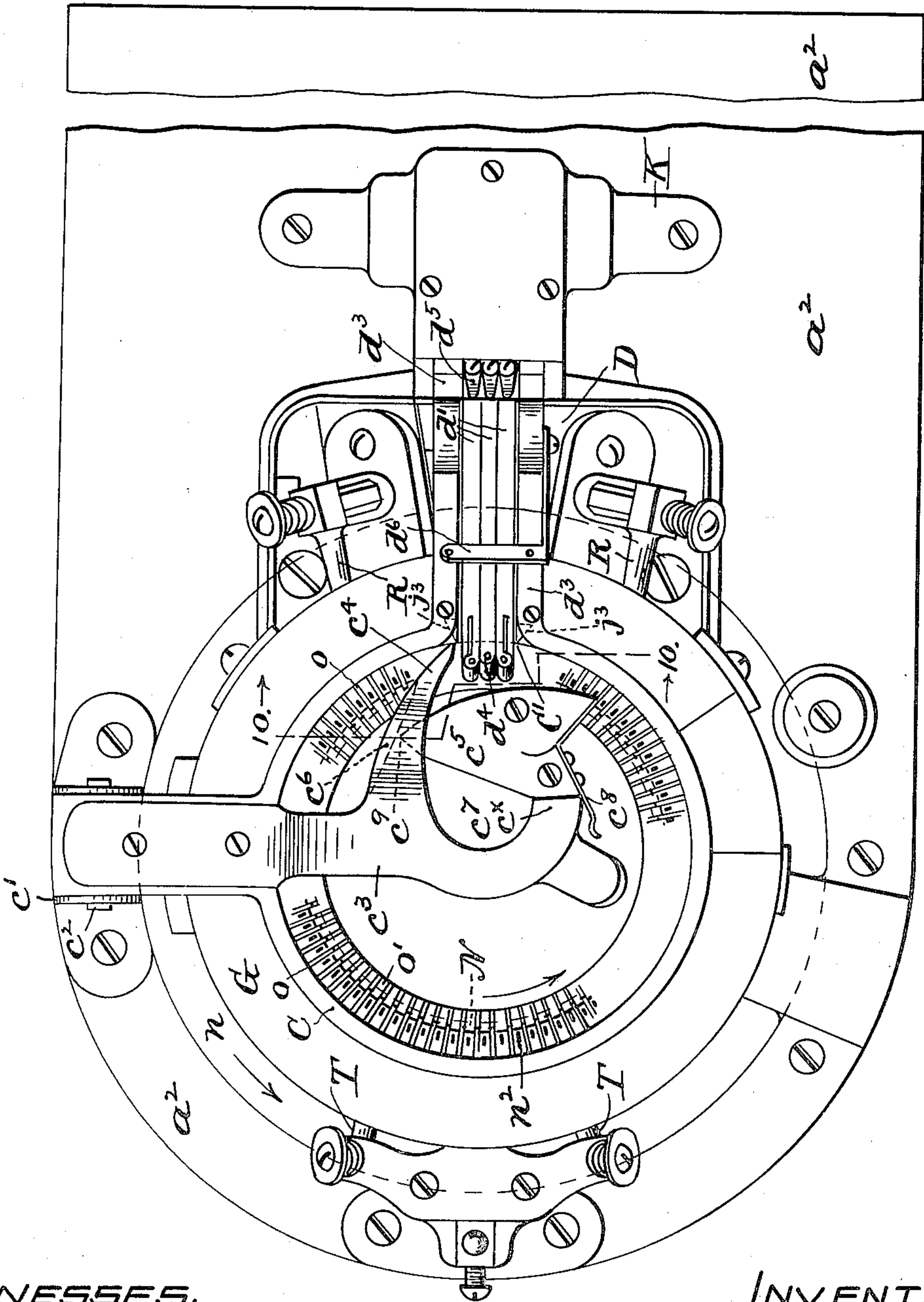
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FIG. 4.



WITNESSES.

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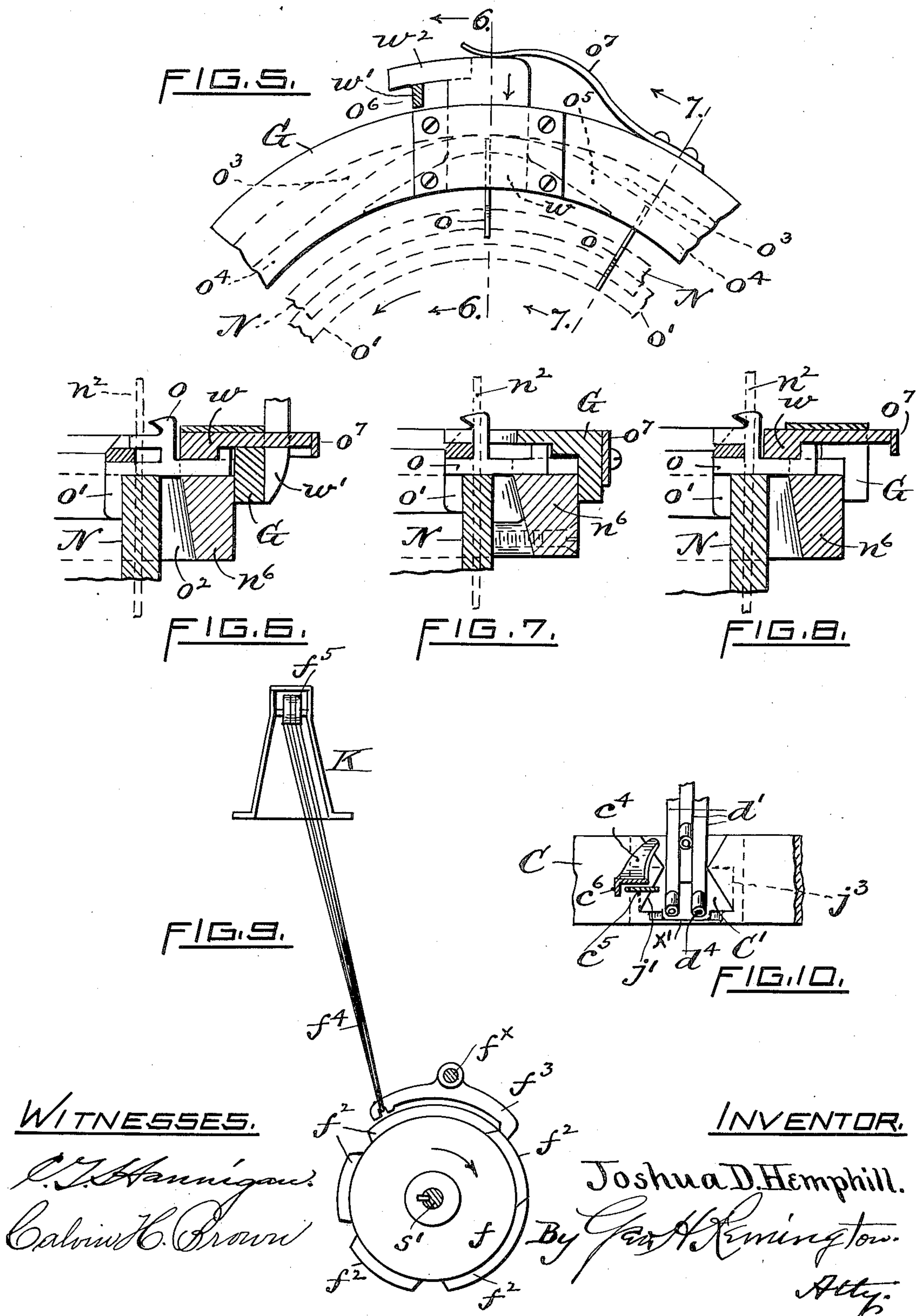


# YARN FEEDING AND YARN CHANGING DEVICE FOR KNITTING MACHINES.

APPLICATION FILED APR. 29, 1907. RENEWED MAR. 16, 1909.

Patented Sept. 21, 1909.

5 SHEETS—SHEET 5.





# UNITED STATES PATENT OFFICE.

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

YARN-FEEDING AND YARN-CHANGING DEVICE FOR KNITTING-MACHINES.

934,969.

Specification of Letters Patent. Patented Sept. 21, 1909.

Original application filed March 26, 1906, Serial No. 308,106. Divided and this application filed April 29, 1907, Serial No. 370,762. Renewed March 16, 1909. Serial No. 483,867.

*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 Yarn-Feeding and Yarn-Changing Devices for Knitting-Machines, of which the following is a specification.

In the pending parent application, Serial No. 308,106, filed by me in the United States Patent Office, is shown and described an improved circular knitting-machine for producing seamless stockings, and in another application, Serial No. 355,236, I have specifically set forth certain novel devices for controlling the sinkers so as to render them operative and inoperative.

My present invention also has relation to knitting-machines, and more particularly to the novel automatic yarn-feeding and yarn-changing devices well adapted to be employed in the machine described in my said parent application.

By means of the present invention the knitting-yarns are automatically selected and positioned with respect to the hooks of the needles so as to be introduced and knitted into the stocking at predetermined points in its production; the device also embodying improved means for rendering the yarns individually inactive, all as more fully herein-after set forth and claimed.

In order to more clearly describe said invention and the manner of its construction and operation I have reproduced herewith portions of the drawings of the parent case. That is to say:—

Figure 1, in the accompanying five sheets of drawings, represents in general an end elevation, viewed from the right, of my improved knitting-machine provided with the yarn-controlling means; the relative position of the parts corresponding substantially to that at the completion of a stocking, wherein the machine is stopped, the work being omitted. Fig. 2 is a corresponding front elevation, in enlarged scale, some of the minor parts being unrepresented. Fig. 3 is a vertical central sectional view, still further enlarged, taken on line 3, 3, of Fig.

1. Fig. 4 is a plan view, corresponding with Fig. 3. Fig. 5 represents a partial plan view of the stationary cap-ring, showing the relation of the sinker-cam, &c., when the latch-ring and the yarn-guides carried by it (not shown) are in the normal operative position. Figs. 6 and 7 are transverse sectional views, taken respectively on line 6, 6, and 7, 7, of Fig. 5. Fig. 8 is a sectional view showing the position of the cam and its sinkers when the cam is advanced to the in-operative or concentric position. Fig. 9 is an end view, in reduced scale, showing portions of the yarn-changing device, and Fig. 10 is a sectional view taken on the irregular line 10, 10, of Fig. 4, showing the yarn-guides, latch-opening device, &c.

The following is a description of my improved yarn-feeding and yarn-changing devices and the manner of operation: The manually controlled swinging latch-ring member C is substantially annular and is provided with a pair of integral parallel lateral arms  $d^3$  united at the outer ends by a short tie  $d^8$  (Fig. 3), the latter when the ring is in the normal or dropped position resting on the upper end of and being supported by the hollow standard K, later described; the said arms extend centrally of the machine and parallel with the driving-shaft. The yarn-guides proper,  $d^1$ , (three being represented in the drawings) are pivoted at  $d^2$  in the upper outer portion of said arms  $d^3$ . The inner or free end of each member  $d^1$  has an eye  $d^4$  through which the knitting yarn is threaded, its opposite or heel end being in continuous yielding contact with a spring,  $d^5$ , secured to and bodily movable with the latch-ring. Upon swinging the latter upwardly from the needle-cylinder the spring-pressed yarn-guides drop until arrested by the throat-tie  $e^1$  or other suitable stop. See also working position of the guide shown by dotted lines in Fig. 3.

The latch-ring is pivoted at  $c^2$  to a standard  $c^1$  (Figs. 1 and 4) located at the rear of the needle-cylinder the said axes  $c^2$  and  $d^2$  (the latter being that of the yarn-guides) are disposed in horizontal planes and at right angles to each other. To the latch-ring is also secured a substantially flat light



arm  $c^3$ , the same extending over the center of the cylinder and terminating in the guard members  $c^4$  and  $c^x$ , and forming between them the enlarged central opening  $c^7$ . The said member  $c^4$  is bent upwardly, its free end being normally positioned contiguous to the upper edge of the mouth  $C^1$  and also adjacent the yarn-carrying end of the guides  $d^1$  when the latter are elevated or inactive.

See also Figs. 3 and 10. A slightly curved shallow thin lip  $c^6$  is secured to and extends below the member  $c^4$ . To the other guard member  $c^x$  is secured a substantially horizontal spring-plate  $c^5$  having its free end extending under the member  $c^4$  and nearly to said lip so as to form a smooth narrow yarn passage  $c^9$  between them, the entrance to which is wide and flaring. It may be added that said passage is in continuous open communication with the central opening  $c^7$ . A spring-clip  $c^8$  is secured to the arm  $c^x$  for temporarily holding the ends of the yarns severed from the last knitted stocking and before they are reintroduced to the needles. By means of this device, whenever the threaded yarn-guides are elevated or thrown out of normal action, the corresponding yarns are automatically guided by the arm or guard  $c^4$  and the passage  $c^9$  into the large central space  $c^7$  where they "float", as it is termed, and revolve with the web, the lipped passage meanwhile preventing them from escaping or being drawn therefrom. The formation of the said mouth  $C^1$  of the opening or passage in which the yarn-guides  $d^1$  of the latch-ring are located (see also Fig. 10) is adapted to insure the dropping of the latches of the revolving needles before they pass the stitch-forming point. That is the lateral sides  $j^1$  of the lower portion of said opening have a beveled or dovetailed form, and also being rearwardly inclined, as indicated by dotted lines  $j^3$ . As thus devised the face of the needles, while the cylinder is revolving in either direction, pass comparatively close to the face or edge of the opening  $C^1$  so that any partly open latches upon striking the beveled edge  $j^1$  will be positively deflected downwardly to the normally wide open position before the hooks of the needles will have reached the yarn-receiving point.

In the lower portion of the casing  $a$  is mounted a shaft  $s^1$ , termed the cam-shaft; the same carrying cams, wheels, the pattern-chain  $B$ , &c., all being constructed, positioned and timed in any suitable or well-known manner, whereby power transmitted by the driving-belt  $p^3$  through intervening mechanisms to said cams, chain, &c., operates to automatically rotate the shaft in an intermittent or step-by-step manner, and in one direction only.

To the cam-shaft  $s^1$  (see Figs. 2 and 9)

is secured a cylinder  $f$  having a plurality of raised concentric cam-ribs  $f^2$ .

The said swinging yarn-guides  $d^1$  are actuated by pivoted horizontal fingers  $f^5$ , in turn connected with downwardly extending wire links  $f^4$ , each jointed to the rear end of the respective tilting-lever  $f^3$  pivoted at  $f^x$ , and having its front end in sliding contact with the corresponding rib or with the cylinder's surface. The yarn-guides when in normal action are adapted to rest upon the throat-tie  $x^1$  of the latch-ring.

The function of the last-described mechanism is such that when the levers  $f^3$  bear upon the cam-ribs the yarn-guides are correspondingly swung upwardly, thus throwing the yarns out of knitting action, the yarns then floating in the central opening  $c^7$ .

The latch-ring may be provided with an auxiliary yarn-guide  $d^6$  and with a depending member or dog  $w^1$ , the latter being located so as to engage with and retract the spring-pressed sinker-cam  $w$  to the normal knitting position when the latch-ring is dropped.

The normal knitting action of the machine follows the shifting of the driving belt onto the pulley  $p$ , thereby rotating the knitting-cylinder and its needles  $n^2$  and sinkers  $o$ , the needles being vertically actuated by suitable cams mounted in cam-block  $D$ , the sinkers at the same time being successively retracted by said cam  $w$  so as to permit the yarn to freely enter the then open hooks of the needles, the yarn being next converted into loops or stitches and knitted into courses and cast from the upper end of the then latch-closed needles into the fabric as usual. Upon completion of the knitting the yarns are automatically elevated out of action, the work drops from the needles and the machine stops. The operator now raises the latch-ring and at the same time severs the yarns from the work and secures the ends under the clip  $c^8$ .

I claim as my invention:—

1. In an automatic stocking knitting-machine, the combination with a needle and sinker-carrying cylinder, driving mechanism for revolving the same, a manually controlled non-revoluble swinging latch-ring and a self-dropping yarn-guide pivotally mounted in and bodily movable with said ring member, of a mechanically revoluble cam located below said driving mechanism, and a pair of suitably mounted and connected pivoted levers disposed between and being in normal frictional contact with said yarn-guide and cam members respectively, constructed and arranged so that the guide is adapted to place the yarn into and out of knitting action while the latch-ring is lying in the normal or dropped position.
2. In a knitting-machine of the character



described, the combination with a capped hollow standard secured to the top of the machine, and mechanically movable levers  $f^5$  pivotally mounted in the standard, of a manually controlled hinged latch-ring, and spring-pressed yarn-guides  $d^1$  pivotally mounted in said ring, said guides when the ring is dropped being in yielding engagement with and supported by the free ends of said levers, the standard at the same time forming a support for the latch-ring, substantially as described.

3. In a knitting-machine of the character described, the combination with a revoluble knitting-cylinder and a non-revoluble latch-ring, of a self-dropping yarn-guide, a swinging finger  $f^5$  having its free end adapted to support said guide, a mechanically revoluble cam, a pivotally mounted lever having its free end in engagement with said cam, and a link uniting said finger and lever members.

4. In a knitting-machine of the character described, the combination of a manually movable latch-ring, a plurality of spring-pressed yarn-guides pivotally mounted therein, a series of suitably arranged interrupted cams or ribs  $f^2$ , means for rotating the latter in unison at predetermined intervals, a corresponding series of swinging levers  $f^3$  in normal continuous engagement with said cams, and tilting members  $f^5$  connected with and actuated by said levers  $f^3$ , constructed and adapted so that when the latch-ring is dropped into its normal stationary position the movements of said levers  $f^3$  cooperate with said yarn-guides to change their positions, for the purpose hereinbefore set forth.

5. In a knitting-machine of the character described, the combination with suitably mounted swinging yarn-guides, of a revoluble member having a plurality of concentric peripheral cam-flanges or ribs  $f^2$ , each being cut transversely to produce suitably disposed openings or gaps, levers  $f^3$  located in the path of the flanges and being in normal frictional engagement therewith, means connected with and actuated by said members  $f^3$  for supporting the yarn-guides and placing them in the operative and inoperative positions, and springs in continuous engagement with the guides for insuring a yielding contact of the levers with the flanges.

6. In a knitting-machine of the character described, the combination with a revoluble knitting-cylinder, needles and sinkers movable therein and revoluble bodily therewith, and mechanically positioned yarn-guides, of a swinging latch-ring carrying said guides, bent arm members,  $c^4$  and  $c^3$ , the latter terminating in a point below member  $c^4$  so as to form a contracted yarn passage between them, the said arm members also forming a

munication with said contracted passage, substantially as described and for the purpose set forth.

7. In a knitting-machine of the character described, the combination with a swinging latch-ring and mechanically positioned yarn-guides pivoted to an extension thereof, of a bent downwardly extending guide-arm secured to the latch-ring having a lip on its under side, a plate secured to the lower portion of said guide-arm to form a float-opening, the free end of said plate being narrowed and extending nearly to said lip thereby forming a contracted passage  $c^9$  therebetween for guiding the inactive yarns to and past said passage into the float-opening.

8. In a knitting-machine of the character described, the combination with the swinging or hinged latch-ring and yarn-guides pivoted thereto, of a member secured to the ring having an upwardly bent arm  $c^4$  and also having a substantially horizontal arm  $c^5$  arranged to form with said member  $c^4$  a central opening  $c^7$ , a protected passage for guiding the inactive yarns therethrough into said opening and preventing their escape therefrom, means for securing the free ends of the yarns after being severed from the work, and having the inner face of the latch-ring oppositely beveled at a point adjacent the free ends of the yarn-guides to insure the opening of the latches of the traveling needles, substantially as described.

9. In a knitting-machine of the character described, the combination with the hinged latch-ring provided with a lateral extension, and self-dropping yarn-guides pivoted therein, of a stationary stand K for supporting the ring when dropped to its normal or working position, and mechanically controlled tilting levers  $f^5$  mounted in said stand and supporting the yarn-guides in the elevated or non-active position.

10. In a knitting-machine of the character described, the combination with a revoluble knitting-cylinder and latch-needles and sinkers movably mounted therein, of a latch-ring having a lateral opening or throat, and having the walls at the mouth of said opening beveled upwardly in a converging manner so that when in use they are engaged or are adapted to be engaged by the partly closed latches of the traveling needles while passing said opening to automatically deflect them downwardly before the knitting or stitch-forming action takes place.

11. In a knitting-machine of the character described, the combination with a revoluble knitting-cylinder, latch-needles and sinkers movably mounted therein and bodily revoluble therewith, of a latch-ring, self-dropping mechanically elevated yarn-guides hinged to the latter, an opening formed in said ring having the yarn-guides arranged



therein, and having the lateral sides or edges  $j^1$  of the mouth of the opening extending upwardly from the bottom in a converging or dove-tail form, whereby any  
5 partly closed latches of the traveling needles upon contacting with said beveled edges are deflected downwardly to the full-open position before the needles receive the knitting-

yarn leading from the then depressed yarn-guide.

Signed at Providence, R. I., this 25th day of April, 1907.

JOSHUA D. HEMPHILL.

Witnesses:

GEO. H. REMINGTON,  
CALVIN H. BROWN.