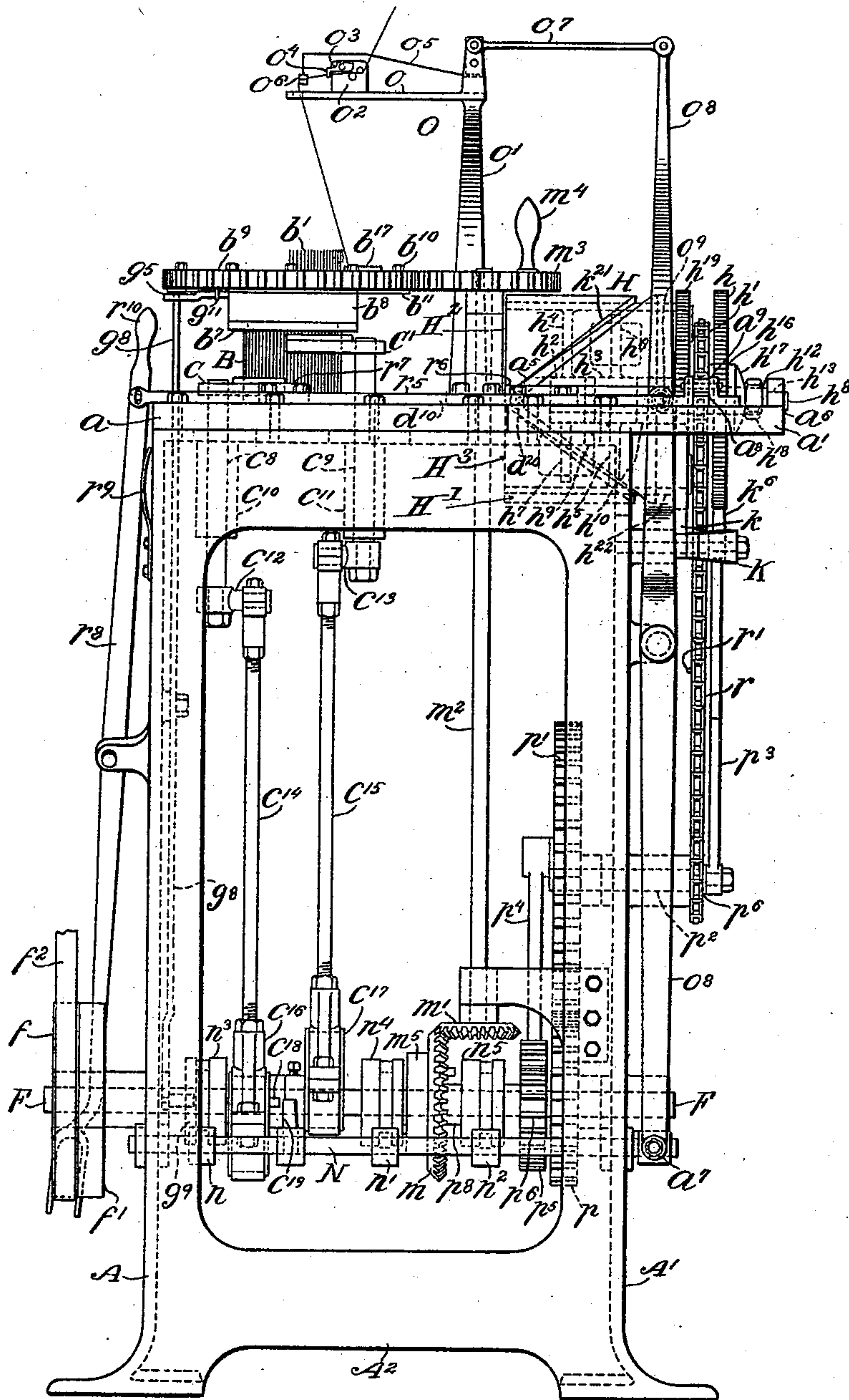


E. J. FRANCK.  
AUTOMATIC CIRCULAR KNITTING MACHINE.

No. 536,616.

Patented Apr. 2, 1895.

Fig: 1



Witnesses:  
W. A. Schaefer  
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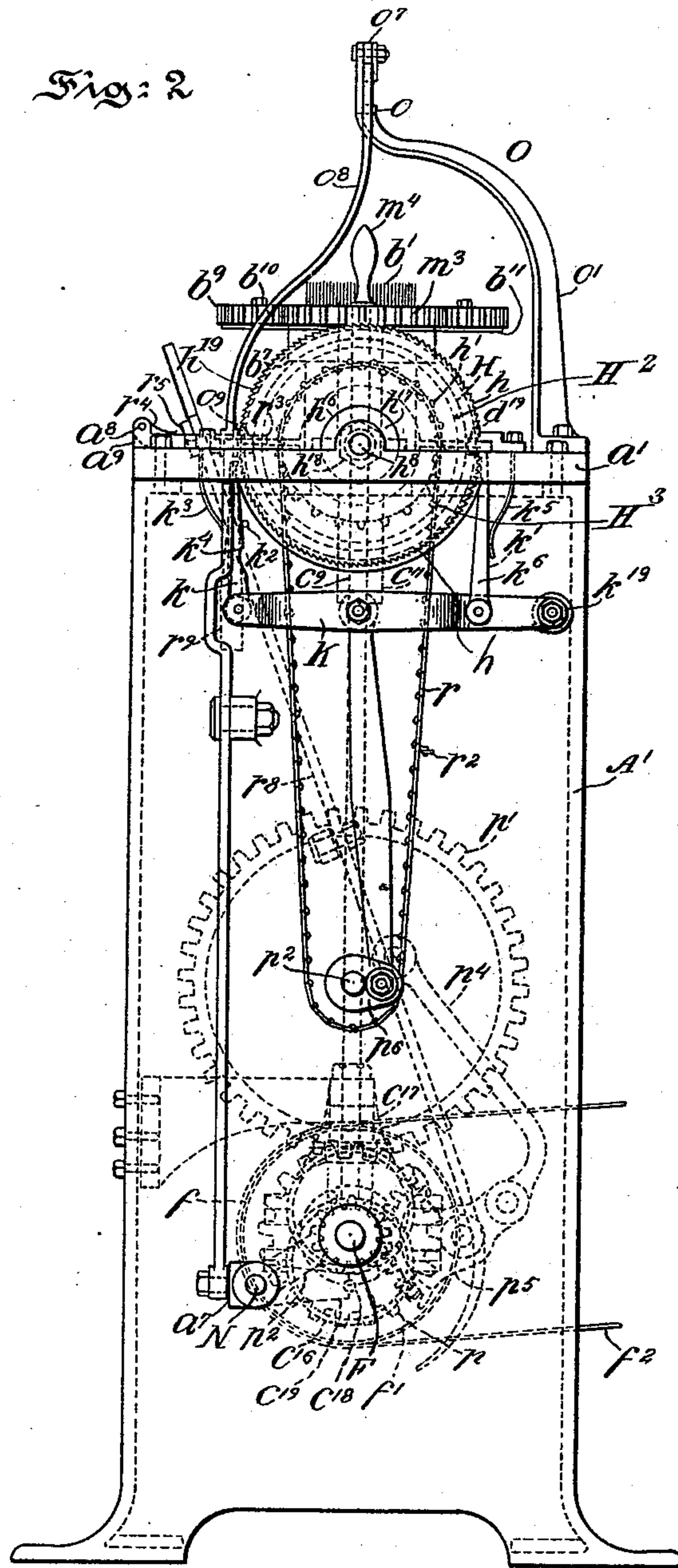
(No Model.)

7 Sheets—Sheet 2.

E. J. FRANCK.  
AUTOMATIC CIRCULAR KNITTING MACHINE.

No. 536,616.

Patented Apr. 2, 1895.



Witnesses:  
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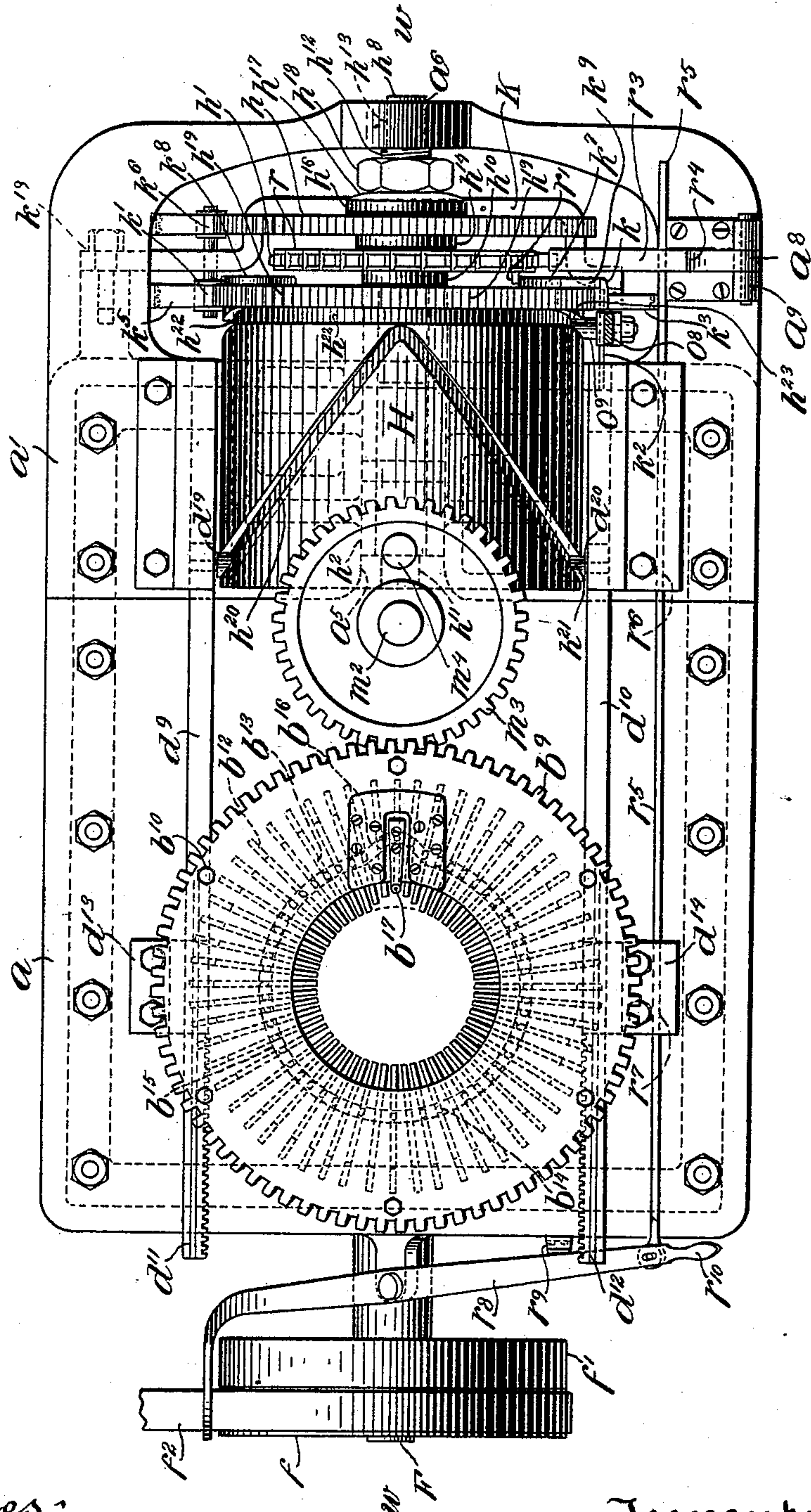


E. J. FRANCK.  
AUTOMATIC CIRCULAR KNITTING MACHINE.

No. 536,616.

Patented Apr. 2, 1895.

Fig. 3



Witnesses:  
W. A. Schaefer  
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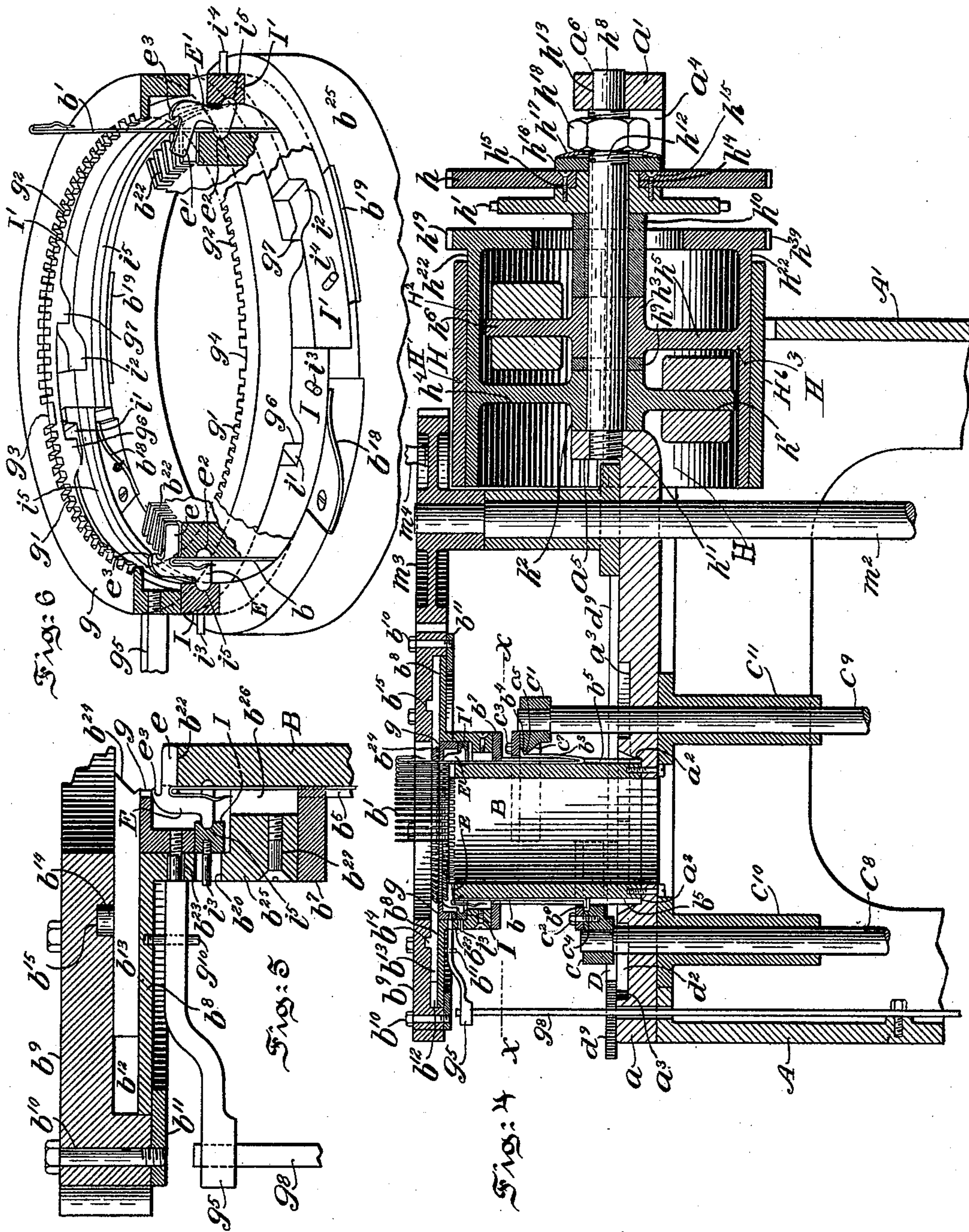
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AUTOMATIC CIRCULAR KNITTING MACHINE.

No. 536,616.

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(No Model.)

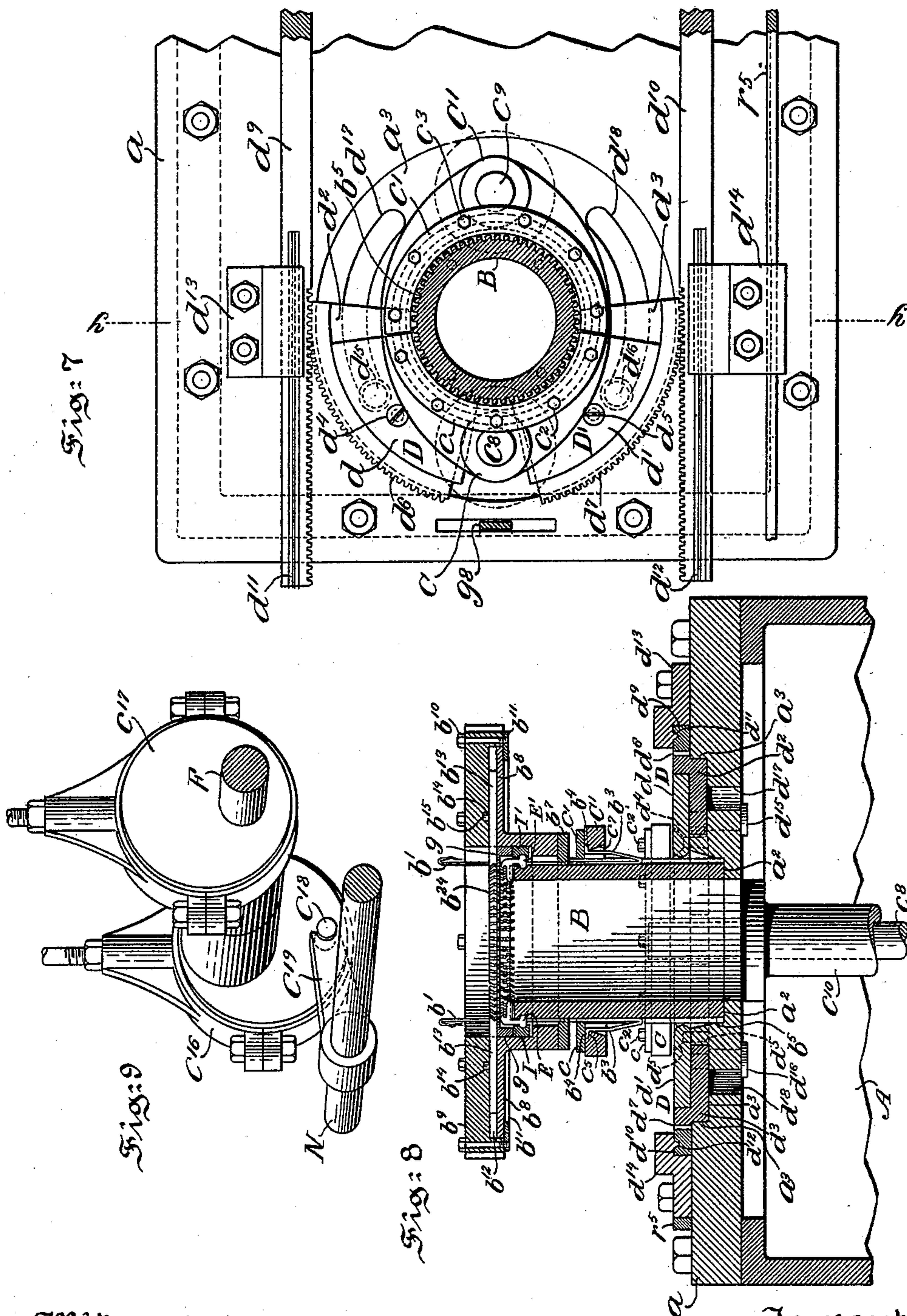
7 Sheets—Sheet 5.

E. J. FRANCK.

# AUTOMATIC CIRCULAR KNITTING MACHINE.

No. 536,616.

Patented Apr. 2, 1895.



Witnesses:  
W. A. Schaefer  
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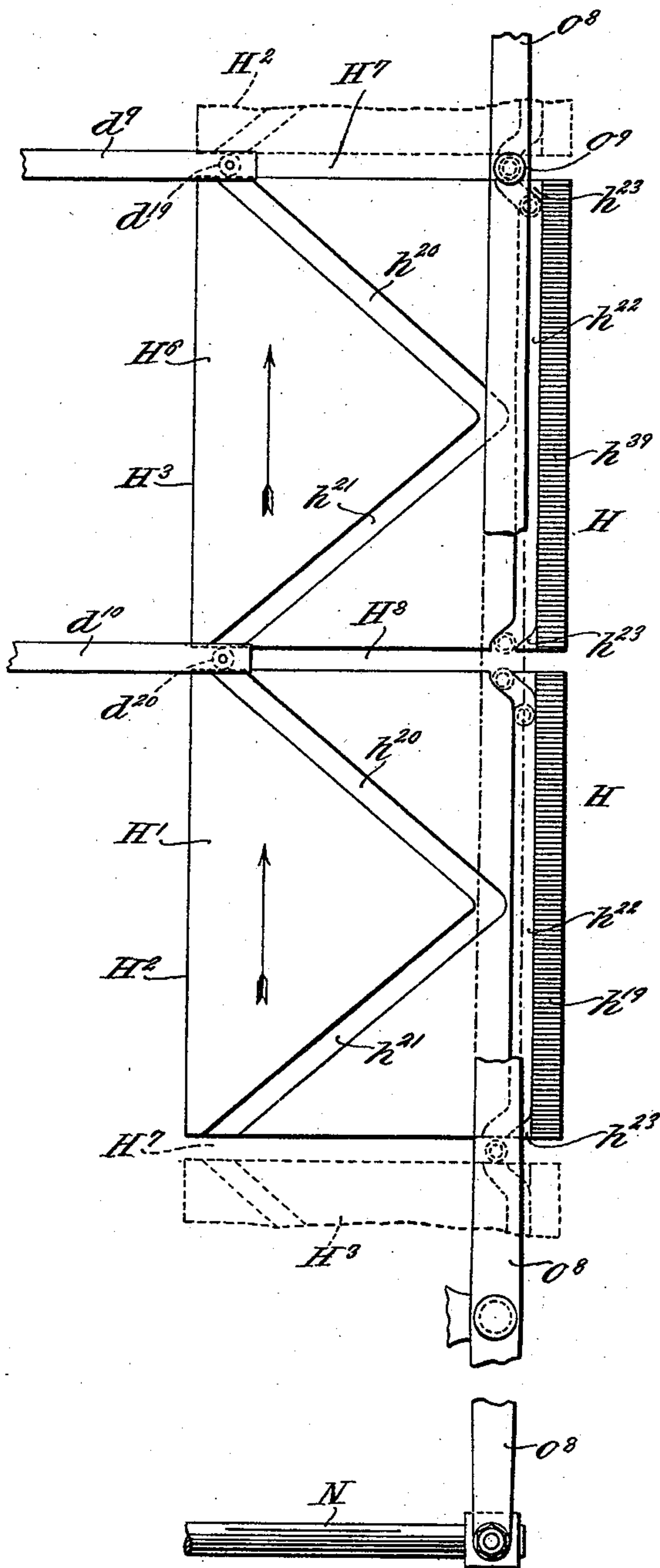


E. J. FRANCK.  
AUTOMATIC CIRCULAR KNITTING MACHINE.

No. 536,616.

Patented Apr. 2, 1895.

Fig: 13



Witnesses:  
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# UNITED STATES PATENT OFFICE.

EMIL J. FRANCK, OF PHILADELPHIA, PENNSYLVANIA.

## AUTOMATIC CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 536,616, dated April 2, 1895.

Application filed September 1, 1893. Serial No. 484,540. (No model.)

*To all whom it may concern:*

Be it known that I, EMIL J. FRANCK, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Circular-Knitting Machines, of which the following is a specification.

My invention relates to knitting machines; and more particularly to so-called circular knitting machines adapted for the manufacture of hosiery, underwear and the like and of the general type of the Letters Patent of the United States No. 502,292, granted to me under date of August 1, 1893.

The principal objects of my present invention are, first, to provide a comparatively simple, efficient and inexpensive knitting machine; second, to provide a circular knitting machine with two groups of needles, whereof one group is fixed as to its holder, and whereof the other group has fashioning needles detachably connected to its holder and provided with spring arms having bent ends forming bits and which groups are alternately elevated and depressed in the grooves of a fixed needle cylinder by means of segmental needle holders alternately moved from a shaft by eccentrics which afford ranges of reciprocating movement to said needles in the direction of their lengths; third, to provide a knitting machine with web holders actuated by a ring having recesses engaging cams connected with an oscillating ring adapted to automatically close the beards of the needles of each group as they descend and accommodate the same as they ascend by certain defined movements of their complemental needle-holders; fourth, to provide a knitting machine with two groups of needles, whereof the needles of one group are provided with spring arms bent to form bits and whereof the needles of the other group have bits, a grooved needle cylinder or support therefor, segmental needle holders or carriers provided with recessed or grooved seats and one of said holders or carriers having a tapering internal surface, eccentrics for reciprocating the holders or carriers of the groups of needles and strippers for liberating the needles of the group provided with spring arms having bits from the recessed or grooved seat of their holder or carrier; fifth, to pro-

vide a knitting machine with improved means for connecting and disconnecting certain of the needles, that is, the fashioning needles, to and from a complemental reciprocating segmental needle holder so as to effect the required narrowing or widening of a fabric; sixth, to provide a knitting machine with improved means for operating the web-holders in a certain direction as to the needle cylinder in order to respectively retain and release the meshes or stitches of the web being fabricated; seventh, to provide a knitting machine with means for operating movable web-holders alternately in a vertical direction by means of a divided spring controlled ring having recesses engaging cams or noses arranged reversely with respect to each other and depending from an oscillating needle-beard closing ring; eighth, to provide a knitting machine with a sectional, divided or two part drum having angular grooved cams disposed preferably at substantially an acute angle to each other and so arranged as to permit, in the alternate operation of strippers or carriages, the fashioning needles in regular sequence from different positions of the needle cylinder, to be thrown out of and into action; ninth, to provide a knitting machine with a sectional drum having angular grooved cams and an annular grooved cam for the reception of a roller connected with a lever actuating a clutch shifting rod and an arm for preventing the rotation through friction of the eccentric actuating the group of needles fixed as to its holder; tenth, to provide a knitting machine with spring pressed pawls and fixed pawls connected with each section of the drum and arranged to permit of the shifting of one of the sections of the same a predetermined distance for throwing simultaneously out of and into action certain of the fashioning needles of the group thereof, at the commencement of the toe portion of the stocking; eleventh, to provide a knitting machine with gear-mechanism actuated by clutches from the main driving shaft for reciprocating the sinker-gear and controlling the movement of the sinker-bars during the widening and narrowing of a web being fabricated; twelfth, to provide a knitting machine with two groups of needles, whereof one group is provided with spring arms having rear bits and whereof the



other group is provided with base-bits, segmental needle holders reciprocated in the direction of the lengths of the needles, an oscillating beard closing ring, web holders, a divided spring controlled ring, a sinker-bed and gear and sinker bars adapted to slacken the thread or yarn between each two of the needles of the groups as they are elevated for holding the same against accidental displacement until the thread or yarn is positively drawn off of said sinker bars by the descent of the groups of said needles; thirteenth, to provide a knitting machine with two groups of needles, whereof one group is provided with spring catches adapted to engage a complementary recessed and tapering surfaced reciprocating holder and with oscillating strippers or carriages so arranged as that by contact of the same with the spring catches of the needles, the holder is permitted to rise free thereof during the fashioning of the heel and toe portions of the web, and, fourteenth, to provide a knitting machine having the parts reduced as to number and the mechanism connected therewith simplified, whereby more positive action is insured in the production of a knit fabric.

My invention comprises a knitting machine provided with two groups of needles, whereof one group is fixed as to its holder, and whereof the other group has fashioning needles detachably connected to its holder and provided with spring arms having bent ends forming bits, and reciprocating segmental needle-holders alternately movable from the main driving shaft by means of eccentrics for respectively actuating said group of needles.

My invention further comprises a knitting machine provided with needles, holders reciprocated in the direction of the lengths of the needles for elevating and depressing the groups thereof, an oscillating ring provided with teeth for closing the beards of each group of needles as they descend and with spaces for accommodating the beards of each group of needles as they ascend, movable web-holders and a divided spring actuated ring provided with recesses engaging oppositely disposed cams, noses or projections of said beard closing-ring, for operating said movable web-holders.

My invention further comprises a knitting machine provided with two groups of needles, whereof one group is fixed as to its holder and whereof the other group has fashioning needles detachably connected to its holder, reciprocating segmental needle holders provided with recessed or grooved seats and one of said holders having a tapering internal surface, eccentrics for reciprocating the holders of the said two groups of needles, and strippers for liberating the fashioning needles from the recessed or grooved seat of their holder to permit of the narrowing and then of the widening of the fabric.

My invention further comprises a knitting machine provided with miter-gears, whereof

one has pins adapted alternately to engage clutch members, one of which is connected by means of a sleeve and pinion with a sector-gear, which latter is connected with the crank-arm of a cross-shaft, the latter carrying a gear meshing with a gear upon the main driving-shaft, and whereof the other clutch member is connected with said shaft, and said clutch members respectively adapted to impart rotary and to and fro motions to the gear of a sinker-bed through the intervention of the gear of a vertical shaft engaging said sinker-gear.

My invention further comprises a knitting machine provided with two groups of needles, whereof one group is provided with spring catches adapted to engage a recessed and tapering surfaced reciprocating holder and oscillating strippers or carriages arranged so that by contact of the same with the spring catches of said needles, said holder is permitted to rise free thereof, during fashioning of the article being fabricated.

My invention further comprises a knitting machine provided with web-holders movable in a vertical direction by means of a divided spring actuated ring having recesses or grooves adapted to engage with cams or noses of an oscillating beard closing ring reversely arranged with respect to each other.

My invention further comprises a knitting machine provided with a drum having an annular grooved cam for the reception of a roll connected with a fulcrumed lever, which latter is in pivotal connection with a horizontal rod, actuating clutches connected with the main driving shaft of the machine, and an arm for preventing rotation through friction of an eccentric of said main driving shaft actuating the group of needles fixed as to their segmental needle holder or carrier.

My invention further comprises a knitting machine provided with spring pressed pawls and fixed pawls connected with each part of a centrally divided drum having angular and annular grooved cams and mechanism adapted to operate the same so as to permit of the throwing simultaneously out of and then into action of certain fashioning needles of a group of needles during fabrication of the toe portion of a stocking.

My invention further comprises a knitting machine provided with spring pressed pawls and fixed pawls connected with each part of a weighted and centrally divided drum and arranged to permit of a shifting of one part of the drum a certain distance for throwing out of and into action simultaneously a certain number of the fashioning needles, and said drum having ratchets with which engage pawls adapted to shift said drum forward step-by-step to throw successively out of and into action the fashioning needles while knitting the heel and toe portions of the stocking, and the drum being constructed to control a clutch-shifting mechanism to change rotary motion of the sinker-cam and thread-carrier



into to and fro movement during fabrication of the heel and toe portions of the stocking; and my invention further comprises a knitting machine constructed, arranged and adapted for operation in substantially the manner hereinafter fully described and claimed.

The nature and general features of my invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof; and in which—

Figure 1, is a front view of a knitting machine embodying features of my invention with the parts and mechanisms thereof shown in such positions respectively as to fabricate round or tubular work and by the shifting of the clutch mechanism of the machine to effect fashioning of the article being fabricated. Fig. 2, is a side view taken from the right hand side of Fig. 1, showing means for operating the sectional, divided or two-part drum, the belt and clutch-shifting devices and mechanism and the means for effecting a reciprocating movement of the machine for fashioning an article being fabricated. Fig. 3, is a top or plan view, showing the disposition of the pawls for operating the sectional, divided or two-part drum, the belt shifter and devices for operating the sinker-bars of the machine. Fig. 4, is a central longitudinal section on the line  $w-w$ , of Fig. 3, showing the needle-cylinder, segmental reciprocating needle-holders and the operating mechanism for the sinker-gear and the sectional or two-part counter-weighted drum and sprocket and ratchet-wheels. Fig. 5, is a central longitudinal section on an enlarged scale from the upper left hand portion of Fig. 4, showing in detail the oscillating needle-beard closing ring and its complemental spring actuated divided ring in engagement with movable web-holders. Fig. 6, is a perspective view of the parts illustrated in Figs. 4 and 5, and also showing the movable web-holders, the leaf spring connected with the sinker-bed support and the flanged oscillating beard closing ring. Fig. 7, is a top or plan view on the line  $x-x$ , of Fig. 4, showing the needle holders and strippers or carriages for releasing and returning the fashioning needles to their initial positions. Fig. 8, is a section on the line  $y-y$ , of Fig. 7. Fig. 9, is a perspective view, showing the device for preventing rotation through friction of the eccentric actuating the needle holder carrying the group of needles fixed as to their said holder. Fig. 10, is a view partly in section and partly in elevation of the two-part drum with its ratchets and spring pressed and fixed pawls, the spring controlled pawls adapted to shift the drum a certain or defined distance at the commencement of the fabrication of the heel and toe portions of the stocking and for shifting the drum step by step during formation of the heel and toe, the sprocket-wheel and chain and projection of the latter for operating the spring pressed pawls of the drum, and an arm or latch which is in

engagement with a rod held in pivotal connection with a belt shifting lever adapted to stop the machine by the shifting of a belt from a fast to a loose pulley. Fig. 11, is an enlarged sectional view of means for imparting a reciprocating motion to the sinker-gear. Fig. 12, is a view on the line  $z-z$ , of Fig. 11; and Fig. 13, is a diagrammatic view, showing developed in longitudinal plan, the construction and arrangement of the two-part grooved drum, showing also the cams adapted to actuate the clutch shifting lever and the rod for operating the clutches of the main driving shaft of the machine.

In the drawings A and A', are the end standards formed integral with the longitudinal base piece or frame A<sup>2</sup>, and carrying a separate and divided bed-plate  $a$  and  $a'$ . This bed-plate  $a$ , has an annular flaring recess or aperture  $a^2$ , for the reception of a needle-cylinder B, which is rigidly secured thereto and an annular recess  $a^3$ , for the reception of the needle-strippers or carriages D and D'.

The needle-strippers or carriages D and D', comprise segmental top-plates  $d$  and  $d'$ , secured in grooved and flanged bed-plates  $d^2$  and  $d^3$ , by means of screws  $d^4$  and  $d^5$ . The bed-plates  $d^2$  and  $d^3$ , are provided with toothed peripheries  $d^6$  and  $d^7$ , which mesh with longitudinal rack-bars  $d^9$  and  $d^{10}$ , afforded a range of to and fro movement along the bed plate  $a$ , and provided with channels or V-shaped grooves  $d^{11}$  and  $d^{12}$ , which are adapted for the reception of longitudinally feathered-brackets  $d^{13}$  and  $d^{14}$ , detachably secured to the bed-plate of the machine. The bed-plates  $d^2$  and  $d^3$ , are provided with pins or bolts  $d^{15}$  and  $d^{16}$ , which engage segmental slots  $d^{17}$  and  $d^{18}$ , provided in the bed-plate  $a$ , of the machine. The segmental slots afford the strippers or carriages D and D', a range of reciprocating movement in the actuation of the rack bars  $d^9$  and  $d^{10}$ , engaging therewith and the stud-pins or bolts  $d^{15}$  and  $d^{16}$ , prevent vertical displacement of the bed-plates  $d^2$  and  $d^3$ , in the oscillating movement of the strippers or carriages D and D'.

The bed-plate  $a'$ , of the machine has an aperture  $a^4$ , adapted for the reception of a drum H, consisting of two parts H<sup>2</sup> and H<sup>3</sup>, so arranged in position above one another that spaces H<sup>4</sup> and H<sup>5</sup>, are formed between opposite edges of the two parts of the same in extent corresponding to a tooth of the teeth of the two parts  $h^{19}$  and  $h^{20}$ , of the flanged ratchet formed integral with or secured to the rear end of the drum H. It may be here remarked that each part of the ratchet of the drum constituting as it were a ratchet wheel thereof corresponds in extent to each half of the drum. When one half H<sup>2</sup>, of the drum is shifted forward the space of a tooth the other half H<sup>3</sup>, of the drum H, is at rest, as will be presently more fully explained.

The two-part drum H, is provided with hubs  $h^2$  and  $h^3$ , loosely mounted on the shaft  $h^8$  and



having radial spokes or arms  $h^4$  and  $h^5$  formed integral therewith and connected with the inner surface of the drum, and with inversely disposed radial counter-weighted arms  $h^6$  and  $h^7$ , formed integral with the hubs  $h^2$  and  $h^3$ , and serving to hold each part of the drum in the required position. The weights of the arms  $h^6$  and  $h^7$ , it is to be understood, are attached thereto by means of set-screws, not shown.

$h^9$ , is a distance piece keyed to the shaft  $h^8$ , between the hubs  $h^2$  and  $h^3$ , of the drum H. The shaft  $h^8$ , has a threaded extremity  $h^{11}$ , which is screwed into the threaded aperture of a bracket  $a^5$ , formed integral with the bed-plate  $a'$ , of the machine. The opposite extremity of the shaft  $h^8$ , is threaded at  $h^{12}$ , and has an end journal  $h^{13}$ , engaging a smooth surfaced aperture  $a^6$ , in the end of the bed-plate  $a'$ , of the machine. On the shaft  $h^8$ , is mounted the sprocket-wheel  $h'$ , provided with a double flanged or recessed hub  $h^{14}$ , which is secured by means of screws  $h^{15}$ , to one face of the ratchet-wheel  $h$ . The ratchet-wheel  $h$ , which is actuated by a pawl  $k^6$ , connected with a cross-lever K, rotates the sprocket-wheel  $h'$ , maintained in contact with a distance piece  $h^{10}$ , mounted on the shaft  $h^8$ , and abutting against the hub  $h^3$ , of the drum H.  $h^{16}$ , is a metal washer and  $h^{17}$ , is a bearing plate engaged by a jam-nut  $h^{18}$ , applied to the threaded portion  $h^{12}$ , of the shaft  $h^8$ . The drum H, is adapted to be rotated on the shaft  $h^8$ , independently of the movement of the ratchet and sprocket wheels  $h$  and  $h'$ , step by step by means of the pawls  $k$  and  $k'$ , during the fabrication of the heel and toe portions of the stocking or by means of the pivotal pawls  $k^7$  and  $k^8$ , and rigid pawls  $k^9$  and  $k^{10}$ , of the ratchet-wheels  $h^{19}$  and  $h^{39}$ , a predetermined distance at the beginning of the formation of the heel and toe portions of the stocking.

The two parts  $H^2$  and  $H^3$ , of the drum H, are provided with detachable jackets  $H'$  and  $H^6$ , which embrace each of the parts of the drum and so as to form spaces  $H^7$  and  $H^8$ , which correspond in extent to the spaces  $H^4$  and  $H^5$ , of the drum H. These jackets  $H'$  and  $H^6$ , are respectively provided with channels or grooves extending from the edge of each half thereof at one end and meeting at the other end in such manner as to constitute angular cams  $h^{20}$  and  $h^{21}$ , which are adapted to permit of the actuation of the strippers D and D', by the rotation of the drum in a manner to be hereinafter fully explained. The two parts of the jacket are provided with a recess or groove  $h^{22}$ , which latter is curved near the end of each half of the jacket, and forms in connection with the two parts  $h^{19}$  and  $h^{39}$ , of the ratchet wheel of the drum, cams  $h^{23}$ , as illustrated in Figs. 3 and 13. These cams  $h^{23}$ , of the two-part jacket serve to permit of the actuation of a clutch shifting rod N, to afford a change of the rotary movement of the sinker-cam  $b^9$ , to a to and fro movement for purposes to be presently

fully explained. It should, however, be understood that these cams may be formed directly in the surface of the drum, and in such case the two-part jacket may be dispensed with. The employment of a two-part jacket, however, is preferred, because such insures good results in the practice of the invention; and moreover, in case of wear or breaking down of the jacket, another may be readily applied to the drum with the least amount of time and labor attending upon the same.

The needle cylinder B, is provided with axial grooves, channels or slots  $b^5$ , in which the needles  $b$  and  $b'$ , are located and afforded a range of vertical movement. The fashioning needles  $b'$ , are provided at the lower parts thereof with springs  $b^3$ , and bits  $b^4$ , adapted to engage a groove or recess formed in the holder or carrier C', therefor. The needles  $b$ , fixed as to their carrier C, are provided at the lower parts with bits  $b^6$ , which engage with a groove or recess  $c^4$  provided in the needle holder or carrier C, therefor. The needles  $b$ , are permanently secured to the holder or carrier C, while the needles  $b'$ , are detachably connected with the holder or carrier C'.

$c$  and  $c'$ , are segmental plates detachably connected with the holders or carriers C and C', by means of screws  $c^2$  and  $c^3$ , for permitting of the removal and replacement of broken or worn needles by others. The plates  $c'$  in conjunction with the segmental groove of the holder C', forms a seat  $c^5$ , for the bits  $b^4$ , of the fashioning needles  $b'$ . The holder C', beneath the seat  $c^5$ , is provided with a slanting or tapering surface  $c^7$ . This surface  $c^7$ , serves to press the bits  $b^4$ , inwardly, when the needles  $b'$ , are detached from the holder C', and released by the strippers D and D', and thus to allow the needles  $b'$ , to return to their normal position with the bits thereof in engagement with the seat  $c^5$ , for purposes to be hereinafter more fully explained. The strippers or carriages D and D', located below the holder C', are adapted to bear against the springs  $b^3$ , of the fashioning needles  $b'$ , to cause the release of the bits  $b^4$ , from the grooved seat  $c^5$ , of the holder or carrier C', when the strippers are shifted toward the carrier C', in Fig. 7, so that the fashioning needles may be thrown out of action for a purpose to be hereinafter fully explained.  $c^8$  and  $c^9$ , are vertical posts journaled to the respective needle holders or carriers C and C', and extending downward through the bed-plate  $a$ , of the machine and through housings or guides  $c^{10}$  and  $c^{11}$ , suitably secured to the under side of the bed-plate  $a$ . These needle operating carrier posts  $c^8$  and  $c^9$ , are pivotally connected at  $c^{12}$  and  $c^{13}$ , to rods  $c^{14}$  and  $c^{15}$ , suitably applied to straps upon eccentrics  $c^{16}$  and  $c^{17}$ , respectively clutched to and mounted on the main driving shaft F, as clearly illustrated in Figs. 1 and 2.

$b^7$ , is an annular ring detachably connected



with the needle cylinder B, by means of a hinge. This ring  $b^7$ , is composed of two parts, each of which is provided with a projection at the end thereof, not shown, for the reception of a screw for holding said parts together. 5 This ring  $b^7$ , forms a support for the sinker-bed  $b^8$ , which is rigidly connected to the needle cylinder B, by means of screws  $b^{27}$ , inserted through the part  $b^{25}$ , of said sinker-bed  $b^8$ , and bearing against the ribs or projections  $b^5$ , of the cylinder B. The sinker-bed  $b^8$ , is connected with the upper ends of the ribs or projections  $b^5$ , forming grooves  $b^{26}$ , adapted for the reception of the beards of the needles, as illustrated in Fig. 4. The sinker-bed  $b^8$ , carries the sinker-gear  $b^9$ . 15

$b^{11}$ , is a ring connected with the gear  $b^9$ , by means of the screw-bolts  $b^{10}$ , in order to rotatably secure the sinker-gear to the sinker-bed. 20 The sinker-bed  $b^8$ , is provided with radial slots  $b^{12}$ , in which the sinker-bars  $b^{13}$ , are afforded ranges of movement to be hereinafter more fully explained. Each of these sinker-bars  $b^{13}$ , is provided at the upper extremity with a lip or lug  $b^{14}$ , engaging an annular groove  $b^{15}$ , formed in the sinker-gear  $b^9$ . This groove  $b^{15}$ , has a curvilinear cam or inverted V-shaped extension  $b^{16}$ , which is adapted to shift the sinker bars first backward and then forward, while the guide  $b^{17}$ , as illustrated in Fig. 3, is presenting the thread or yarn to the stems of the respective groups of needles  $b$  and  $b'$ . 30

$g$ , is a flanged ring movably connected with the sinker-bed  $b^8$ , as fully illustrated in Figs. 4, 5, 6 and 8. This ring is provided upon its inner edge with two sets of teeth  $g'$  and  $g^2$ , whereof one set  $g^2$  pertains to the beards of the needles  $b'$ , operated by the holder or carrier  $C'$ , and the other set to the needles  $b$ . The tooth  $g^3$ , between the two sets of teeth at one side, is made wider than the other teeth, as shown in Fig. 6, and at the opposite side of the ring there is a corresponding wide space  $g^4$ , between the two series of teeth, in order to insure engagement or disengagement of the beards of the needles at the ends of the two groups  $b$  and  $b'$ , with and from the corresponding teeth of the ring  $g$ . The needles, especially those illustrated in Figs. 1, 2, 4 and 8, are in a position for knitting a tubular or round fabric. 45 50

When the fabrication of the heel of a stocking has been reached, the fashioning needles  $b'$ , are stripped from their holder or carrier  $C'$ , by means of the strippers or carriages D and D', which cause the springs  $b^3$ , of said needles to be pressed inward in order to release the bits  $b^4$ , from the recessed seat  $c^5$ , of the needle holder or carrier  $C'$ , so that when this holder or carrier is next moved in a vertical direction, the fashioning needles of the group  $b'$ , remain down throughout the action of the strippers or carriages D and D', which are shifted forward toward the right in Fig. 7, in order to allow the holder or carrier  $C'$ , to rise independently, so as to drop or release 65

one stitch at a time, while the heel and toe portions of the article are being fabricated. The forward movements of the strippers or carriages D and D', and of the needle holder or carrier  $C'$ , are then repeated until one half of the heel has been fashioned or until all the needles  $b'$ , requisite for fashioning the heel, are thrown out of action. Upon reaching the point where the needles are to be again thrown into action, the strippers D and D', are moved in reverse directions alternately the space of one needle of the group at a time to release the springs  $b^3$ , of the fashioning needles  $b'$ , one after another. The needles  $b'$ , are then successively returned to their initial positions, in the needle holder or carrier  $C'$ , as the bits  $b^4$ , which were pressed toward the needle cylinder B, by the strippers D and D', are returned into contact with the slanting surface  $c^7$ , of the holder C, and so as to force the bits toward the stems of the needles until they are in a position to spring into the annular recessed or grooved seat  $c^5$ , of the needle holder or carrier  $C'$ , in a position for further action. It will be observed that by successive movements of the strippers D and D', all the fashioning needles  $b'$ , are again thrown into action and the heel by that time has been fashioned. 70 75 80 85 90 95

The flanged oscillating beard closing ring  $g$ , is operated by an arm  $g^5$ , which is secured thereto and extends through a slot  $b^{23}$ , in the side of the sinker-bed  $b^8$ . This arm  $g^5$ , is actuated by a pivotal lever  $g^8$ , provided with a forked extremity engaging the cam  $g^9$ , of a clutch device  $n^3$ , mounted on the main driving shaft F, of the machine. The range of to and fro movement of the arm  $g^5$ , and of the beard closing ring  $g$ , is limited by means of the side pins  $g^{10}$  and  $g^{11}$ , projecting from the under of the sinker-bed  $b^8$ . This mechanism actuates the beard closing ring  $g$ , the distance of a needle to effect the closing of each beard of the needles of the group and the raising and lowering of the web-holders E and E', in succession for engaging and disengaging the meshes or stitches of the article being fabricated by the needles raised and lowered through the intervention of the eccentrics  $c^{16}$  and  $c^{17}$ . The oscillations of the ring  $g$ , by means of the cam of the clutch device  $n^3$ , are timed with respect to the movement of the needle holders or carriers C and C'. The beards of the rising needles  $b'$ , working in the spaces of the corresponding teeth  $g^2$ , of the ring  $g$ , are permitted to open in order to allow the yarn to be laid beneath the same and when the needles  $b'$ , are descending, their beards collide with the corresponding teeth  $g^2$ , in order that they may be closed thereby. Correspondingly the beards of the needles  $b$ , working in the spaces of the teeth  $g'$ , of the ring  $g$ , are permitted to open, in order to allow the yarn to be laid beneath the same and when these needles  $b$ , are descending their beards collide with the teeth  $g'$ , so as to close the same. 100 105 110 115 120 125 130



$g^6$  and  $g^7$ , are noses, cams or projections depending from the ring  $g$ , and adapted to engage corresponding recesses or grooves  $i'$  and  $i^2$ , of a spring controlled divided ring I and I'.

5 These noses, cams or projections  $g^6$  and  $g^7$ , of the flanged oscillating ring  $g$ , are so arranged that when the ring is moved to the right, as illustrated in Fig. 6, the fashioning needle side I' of the divided movable ring is pressed downward against the force of one or more of the reversely disposed leaf springs  $b^{19}$ , detachably connected with the sinker-bed  $b^8$ , to cause the web-holders E', on the same side to release the stitches of the web being fabricated, while the same movement of the ring  $g$ , will cause the web-holders E, on the opposite or fixed needle side of the machine, by the force of the springs  $b^{18}$ , connected with the sinker-bed  $b^8$ , in the movement of the part

10 I of the divided ring to retain the stitches of the web being fabricated. The oscillating ring  $g$ , is next moved to the left, and the fashioning needle side I' of the divided ring is released, in order to allow the same to rise by the force of the leaf springs  $b^{19}$ , and the fixed needle side I of the divided ring is simultaneously forced against the action of the leaf springs  $b^{18}$ , and thereby caused to move in a downward direction to release the corresponding stitches of the web being fabricated, and at the same time securing the stitches on the fashioning side of the machine. This divided ring I and I', is provided with pins or studs  $i^3$  and  $i^4$ , having a range of movement

15 in vertical slots  $b^{20}$ , suitably provided in the sinker-bed  $b^8$ , and adapted to prevent accidental rotation of the divided ring I and I', by friction, as clearly shown in Fig. 5.

The projecting shanks  $e$  and  $e'$ , of the web-holders E and E', are guided in radial grooves or slots  $b^{22}$ , formed in the upper end of the needle cylinder B, as clearly illustrated in Figs. 4, 5, 6 and 8. Each of these radial grooves or slots  $b^{22}$ , is located between each needle and the next. Each of the web-holders has also a movable bearing or seat  $i^5$ , in the inner surface of the divided ring I and I'. The web-holders E and E', are permitted to hold and then release the respective meshes or stitches

20 from the curved fingers  $e^3$ , of said holders, as clearly shown in Figs. 4, 5, 6 and 8.

In fabricating a circular web or tube, the sinker-gear  $b^9$ , with the sinker-cam  $b^{16}$ , is revolved in one direction and the oscillating beard closing ring  $g$ , through the intervention of the pivotal rod  $g^8$ , and cam  $g^9$ , of the clutch device  $n^3$ , is operated to alternately actuate the web-holders E and E'.

O, in Fig. 1, is a thread or yarn controlling device provided with a platform  $o$ , having a projection or lug  $o^2$ , secured thereto.

$o^3$ , is a guide pivoted to the lug  $o^2$ , and provided with an eye  $o^4$ , for the reception of the thread or yarn.

65  $o^5$ , is a spring guide finger having an eye  $o^6$ , through which the thread or yarn is conducted from the eye  $o^4$ , of the pivotal guide  $o^3$ , in a

downward direction through the thread guide  $b^{17}$ , upon the sinker gear  $b^9$ .

The standard  $o'$ , of the thread controlling device O, has pivoted thereto a horizontal arm  $o^7$ , which is pivotally connected with a vertical lever  $o^8$ , carrying a roller  $o^9$ , adapted to engage in the annular grooved cam  $h^{22}$ , of the two-part or centrally divided drum H. The vertical lever  $o^8$ , is pivotally connected at  $a^7$ , with the horizontal clutch-rod N, suitably journaled to the frame of the machine. On this rod N, are mounted at suitable distances apart forked devices  $n$ ,  $n'$  and  $n^2$ , adapted to engage clutch members  $n^3$ ,  $n^4$  and  $n^6$ , mounted on the main driving shaft F, it being understood that the roller  $o^9$ , will play in the groove  $h^{22}$ , the drum H, being actuated by the lever-pawls  $k$  and  $k'$ , engaging the ratchets  $h^{19}$ ,  $h^{39}$  during the fabrication of the heel and toe portions of the stocking. There is a belt  $f^2$ , applied to the fast pulley  $f$ , mounted on the main driving shaft F, which shaft by means of the gear-wheels  $p$  and  $p'$ , communicates motion to the crank-shaft  $p^2$ , and in turn to a connecting-rod  $p^3$ , mounted on the crank-arm  $p^6$ , of said crank shaft  $p^2$ . This connecting rod  $p^3$ , is pivotally attached to the cross arm K, in order to reciprocate the lever-pawls  $k$ ,  $k'$  and  $k^6$ , to cause the drum H, to be moved step by step and likewise the ratchet wheel  $h$ . This drum H, in turn imparts a like movement to the rack-bars  $d^9$  and  $d^{10}$ , through the intervention of rollers  $d^{19}$  and  $d^{20}$ , journaled thereto.

When fabricating a circular web or tube, the sinker-gear  $b^9$ , with the sinker-cam  $b^{16}$ , is revolved in one direction. The sinker-bar  $b^{13}$ , corresponding to a fashioning needle, being thrown outward from the center of the needle cylinder B, during the application of the thread or yarn, is subsequently drawn forward toward the center of the cylinder to engage the yarn or thread and to push a loop or bight of the same inward past the needle. It should of course be borne in-mind that the projection  $b^{24}$ , on the end of the sinker-bar  $b^{13}$ , holds the bight or loop in such position, against upward displacement, while the thread is being laid on the rest of the fashioning needles, that are actuated by the holder or carrier C'. As the thread guide  $b^{17}$ , approaches the center needle of the constantly rising holder or carrier C', the thread is inserted beneath the beards of the needles and the sinker-bars  $b^{13}$ , appertaining to these needles are projected forward toward the center of the needle cylinder B, one after another. As soon as the thread has been laid onto the needles of the group, to which they pertain, the needles  $b'$ , are permitted simultaneously to descend. After the thread or yarn guide  $b^{17}$ , passes the center or thereabout of the holder or carrier C', and while it is approaching the opposite extremity thereof, the holder or carrier C', will begin to descend. During the descent of the holder or carrier C', the thread is laid onto the remaining needles and loops



or bights of the threads, are pushed inward toward the center of the needle-cylinder B, and held in such position by the projections  $b^{24}$ , of the sinker-bars  $b^{13}$ , it being understood that these sinker-bars  $b^{13}$ , are for this purpose operated successively in the manner hereinbefore explained. The thread or yarn carrier  $b^{17}$ , and sinker-bars  $b^{13}$ , then lay the thread or yarn onto the needles  $b$ , operated by the holder or carrier C, in precisely the manner hereinabove explained, with reference to the fashioning needles  $b'$ , of the holder or carrier C'. While the thread or yarn is being laid onto these needles  $b$ , the carrier C', will be descending, with the result that the beards of the needles  $b'$ , operated thereby are closed by contacting with the teeth of the oscillating ring  $g$ , so that the thread is drawn by means of the closed beards off the projections  $b^{24}$  of the sinker-bars  $b^{13}$ , over the curved fingers  $e^3$ , of the web-holders E', and through the stitches of the previously formed course, and these latter stitches are permitted thereby in the usual manner to be disengaged from the closed beards of the needles  $b'$ .

The repetition of the above described operations results in the production of a knit-tube or web which is held down by means of the curved fingers  $e^3$ , of the web-holders and which is fed away from the machine through the interior of the needle cylinder B.

In knitting a flat web one of the holders or carriers C', for example, is permitted to rise and fall and the other holder or carrier, for example C, is thrown out of action, the oscillating ring  $g$  operating to close the beards of the fashioning needles  $b'$  as they descend, and allowing them to open as they ascend, and the sinker-gear  $b^9$ , is caused to turn first in one direction and then in the other in order to permit the thread guide  $b^{17}$ , to lay the thread backward and then forward across the needles that are operated by the holder or carrier C', and also to cause the sinker-bars  $b^{13}$ , to press the thread between the fashioning needles  $b'$ , and toward the center of the needle cylinder B, as hereinbefore explained.

The flat web may be narrowed by shifting the needle strippers D and D', toward the needle holder or carrier rod  $c^9$ , as previously described, so that when the holder or carrier C', descends, the springs  $b^3$ , of the needles  $b'$ , are pressed against the inner edges of the strippers D and D', the bits  $b^4$ , being thereby forced toward the stems of the needles and out of engagement with the annular grooved seat  $c^5$ , of the holder or carrier C'.

The flat web may be widened by throwing into action in the fabrication of the article, the needles  $b'$ , one after another, by reversing the movement of the strippers D and D', and returning the same to their normal position, as illustrated in Fig. 7.

The eccentric  $c^{16}$ , has secured thereto a pin  $c^{18}$ , which projects at a right angle to the face thereof and serves to engage with a project-

ing arm  $c^{19}$ , connected with the clutch shifting rod N. This arm  $c^{19}$ , when in engagement with the pin  $c^{18}$ , is adapted to prevent accidental rotation of the fixed needle holder eccentric  $c^{16}$ , during the reciprocating movement of the mechanism of the machine, for effecting the fashioning of the heel and toe portions of the stocking being fabricated, as illustrated in Fig. 9. The pawls  $k$  and  $k'$ , are attached to a pivotally supported cross-arm K, as illustrated in Figs. 1, 2, 3 and 10. The lever-pawl  $k$ , located at the extreme end of the pivotal cross-arm K, has a greater range of movement than the lever-pawl  $k'$ , which is located near the pivoted end of the cross-arm K. Each of the lever-pawls  $k$  and  $k'$ , actuates one of the sections or parts of the drum the space of a tooth on each side alternately in the revolution thereof.

$k^2$ , is a pin or stud projecting from the surface of the standard A', and the pawl  $k$ , is pressed against the pin or stud  $k^2$ , by means of a spring  $k^3$ , suitably connected with the bed plate  $a'$ , of the machine. This pawl  $k$ , in its vertical movement, as shown in Fig. 10, is brought into contact with the teeth of the ratchet  $h^{39}$ , of the drum H, when the pin  $k^2$ , enters the recess  $k^4$ , formed in the edge of the pawl  $k$ , this recess permitting the same to mesh with and actuate the lower part  $H^3$ , of the drum H, the space of one tooth of said ratchet  $h^{39}$ , at each movement thereof.

When the heel part is to be fabricated a lug  $r'$ , projecting from the pattern-chain  $r$ , shifts the nose  $k^{17}$ , of the pawl  $k^7$ , into the path of the pawl  $k$ , which causes the same to engage said pawl  $k^7$ , and both pawls  $k$  and  $k^7$ , will thereby shift the lower part  $H^3$ , of the drum H, forward a space sufficient to shift the rollers  $d^{19}$  and  $d^{20}$ , out of the spaces  $H^7$  and  $H^8$ , between the two parts of the jacket  $H'$  and  $H^6$ , and thus to throw out of action one of the fashioning needles  $b'$ , by means of the stripper D', which is simultaneously shifted forward equal to one of the fashioning needles  $b'$ , by means of the cam  $h^{21}$ , of the lower part  $H^3$ , of the drum H. The first or upward movement of the lower part  $H^3$ , of the drum H, moves the upper part  $H^2$ , and its ratchet  $h^{19}$ , within reach of the pawl  $k'$ , thereby causing the said pawl to engage the ratchet  $h^{19}$ . When the cross-arm K, moves downward, the pawl  $k'$ , will shift the upper half  $H^2$ , of the drum forward and will throw out of action one of the fashioning needles  $b'$ , by means of the stripper D, which is shifted forward toward the right, as illustrated in Figs. 3 and 7 by means of the cam  $h^{20}$ , of the upper half  $H^2$ , of the drum H.

It may be here remarked that the drum H, in the fabricating of a tubular web will not be shifted forward, because at such time the pawls  $k$  and  $k'$ , will enter the toothless spaces between the two ratchets  $h^{19}$  and  $h^{39}$ , of the drum H, as illustrated in Fig. 10, which correspond to the parts of the drum; it being understood that said spaces  $H^4$  and  $H^5$ , be-



tween the two parts of the drum H, correspond with the space of a tooth in the ratchets  $h^{19}$  and  $h^{39}$  of the drum. It should also be borne in mind that the lever pawls  $k$  and  $k'$ , each shift one part of the drum H, the space of a tooth of the ratchets  $h^{19}$  and  $h^{39}$ , without moving the other half of the drum, in order to throw out of and into action successively the fashioning needles.

10 In the downward movement of the cross-arm K, the lever-pawl  $k$ , is brought into a position for further action. By the same movement of the cross-arm K, the lever-pawl  $k'$ , near the pivoted end of the cross-arm K, and  
15 on the opposite side of the drum, engages with the teeth of the ratchet  $h^{19}$ , by means of a spring  $k^5$ , attached to the bed-plate  $a'$ , and normally engaging therewith, to effect a movement of the upper part  $H^2$ , of the drum H, the  
20 space of one tooth, without causing a similar movement of the other part  $H^3$ , of the drum. These movements are repeated until the rollers  $d^{19}$  and  $d^{20}$  of the rack-bars  $d^9$  and  $d^{10}$  and  
25  $h^{21}$ , of the drum H, have reached the meeting points of the cams, when they are returned to their respective initial positions and therewith the strippers D and D', whereby narrowing or widening of the web is insured to its  
30 full extent by the throwing out of and then into action successively of the fashioning needles  $b'$ , as hereinbefore described.

When the machine has reached the point to commence fabrication of the heel, the operation of the parts to change the rotary movement of the sinker-gear  $b^9$ , into a to and fro  
35 movement, is as follows:—The roller  $o^9$ , on the vertical clutch shifting lever  $o^8$ , is through the intervention of the cam  $h^{23}$ , of the annular groove  $h^{22}$ , of the drum H, actuated to shift  
40 the lever  $o^8$ , at its lower extremity to the left of the position as illustrated in Fig. 1, and the clutch-device  $n^3$ , is thrown out of engagement with the eccentric  $c^{16}$ , actuating the needles  $b$ . The clutch device  $n^4$ , is thrown out of en-  
45 gagement with the gear  $m$ , while the clutch device  $n^5$ , is thrown into engagement with the gear  $m$ , which engages a complementary gear  $m'$ , mounted on a vertical shaft  $m^2$ , extending through the bed plate  $a$ , of the machine, and  
50 carrying a gear-wheel  $m^3$ , provided with a handle  $m^4$ . This gear-wheel  $m^3$ , meshes with the sinker-gear  $b^9$ , and is operated by means of the handle  $m^4$ , so as to cause, in the event of the breaking of a thread, by the turning of  
55 the sinker gear around the part  $b^{16}$ , of the groove  $b^{14}$ , of said gear to shift the sinker-bars  $b^{13}$ , so as to permit of the tying of the ends of the threads in order that the knitting operation may be proceeded with. The gear-wheel  
60  $p$ , secured to the main driving shaft F, meshes with a gear-wheel  $p'$ , mounted on the crank-shaft  $p^2$ . This gear-wheel  $p'$ , is connected by means of a crank-arm with the rod  $p^4$ , operating the toothed sector  $p^5$ , which is pivotally  
65 mounted upon the standard A' of the machine. The gear wheel  $m$ , in the hub portion  $m^5$ , thereof is provided with pockets  $m^8$  and  $m^9$ ,

for the reception of pins  $m^6$  and  $m^7$ . These pins permit the miter-gear  $m$ , to be connected with one or the other of the clutch members  
70  $n^4$  or  $n^5$ , by the actuation of the clutch-rod N, through the intervention of the lever  $o^8$ , in order to change the rotary movement of the sinker-gear  $b^9$ , into a reciprocating movement, as hereinafter more fully explained. 75

When the gear wheel  $m$ , with its pin  $m^7$ , is in engagement with the clutch device  $n^5$ , a to and fro movement of the sinker-gear  $b^9$ , is secured through the intervention of the fixed gear  $p$ , meshing with the gear  $p'$ . The pinion  
80  $p^6$ , is loosely mounted on the main driving shaft F and has a sleeve  $p^8$ , provided with a horizontal slot  $p^9$ , adapted to engage a pin  $p^{10}$ , of the clutch device  $n^5$ , whereby through the shifting of said clutch device  $n^5$ , to the left by  
85 means of the clutch-rod N, the movement of the sinker-gear  $b^9$ , is changed, as above mentioned.

The sprocket or pattern chain  $r$ , engages the sprocket-wheel  $h'$ , on the shaft  $h^8$ . This sprocket-wheel  $h'$ , is rigidly secured to the ratchet-wheel  $h$ , in the manner hereinbefore fully explained. The ratchet-wheel  $h$ , is engaged by the pawl  $k^6$ , which is pivotally attached in front of the cross-arm K, opposite  
95 the pawl  $k'$ , as illustrated in Fig. 2, and is actuated in one direction by the same mechanism as actuates the pawls  $k$  and  $k'$ , as hereinbefore explained. The step or lug  $r'$ , extending from one side of the sprocket or pattern  
100 chain  $r$ , is brought into engagement with the spring pressed pawl  $k^7$ , pivotally connected to one half of the drum H, as previously described and a similar pawl  $k^8$ , which is pivotally connected with the opposite half of said  
105 drum, to be presently more fully explained.

$k^{11}$  and  $k^{12}$ , are slots provided in the spring controlled pawls  $k^7$  and  $k^8$ , and pins  $k^{13}$  and  $k^{14}$ , attached to the drum at the front side of each section thereof project through the slots  
110  $k^{11}$  and  $k^{12}$ , in such manner as to limit the range of to and fro movement of the pawls  $k^7$  and  $k^8$ , when pressed outward by the lug  $r'$ , of the pattern chain  $r$ , as illustrated at the left hand side of Fig. 10, and pressed inward  
115 by the springs  $k^{15}$  and  $k^{16}$  to their initial positions as shown at the right hand side of Fig. 10. These pawls  $k^7$  and  $k^8$ , are provided with curved noses  $k^{17}$  and  $k^{18}$ , adapted to engage alternately the lever-pawl  $k$ .  $k^9$  and  $k^{10}$ , are  
120 pawls rigidly connected with the drum H, as illustrated in Fig. 10, for purposes to be hereinafter fully explained.

Upon the completion of the heel portion of the stocking and by which time it must be understood that the drum has made a one half  
125 revolution, the pawl  $k^{10}$ , will have been brought by such movement into the path of the pawl  $k$ , so as to engage therewith in such manner as to shift the drum a sufficient distance to  
130 bring the rollers  $d^{19}$  and  $d^{20}$ , of the rack-bars  $d^9$  and  $d^{10}$ , immediately over or into the spaces  $H^4$  and  $H^5$  in their engagement with the cams  $h^{20}$  and  $h^{21}$ . The drum will remain in this posi-



tion, because the pawls  $k$  and  $k'$ , by the above shifting of the drum H, will now enter the blank spaces between the ratchets  $h^{19}$  and  $h^{39}$ .

It should be borne in mind that upon the completion of the heel portion of the stocking it is necessary to automatically turn the clutch shifting mechanism to its initial position, that is, the position which it occupied prior to the commencement of the fabrication of the heel, so as to change the to and fro movement of the sinker-gear  $b^9$ , to a rotary movement thereof, and so as to begin the foot portion of the stocking. This is effected by means of one of the cams  $h^{23}$ , by the above shifting of the drum H, by means of the pawls  $k$  and  $k^{11}$ , as hereinbefore described. One end of the lever-arm  $o^8$ , is simultaneously shifted toward the left in Fig. 1, and the clutch-rod N, shifts thereby the clutch device  $n^3$ , into engagement with the eccentric  $c^{16}$ , and the clutch-device  $n^4$ , into engagement with the gear  $m$ , so that the same will be connected directly with the main driving shaft F, and the to and fro movement of the sinker-gear  $b^9$ , will be changed into a rotary movement and both needle carriers C and C', will be afforded up and down movements and the arm  $c^{19}$ , of the rod N, will be thereby freed from the pin  $c^{18}$ , of the eccentric  $c^{16}$ . The foot portion of the stocking is fabricated in the same manner as previously described in connection with the knitting of the tubular web of the stocking. When the foot portion of the stocking is completed, a lug of the pattern chain  $r$ , similar to the lug  $r'$ , will be brought into engagement with the pawl  $k^8$ , by which time the same will have assumed a position on the left hand side of the drum similar to that of pawl  $k^7$  illustrated in Fig. 10, thereby shifting the nose  $k^{18}$ , of said pawl  $k^8$ , into the path of the pawl  $k$ .

As shown in Fig. 10, the pawls  $k^7$  and  $k^8$ , are located at different distances from the ends of their respective ratchets  $h^{39}$  and  $h^{19}$ , the location of the former being such that when thrown into the path of the pawl  $k$ , the drum is moved only far enough to throw one needle  $b'$ , out of action, while the location of the latter  $k^8$ , at a greater distance from the end of its ratchet is such that when engaged by the pawl  $k$ , the drum is moved a distance sufficient to throw five needles  $b'$ , out of action. The said pawl  $k$ , will thereby shift the drum H, forward for the space of five teeth of the ratchet  $h^{19}$ , and five needles located at each end of the carrier C', will be thrown out of action simultaneously therewith. It must be borne in mind that the rollers  $d^{19}$  and  $d^{20}$ , after such shifting will have passed the spaces between the parts of the drum H, and be in engagement with the respective cams thereof.

The needle holder C', carries in the present instance, at each end five fashioning needles  $b'$ , more than are necessary to form the toe portion of the stocking, but, the number of fashioning needles thrown out of action simultaneously at the beginning of the formation of the toe portion of the stocking will

depend upon the size or fullness of the stocking to be fabricated. With regard to Fig. 7, of the drawings, it will be observed that the number of fashioning needles  $b'$ , is greater than the number of needles  $b$ , in order that when a certain number of the fashioning needles  $b'$ , at each end are thrown out of action, those remaining will correspond in number with the fixed needles  $b$ . Shifting the lower part of the drum the space of five teeth of the ratchet  $h^{19}$ , will simultaneously transfer the upper half of the drum the same distance. By the shifting of the drum for five teeth of the ratchet  $h^{19}$ , the clutch shifting lever  $o^8$ , will be simultaneously actuated toward the right hand in Figs. 1 and 13, and the rotary movement of the gears  $m$  and  $m^3$ , and the sinker-gear  $b^9$ , will be changed to that of a to and fro movement.

The formation of the toe portion of the stocking, that is, the narrowing and widening of the same, is as described in connection with the heel portion of the stocking. In the position of the drum H, for beginning the fashioning of the toe portion of the stocking the fixed pawl  $k^9$ , will be at the right hand side of the ratchet  $h^{19}$ , and it is at a distance from the end of said ratchet greater than that of the fixed pawl  $k^{10}$  from the end of its ratchet on the opposite side and at the end of the ratchet  $h^{39}$ , but similar to that of the pawl  $k^8$ . It will thus be observed that at the end of the toe fashioning when the pawl  $k$ , engages the said pawl  $k^9$ , the drum H, will be shifted a distance corresponding to that caused by the pawl  $k^8$ , at the beginning of the toe portion of the stocking and so as to throw simultaneously into action, the five needles at each end of the group of needles  $b'$ , previously thrown out of action.

To finish the toe portion of the stocking after the mechanism and devices of the machine are again in position for fabricating round or tubular work, it should be borne in mind that about fifteen or more courses of stitches or meshes are formed before the machine comes to a stop in order to provide for the looping of the parts of the toe together.

In order to automatically stop the machine upon the completion of the several operations hereinbefore explained, the pattern chain  $r$ , is provided with a step or projection  $r^2$ .

$r^3$ , is a cross-arm suitably hinged at  $a^8$ , in a grooved lug  $a^9$  and extending through the same.

$r^4$ , is a leaf spring normally contacting with the cross-arm  $r^3$ , which extends in the path of the step or projection  $r^2$ . This step or projection  $r^2$ , is so arranged as that when the stocking is finished, the same will be brought into engagement with the free extremity of the cross-arm  $r^3$ , as clearly illustrated in Figs. 1, 2, 3 and 10, to raise said arm out of engagement with the longitudinal rod  $r^5$ , held in the guides  $r^6$  and  $r^7$ , of the bed plates  $a$  and  $a'$ . This rod  $r^5$ , is pivotally connected with a belt shifting lever  $r^8$ , pressed outward by



means of a spring  $r^9$ , which is suitably secured to the end standard A, of the machine. The cross-arm  $r^8$ , by rising through the instrumentality of the step or projection  $r^2$ , engaging therewith, liberates the longitudinal rod  $r^5$ , and by the tension of the spring  $r^9$ , the pivotal belt shifting lever  $r^8$ , is shifted into such position as to cause the belt  $f^2$ , on the fixed pulley  $f$ , of the main driving shaft F, to be shifted onto the loose pulley  $f'$ , thereby stopping the machine.

It will be manifestly obvious to those skilled in the art to which my invention appertains, that modifications may be made in the details of construction and arrangement of the parts, without departing from the spirit of the invention; and hence I do not wish to be understood as limiting myself to the precise construction and arrangement of the parts as hereinbefore explained.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A knitting machine provided with two groups of needles, one group being fixed as to its holder and the other group having fashioning needles detachably connected to its holder and provided with spring arms having bent ends forming bits, a support or grooved cylinder, a driving shaft, reciprocating segmental needle holders alternately actuated from said shaft, and eccentrics connected with said shaft and holders for respectively actuating said groups of needles, substantially as and for the purposes set forth.

2. A knitting machine provided with two groups of needles, holders reciprocated in the direction of the lengths of the needles for elevating and depressing the groups thereof, an oscillating ring provided with teeth for closing the beards of each group of needles as they descend and with spaces for accommodating the beards of each group of needles as they ascend, movable web-holders, and a divided spring actuated ring provided with recesses engaging oppositely disposed cams, noses or projections of said beard closing ring for operating said movable web-holders, substantially as and for the purposes set forth.

3. A knitting machine provided with two groups of needles, whereof the needles of one group are provided with spring arms bent to form bits and whereof the needles of the other group have bits, a grooved cylinder or support therefor, segmental needle holders or carriers provided with recessed or grooved seats and one of said holders or carriers having a tapering internal surface, eccentrics for reciprocating the holders or carriers of the groups of needles, and strippers for liberating the needles of the group provided with spring arms having bits from the recessed or grooved seat of their holder or carrier, substantially as and for the purposes set forth.

4. A knitting machine provided with a cylinder having radial top notches, needles, movable web-holders having curved fingers, lat

eral shanks and base projections, a ring, and means for imparting vertical movement to said ring to actuate said web-holders, substantially as and for the purposes set forth.

5. A knitting machine provided with a slotted needle-cylinder, two groups of needles, whereof one group is fixed as to its holder and provided with base bits, and whereof the other group is provided with spring arms having bent ends forming bits, holders, a main driving shaft, eccentrics, strippers, movable web-holders having curved fingers and transverse shanks engaging the slotted portions of said cylinder, and means for actuating the same so as to engage and disengage stitches with the fingers of said web-holders, substantially as and for the purposes set forth.

6. A knitting machine provided with two groups of needles, segmental reciprocating needle-holders, web-holders, a needle cylinder provided with radial notches for the shanks of said web-holders, an oscillating beard closing ring having noses or projections, and a divided ring provided with recesses, said ring adapted to operate said web-holders, substantially as and for the purposes set forth.

7. A knitting machine provided with two groups of needles movable in respect to their cylinder or support, segmental needle holders reciprocated in the direction of the lengths of the needles, an oscillating ring provided with teeth for closing the beards of each group as they descend and accommodating the same as they ascend and having lugs, cams or projections, movable web-holders and a spring controlled divided ring provided with recesses engaging the noses, lugs or cams of said beard closing ring and for operating said web-holders, substantially as and for the purposes set forth.

8. A knitting machine provided with two groups of needles, a cylinder or support therefor, segmental needle holders reciprocated in the direction of the length of the needles, a ring having noses or projections, web-holders, and a spring controlled ring provided with recesses, substantially as and for the purposes set forth.

9. A knitting machine provided with two groups of needles, whereof the needles of one group are provided with spring arms with bent ends forming bits, and whereof the needles of the other group are provided with base bits, reciprocating segmental needle-holders, an oscillating beard closing ring, web holders, a spring controlled divided ring, strippers or carriages oscillated so as to engage and disengage said needles, and means connected with and operated from the main driving shaft for alternately and successively permitting of the actuation of said groups of needles, substantially as and for the purposes set forth.

10. A knitting machine provided with needles movable in the direction of their support, segmental needle holders reciprocated alternately from the main driving shaft, a sec-



tional or two-part drum, each part of which is counter weighted and provided with grooved cams, strippers or carriages, rack-bars, rollers engaging said cams and adapted to actuate  
5 said rack-bars controlling said strippers or carriages, and means for actuating the two part drum, substantially as and for the purposes set forth.

11. A knitting machine provided with fashioning needles having spring arms with bits, needles having lateral base bits, said needles movable in the direction of their cylinder, reciprocating segmental needle holders adapted to receive and support the bits of said needles, movable strippers or carriages provided with toothed peripheries, rack-bars having rolling means engaging grooved cams of a two part weighted drum, and means for positively actuating said drum step-by-step to  
10 throw into and out of action said fashioning needles, substantially as and for the purposes set forth.

12. A knitting machine provided with two groups of needles, whereof one group is provided with spring arms with rear bits, and whereof the other group is provided with base bits, segmental needle holders reciprocated in the direction of the length of the needles, an oscillating beard closing ring, web-holders,  
25 a divided spring controlled ring, a sinker-bed and gear and sinker-bars adapted to slacken the thread or yarn between each two of the needles of the groups as they are elevated for holding the same against accidental displacement until the thread or yarn is positively drawn off of said sinker-bars by the  
30 descent of the groups of said needles, substantially as and for the purposes set forth.

13. A knitting machine provided with two groups of needles, whereof one group is provided with spring arms with bent ends forming bits and whereof the other group is provided with base bits movable within a grooved support, segmental needle holders reciprocated in the direction of the lengths of the needles, a beard closing ring having noses or projections, movable web-holders, a spring controlled ring provided with recesses and strippers or carriages, substantially as and for  
40 the purposes set forth.

14. A knitting machine provided with needles movable in respect to their channeled cylinder or support, segmental needle holders, movable web-holders and means for operating  
55 the same in certain directions with respect to said cylinder or support for respectively retaining and releasing the meshes or stitches of the article being fabricated, substantially as and for the purposes set forth.

15. A knitting machine provided with two groups of needles, whereof one group is provided with spring arms having bent ends forming bits and whereof the other has base bits, complementary reciprocating segmental needle-holders, strippers, movable web-holders and means for operating said web-holders in  
65

certain directions with respect to the needle cylinder for retaining and releasing the meshes or stitches of the article being fabricated, substantially as and for the purposes  
70 set forth.

16. A knitting machine provided with two groups of needles, complementary segmental needle holders for said groups, eccentrics, a driving shaft, movable strippers or carriages, movable web-holders, a divided ring having recesses, a flanged oscillating toothed beard closing ring provided with noses or projections, rack-bars having means adapted to travel in grooved cams of a sectional drum  
80 to permit of a step-by-step motion being imparted thereto, and means for actuating said drum, substantially as and for the purposes set forth.

17. A knitting machine provided with needles arranged in separate groups, whereof one group is provided with spring arms having rear bits and whereof the other is provided with base bits, complementary segmental needle holders, movable strippers or carriages, a sectional drum with grooved cams, rack-bars adapted to actuate said strippers or carriages, and means for imparting a step by step movement to said drum and for shifting the same a predetermined distance, substantially as  
90 and for the purposes set forth.

18. In a knitting machine, a divided spring actuated ring provided with recesses or grooves, an oscillating beard closing ring provided with cams or noses reversely arranged with respect to each other, and web-holders moved in a vertical direction by means of said divided ring, substantially as and for the purposes set forth.  
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19. A knitting machine provided with a two-part drum loosely mounted on a shaft and having a two-part jacket provided with cams, ratchets connected with one end of said drum, reciprocating pawls and devices in virtue of which said pawls are caused to impart step by step and predetermined movements to said drum, substantially as and for the purposes set forth.  
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20. A knitting machine provided with a sectional drum loosely mounted on a shaft having radial counterweighted spokes or arms and grooved cams, spring pressed pawls adapted to alternately engage a ratchet of said drum, and means for actuating said pawls, substantially as and for the purposes set forth.  
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21. A knitting machine provided with two groups of needles, needle-holders, movable strippers or carriages, a two-part weighted drum having triangular grooves, spring pressed and fixed pawls connected with ratchets of said drum, rack-bars provided with rolls engaging said cams, devices in virtue of which one of said spring pressed pawls is adapted to impart a movement to said drum at the beginning of the heel and the other a movement thereof at the beginning of the toe, the fixed pawls being adapted to impart corresponding  
120  
125  
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movements to said drum at the completion of the heel and toe portion of the stocking, substantially as and for the purposes set forth.

22. A knitting machine provided with two groups of needles, one group being fixed as to its segmental holder or carrier, a drum having an annular grooved cam, a roll connected with a fulcrumed lever, a horizontal shifting rod in pivotal connection with said lever, a clutch member connected with the main driving shaft of the machine, an eccentric loosely mounted thereon, and an arm for preventing rotation through friction of the eccentric, the same being operatively connected to actuate said group of needles fixed as to its holder, substantially as and for the purposes set forth.

23. A knitting machine provided with fashioning needles, a segmental needle-holder, strippers or carriages adapted to be oscillated by rack-bars, a sectional counter-weighted drum provided with grooved cams disposed at substantially an acute angle to each other and adapted to alternately operate said strippers or carriages step by step a predetermined distance and to permit said strippers or carriages to throw certain of the fashioning needles successively and simultaneously into and out of action, substantially as and for the purposes set forth.

24. A knitting machine provided with a drum having a jacket with grooved cams, a roller adapted to engage said cams and connected with a vertical rod fulcrumed to the machine, a horizontal shifting rod in pivotal connection with said vertical rod, clutch members mounted on the main driving shaft, provisions for rotating one and reciprocating the other of said members, one of said clutch members being adapted to engage a gear on said shaft meshing with a miter-gear wheel of a vertical shaft, a sinker-gear and a gear meshing therewith mounted on the upper end of said vertical shaft, substantially as and for the purposes set forth.

25. A knitting machine provided with a cylinder, two groups of needles, holders, a two-part drum having an annular grooved cam, a roll adapted to engage therewith, a clutch shifting mechanism actuated by said roll, gearing adapted to operate a sinker-cam, strippers or carriages, rack-bars and cams adapted to actuate said strippers or carriages, substantially as and for the purposes set forth.

26. A knitting machine provided with a drum having an annular grooved cam, a vertical lever provided with a roller, the latter engaging said cam and said lever being connected with a horizontal clutch shifting rod, a main driving shaft, clutch members and provisions for causing the rotation of one and reciprocation of the other, a gear constructed so as to be connected with each clutch member, a sinker-cam, sinker-gearing actuated by said gear to communicate rotary and to and fro movements to said sinker-cam, and means for actuating said drum, substantially as and for the purposes set forth.

27. A knitting machine provided with a sinker-bed having sinkers, a sinker gear adapted to actuate said sinkers, a vertical shaft provided at one end with a miter-gear and at the other with a gear engaging said sinker-gear, a bevel-gear mounted on the main driving shaft and engaging the miter-gear of said vertical shaft, a clutch movable on a sleeve mounted on the main driving shaft, said sleeve provided with a pinion, which latter meshes with a sector-gear connected by means of a rod and a crank with a shaft carrying a gear, which latter meshes with a gear on the main driving shaft, whereby a rotary movement of said driving shaft is transformed into to and fro movement of the sinker-gear, substantially as and for the purposes set forth.

28. A knitting machine provided with two groups of needles, whereof one group is provided with springs having bits and whereof the other group has base bits, reciprocating segmental needle holders provided with grooved or recessed seats for the bits of said needles, one of said holders having a tapering or slanting body, oscillating strippers or carriages with toothed peripheries, grooved rack-bars engaging therewith, feathered brackets engaging the grooves of the rack bars, a sectional drum provided with grooved cams, means connected with said rack-bars and engaging the grooved cams of said drum for actuating said strippers or carriages, and means to impart a step-by-step movement to said drum, substantially as and for the purposes set forth.

29. A knitting machine provided with a fixed needle cylinder with radial notches, two groups of needles, web-holders with shanks and curved fingers, a flanged toothed beard closing ring with noses, cams or projections, a divided ring with complementary recesses or grooves, springs in engagement with said divided ring, and means for oscillating said beard closing ring and elevating and depressing said divided ring, substantially as and for the purposes set forth.

30. A knitting machine provided with needles movable in their support, segmental needle holders therefor, eccentrics for causing the alternate movements of said holders, strippers or carriages, means for oscillating the same comprising a sectional drum provided with an annular grooved cam and a clutch shifting mechanism provided with means adapted to engage said cam and to prevent rotation through friction of one of the needle operating eccentrics, substantially as and for the purposes set forth.

31. A knitting machine provided with needles movable in their grooved support or cylinder, reciprocating segmental needle holders, oscillating strippers or carriages, an oscillating beard closing ring, rack-bars engaging said strippers or carriages, a sectional counter-weighted drum provided with grooved cams, means connected with said rack-bars and engaging said grooved cams, and means



for actuating said drum and rack-bars for throwing certain of said needles into and out of action, substantially as and for the purposes set forth.

5 32. A knitting machine provided with two groups of needles, whereof the needles of one group are provided with spring catches having bits and whereof the needles of the other group have base-bits, a grooved needle cylinder, 10 complementary reciprocating segmental needle holders, strippers or carriages, rack-bars, a counter-weighted two-part drum and means for affording a step by step movement thereto, substantially as and for the purposes 15 set forth.

33. A knitting machine provided with two groups of needles, whereof the needles of one group are provided with springs having bits and whereof the needles of the other group 20 have bits, a grooved needle cylinder, segmental needle holders or carriers, strippers or carriages having toothed peripheries engaging rack-bars provided with rolling means which engage grooved cams or jackets of a counter- 25 weighted two-part drum and means for imparting a step-by-step movement to said drum, substantially as and for the purposes set forth.

34. A knitting machine provided with two groups of needles, whereof the needles of the 30 one have springs with bits and whereof the needles of the other have base bits, a fixed grooved cylinder or support therefor, complementary needle holders having recessed seats, one of said holders provided with a slanting 35 inner surface and both of said holders provided with a removable top-plate, substantially as and for the purposes set forth.

35. A knitting machine provided with a grooved needle cylinder for the reception of 40 needles, a needle holder reciprocated by an eccentric mounted on the main driving shaft, and a clutch shifting rod provided with a projecting arm adapted to engage a pin connected with said eccentric, substantially as 45 and for the purposes set forth.

36. A knitting machine provided with a shaft, a two part weighted drum, spring pressed pawls connected with the ratchets of said two-part drum and pawls connected with 50 a cross-arm which is actuated by a crank mounted on a shaft driven by gears from the main driving shaft, a sprocket wheel, a chain with a step or projection, and means for operating said wheel, substantially as and for 55 the purposes set forth.

37. A knitting machine provided with two groups of needles, whereof the needles of one group are provided with curved springs and bits and whereof the needles of the other 60 group are provided with base-bits, a fixed grooved needle cylinder, reciprocating segmental needle holders, oscillating strippers or carriages, longitudinal rack-bars provided with rollers, a counter-weighted two-part 65 drum with angular cams, a sprocket-wheel and pattern-chain with steps or projections, a spring pressed pawl connected with each

part of said drum and mechanism actuated from the main driving-shaft and adapted to be brought into engagement with said pawls 70 so as to start the drum and to impart a step-by-step movement thereto so as to permit of certain of said needles being thrown into and out of action, substantially as and for the purposes set forth. 75

38. A knitting machine provided with longitudinal rack-bars with grooved channels, feathered brackets engaging therewith, rollers journaled to said rack-bars, a grooved two-part drum, and means for imparting a 80 step-by-step movement thereto and to said rack-bars, substantially as and for the purposes set forth.

39. A knitting machine provided with needles having base-bits afforded a range of movement vertically in a grooved support, a complementary needle holder with an inner recessed or grooved seat and with a detachable plate or rim, a driving-shaft, an eccentric 85 mounted thereon and provided with a pin and a clutch-shifting mechanism provided with an arm adapted to engage the pin of said eccentric, substantially as and for the purposes set forth. 90

40. A knitting machine provided with a bed- 95 plate with a dish-shaped aperture, a grooved needle cylinder mounted therein, needles with curved springs and bits, a complementary needle holder with a grooved or recessed seat and with a slanting inner surface and oscillating 100 strippers or carriages adapted to disengage said needles to permit said holders to rise free thereof, substantially as and for the purposes set forth.

41. A knitting machine provided with a 105 fixed needle cylinder having radial notches or slots in the top thereof and carrying a detachable ring forming a support for the sinker-bed, bars and gear, an oscillating beard closing ring having noses adapted to engage recesses 110 of a spring controlled divided ring and to actuate the same, and web-holders engaging said ring, substantially as and for the purposes set forth.

42. A knitting machine provided with two 115 groups of needles movable in their support, needle holders actuated from a main driving shaft by means of eccentrics, oscillating strippers or carriages, rack-bars, a sectional drum and means for imparting a step-by-step movement to said drum and strippers or carriages, 120 substantially as and for the purposes set forth.

43. A knitting machine provided with two groups of needles, whereof the needles of one group have spring arms with bent ends forming bits, and whereof the needles of the other 125 group have lateral base bits, means for reciprocating the same in the direction of the lengths thereof, a grooved needle cylinder, a two-part counter-weighted drum having 130 grooved cams, rack-bars, strippers, spring pressed pawls, one of which is arranged at the end and the other near the end of the ratchets of said drum, and fixed pawls arranged oppo-



site said spring pressed pawls upon said ratchets, the same being adapted to shift said drum different distances, spring controlled lever-pawls, and a pattern-chain provided with pins or projections, substantially as and for the purposes set forth.

44. A knitting machine provided with two groups of needles, means for reciprocating the same in the direction of the lengths thereof, strippers or carriages, a two-part counter-weighted drum having grooved cams, rack-bars provided with rollers which engage certain of said cams, a sinker bed and sinkers, a sinker-gear, a gear meshing therewith carried by a vertical shaft journaled to the machine, a miter-gear at the lower end of said shaft meshing with a similar gear on the main driving shaft provided with sockets having pins therein adapted to engage complementary sockets of adjacent clutch-members on said shaft, a pinion connected with one of said clutch members, a sector-gear meshing with said pinion and actuated from the crank-arm of a cross-shaft provided with a gear meshing with a complementary gear of said driving shaft, and means for actuating said drum, substantially as and for the purposes set forth.

45. A knitting machine provided with two groups of needles, segmental holders for reciprocating the same, eccentrics, a driving shaft, oscillating strippers or carriages, rack-bars, a two part drum with grooved cams, rollers adapted to engage and travel in said grooved cams, spring pressed and fixed pawls connected with said drum, pawls pivotally connected with a cross-arm, and means for actuating said cross-arm, substantially as and for the purposes set forth.

46. A knitting machine provided with needles movable in a channeled and notched cylinder, reciprocating segmental needle holders, oscillating strippers or carriages, rack-bars, a spring controlled divided ring provided with recesses, a beard closing ring provided with noses or projections, movable web-holders engaging the notches of said cylinder, a sectional drum having grooved cams, devices adapted to engage and travel in said cams, and means for imparting a step-by-step movement to said drum and actuating said devices and strippers or carriages, substantially as and for the purposes set forth.

47. A knitting machine provided with a grooved needle cylinder having two groups of needles afforded a range of vertical movement therein, one group of said needles being engaged by a segmental needle holder and the other group detachably connected with a segmental needle holder, said holders reversely actuated in the direction of the lengths of the respective needles of the groups, oscillating strippers, a two-part drum provided with grooved cams, and means connected with the main driving shaft for actuating and controlling said drum, substantially as and for the purposes set forth.

48. A knitting machine provided with needles,

a fixed needle-cylinder, segmental needle holders alternately reciprocated from the main driving shaft, oscillating strippers or carriages for throwing needles into and out of action, an oscillating beard closing ring provided with noses or projections, a divided spring controlled ring provided with recesses, movable web-holders and means for actuating said beard closing ring so as to engage and disengage meshes of a web to and from said holders, substantially as and for the purposes set forth.

49. A knitting machine provided with a fixed needle cylinder, fashioning needles provided with spring arms with bent ends forming bits, a segmental needle holder therefor, movable web-holders, strippers or carriages, an oscillating beard closing ring with noses or projections, a spring controlled divided ring with recesses, a main driving-shaft provided with an eccentric, a rod and a strap provided with a pivotal connection for actuating said holder so as to impart a reciprocating motion thereto, a two-part drum, and means for actuating the same, substantially as and for the purposes set forth.

50. In a knitting machine, a fixed needle cylinder provided with two groups of needles, whereof one group is provided with spring arms having rear bits engaging a slanting recessed segmental needle holder, and whereof the other group of needles is provided with lateral base bits engaging a recessed segmental needle holder, and vertical connecting rods attached to posts of said holders and to straps of eccentrics mounted on a main driving shaft and adapted to impart a reciprocating motion to said holders, substantially as and for the purposes set forth.

51. A knitting machine provided with a fixed needle cylinder, needles, segmental needle holders, strippers or carriages, means for actuating the same through the intervention of a two-part drum provided with grooved cams and having means connected therewith for imparting a step-by-step motion thereto and to said strippers or carriages, a sinker-gear, sinkers, sinker-bed, means to rotate said sinker-gear, and means to change the rotary movement into a reciprocating movement, substantially as and for the purposes set forth.

52. In a knitting machine, a main driving shaft, having two clutch members with provisions for rotating one and reciprocating the other and both of said members being adapted to engage and be disengaged from a miter-gear, the latter meshing with a complementary gear connected with a vertical shaft, said shaft carrying a gear which meshes with the gear of a sinker-bed, sinker-bars, said sinker gear having a cam to actuate said bars, a cylinder provided with needles, segmental needle holders, strippers or carriages adapted to be operated so as to throw certain of said needles out of action, a beard closing ring, and means for actuating the same, substantially as and for the purposes set forth.



53. A knitting machine provided with needles, a notched and grooved needle-cylinder, means for reciprocating said needles in the direction of the lengths thereof, a beard closing ring provided with noses, lugs or projections reversely disposed with respect to each other, a divided spring controlled ring having complemental recesses or grooves, web-holders connected with said needle-cylinder and divided spring controlled ring and the shanks thereof detachably engaging the notches of said cylinder, and means for oscillating said beard closing ring and actuating said web-holders, substantially as and for the purposes set forth.

54. A knitting machine provided with a drum having cams, means adapted to engage therewith and connected with rack-bars, a lever provided with a roller at one end and at the other end connected with a rod which is provided with means adapted to engage clutch members, whereof one is mounted on the main driving shaft and whereof the other is mounted on a sleeve loose on said shaft, a pinion secured to said sleeve, a sector gear meshing therewith and actuated from the crank-arm of a cross-shaft provided with a gear, the latter meshing with a gear-wheel secured to said main driving-shaft, a miter-gear mounted on said main driving shaft and meshing with a complemental gear of a vertical shaft carrying at the upper end thereof a gear meshing with a sinker-gear, a sinker-bed and sinkers, eccentrics mounted on said driving shaft and their accessories connected with needle-holders, needles, a needle-cylinder, strippers or carriages controlled by said rack-bars, and means for actuating said drum, substantially as and for the purposes set forth.

55. A knitting machine provided with a fixed needle cylinder having a ribbed or channeled surface engaging a dish-shaped recess in the bed-plate of the machine, two groups of needles, whereof one group is provided with spring catches and whereof the other group is provided with bits, segmental needle holders, a main driving shaft, means connected therewith for reciprocating said holders, and strippers or carriages adapted to permit certain of said needles to be thrown into and out of action, substantially as and for the purposes set forth.

56. A knitting machine provided with two groups of needles, whereof one group is provided with spring arms with bits which are adapted to permit said bits to engage and disengage a complemental needle holder, strippers or carriages adapted to permit of certain of said needles being thrown out of action, and whereof the other group of needles is provided with lateral bits actuated by a holder having actuating means, said means having provisions for being thrown out of and into action, a ring connected with said cylinder for supporting the sinker-bed carrying sinker bars and gear, and a gear having provisions for being connected and disconnected to and from a

clutch device upon the main driving shaft of the machine and connected to said sinker-gear, substantially as and for the purposes set forth.

57. A knitting machine provided with needles movably connected with a fixed needle cylinder, segmental holders for said needles, means comprising clutch members for reciprocating said holders and needles alternately in up and down directions, a two-part drum provided with angular and annular grooved cams, rollers adapted to engage said angular cams and connected with rack-bars, strippers or carriages, a roller provided at one end of a pivotal lever and engaging the cams of said annular groove, a horizontal rod connected with the other end of said lever and actuating said clutch members, a main driving shaft, and means connected with said shaft for imparting motion to said drum, substantially as and for the purposes set forth.

58. A knitting machine provided with a two-part drum having a ratcheted end, a shaft carrying a sprocket-wheel, a ratchet-wheel loose on said shaft, means for actuating said ratchet-wheel, lever-pawls adapted to engage the ratcheted end of said drum, fixed and movable pawls connected with said drum, and a chain mounted on said sprocket-wheel and provided with lugs for shifting said movable pawls, substantially as and for the purposes set forth.

59. A knitting machine provided with two groups of needles, whereof one group is fixed to a segmental holder, and whereof the other group is detachably connected with a segmental holder, a fixed needle-cylinder, strippers or carriages, a two-part drum provided with angular grooved cams, spring pressed pawls connected with said drum, a lever-pawl adapted to actuate said spring pressed pawls, a pattern-chain, rack-bars, and means for imparting motion to the said lever-pawl, substantially as and for the purposes set forth.

60. A knitting machine provided with a needle cylinder, two groups of needles, whereof one group is provided with spring arms with bent ends forming bits engaging a segmental holder having a recessed seat and a slanting interior surface, and whereof the other group is provided with bits engaging a segmental holder, said needles being reciprocated in up and down directions by means of eccentrics mounted on the main driving-shaft one of said eccentrics being clutched thereto, and means for engaging and disengaging said eccentric to and from said shaft, substantially as and for the purposes set forth.

61. A knitting machine provided with a fixed needle cylinder, two groups of needles, whereof one group has spring arms with bent ends forming bits, and whereof the other group is provided with bits, said groups of needles being reciprocated alternately in the direction of the lengths thereof, segmental needle-holders actuated from the main driving shaft, strippers or carriages oscillated at right angles to the direction of movement of



said needles for throwing one group out of action, an oscillated beard closing ring, a sinker-bed carrying a sinker-gear and sinker-bars, and means for rotating the same and changing the direction of movement thereof, substantially as and for the purposes set forth.

62. A knitting machine provided with a main driving shaft, a pivotal forked lever actuated by said shaft, a beard closing ring provided with noses or projections, a horizontal arm connected to the beard closing ring and engaged by said lever, a sinker-bed, sinkers and sinker-gear, gearing for actuating said sinker-gear comprising clutch mechanism connected with said driving shaft, a divided ring provided with recesses, a needle cylinder and web-holders having shanks engaging notches of said cylinder, substantially as and for the purposes set forth.

63. A knitting machine provided with a fixed needle cylinder, a spring controlled divided ring provided with recesses reversely disposed with respect to each other, said ring afforded a slight range of vertical movement, an oscillating beard closing-ring provided with lugs or projections engaging said recesses and controlled by means of a vibrating arm through the oscillations of a pivotal lever actuated from the main driving shaft, and web-holders normally engaging said cylinder and said spring controlled divided ring, substantially as and for the purposes set forth.

64. A knitting machine provided with a fixed grooved needle cylinder, two groups of needles engaging the grooves thereof, means for reciprocating said needles alternately in vertical directions, oscillating strippers or carriages for releasing certain of said needles, a divided spring controlled ring provided with recesses or grooves, web-holders, an oscillating beard closing-ring provided with noses, cams or projections, and means for oscillating said beard closing-ring and throwing said web-holders into and out of action, substantially as and for the purposes set forth.

65. A knitting machine provided with a main driving shaft, a gear mounted thereon and provided with internal pockets, pins in said pockets adapted to be brought into engagement with clutches on said shaft, a complementary gear mounted on a vertical shaft and meshing with said gear, said shaft carrying a second gear, and a sinker-gear meshing therewith, substantially as and for the purposes set forth.

66. In a knitting machine, a main driving shaft, a clutch shifting mechanism, an arm projecting from the clutch shifting rod of said mechanism, and having a recessed extremity adapted to engage a pin and an eccentric mounted on said shaft, substantially as and for the purposes set forth.

67. A knitting machine provided with a fixed needle cylinder, a base-plate having a tapering or dish-shaped opening therein, two groups of needles, whereof one is provided with lower flaring springs with angular bits,

and whereof the other is provided with angular bits, said bits engaging segmental needle holders, a main driving-shaft, eccentrics mounted thereon and provided with straps and connecting rods in pivotal connection with posts of said needle-holders, oscillating strippers, rack-bars, a drum, and means for imparting step-by-step motion thereto, substantially as and for the purposes set forth.

68. A knitting machine provided with oscillating strippers or carriages, pins engaging with said strippers or carriages and with the bed-plate of the machine to prevent displacement thereof, rack-bars provided with grooved ways, feathered brackets engaging said ways, rollers connected with said rack-bars, a two-part drum provided with cams, and means for imparting motion to said drum, substantially as and for the purposes set forth.

69. A knitting machine provided with a fixed needle cylinder having top notches and recesses in the body thereof, web-holders provided with curved fingers and with lateral shanks and end projections adapted to engage said recesses and notches, a ring provided with reversely disposed recesses or grooves, means for raising said ring, a beard closing-ring provided with an inner flange having teeth formed in the surface thereof and cams, lugs or projections depending therefrom, and means for imparting an oscillating movement to said beard closing ring, substantially as and for the purposes set forth.

70. A knitting machine provided with a fixed needle cylinder, two groups of needles, whereof one group has spring arms with bent ends forming bits, which arms are adapted to permit said bits to engage and to be disengaged from their segmental holder, and whereof the other group has base-bits adapted to engage a segmental holder, a flanged beard closing-ring having teeth arranged around the inner edge and one tooth thereof being larger than the remaining teeth of said ring, a complementary recess corresponding to the larger tooth of said ring, and means, substantially as described, for oscillating said ring and actuating said holders, substantially as and for the purposes set forth.

71. A knitting machine provided with two groups of needles, whereof one is provided with spring catches, needle holders therefor, oscillating strippers or carriages, a two-part counter-weighted drum provided with angular grooved cams and with a ratcheted end and spring pressed pawls, a sprocket-wheel carrying a sprocket-chain, a ratchet-wheel, and means adapted to be brought into engagement with the ratcheted end of said drum for imparting step-by-step motion to said drum, substantially as and for the purposes set forth.

72. A knitting machine provided with two groups of needles, whereof one group is provided with spring arms with bent ends forming bits, both groups engaging segmental needle holders alternately reciprocated in the direction of the lengths of the needles from



the main driving shaft by means of eccen-  
trics, a fixed grooved needle cylinder, oscil-  
lating strippers or carriages connected with  
rack-bars actuated by rollers adapted to  
travel in cams of a two-part weighted drum,  
a sinker-bed supported from said cylinder  
and provided with sinker-bars, sinker-gear,  
and means for actuating said sinker-gear, sub-  
stantially as and for the purposes set forth.

73. A knitting machine provided with a  
drum having spring pressed pawls limited as  
to their range of movement by means of pins,  
a sprocket-wheel mounted on the drum shaft  
and carrying a sprocket-chain with steps or  
projections, and lever-pawls adapted to be  
brought into engagement with the ratcheted  
end of said drum and with the spring pressed  
pawls, substantially as and for the purposes  
set forth.

74. A knitting machine provided with a di-  
vided ring having pins projecting therefrom,  
a sinker-bed with a depending extension pro-  
vided with recesses or slots for the reception  
of the pins of said ring, and means for elevat-  
ing and depressing said ring, substantially as  
and for the purposes set forth.

75. A knitting machine provided with needles,  
a fixed grooved needle cylinder, reciprocating  
segmental needle holders or carriers, a spring  
controlled divided ring with projecting pins  
and recesses or grooves, a sinker-bed with a  
projecting slotted frame adapted for the reception  
of the pins of said ring, a sinker-gear and bars,  
a beard closing-ring provided with noses, lugs  
or projections, movable web-holders actuated  
by said spring controlled ring, a cam mounted  
on the main driving shaft and connected with a  
clutch, a lever limited as to its range of movement  
by means of pins and causing the movement of  
said beard closing-ring and actuated by said cam,  
substantially as for the purposes set forth.

76. In a knitting machine, a divided drum  
provided with a jacket with grooved cams for  
the reception of travelers, said drum being  
provided with spokes and weighted arms project-  
ing from the divided hubs thereof, substantially  
as and for the purposes set forth.

77. In a knitting machine, a divided drum  
provided with a jacket with grooves or recesses  
formed therein, said drum having a divided hub,  
with spokes and weighted arms and a distance-  
piece between the members of said hub, sub-  
stantially as and for the purposes set forth.

78. A knitting machine provided with a shaft  
having a threaded end, a divided drum with a  
two-part jacket having grooves or recesses  
formed therein, a divided hub integrally con-  
nected with said drum and provided with radial  
arms having weights connected therewith, a  
distance-piece between the members of said  
divided hub, a sprocket-wheel with a step-like  
hub having a ratchet-

wheel secured thereto, washers and a jam-  
nut applied to the threaded portion of said  
shaft, substantially as set forth.

79. A knitting machine provided with a counter  
weighted two-part drum mounted on a shaft  
and having divided hubs with a distance piece  
and provided with a grooved jacket, strippers  
or carriages, means adapted to engage and travel  
in the grooves of said jacket carried by rack-bars  
for actuating said strippers or carriages, and  
means for imparting step-by-step movement to  
said drum, substantially as and for the purposes  
set forth.

80. A knitting machine provided with fashioning  
needles having spring arms with bits, a segmen-  
tal reciprocating needle holder or carrier actuated  
by an eccentric provided with a strap and connect-  
ing rod, a main driving-shaft, movable strippers,  
rack-bars with travelers, a counter weighted drum  
with a flanged ratcheted end, a jacket having  
grooves formed therein, lever-pawls, fixed and  
spring pressed pawls connected with the ratcheted  
end of said drum, and a pattern chain having  
lugs adapted to engage said spring pressed  
pawls, substantially as and for the purposes  
set forth.

81. A knitting machine provided with a divided  
drum having a flanged ratcheted end, slotted  
pawls pivoted to said drum, springs engaging  
said pawls, a pattern chain with lugs, spring  
controlled pawls connected with a pivotal cross-  
arm, and means for actuating said cross-arm,  
substantially as and for the purposes set forth.

82. A knitting machine provided with a drum  
having grooved cams and a flanged end with  
teeth, spring controlled pawls connected with a  
pivotal cross-arm, one of said pawls provided  
with a recessed surface, a pin located in the  
path thereof, spring pressed pawls pivotally  
connected with said drum and limited as to their  
range of movement by means of pins, a pattern-  
chain provided with lugs for actuating said  
pawls, and means for actuating said cross-arm,  
substantially as and for the purposes set forth.

83. A knitting machine provided with a drum  
having a ratchet, slotted spring pressed pawls  
connected with said drum, pins engaging the  
slotted portions of said pawls to limit the range  
of movement thereof, a main driving shaft,  
lever-pawls operated from a crank-shaft actuated  
from said main driving shaft, a sprocket wheel  
and a chain provided with steps or lugs, sub-  
stantially as and for the purposes set forth.

In testimony whereof I have hereunto set  
my signature in the presence of two subscrib-  
ing witnesses.

EMIL J. FRANCK.

Witnesses:

THOMAS M. SMITH,  
RICHARD C. MAXWELL.