

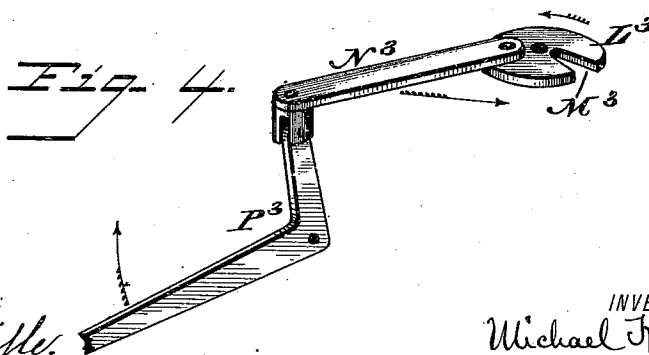
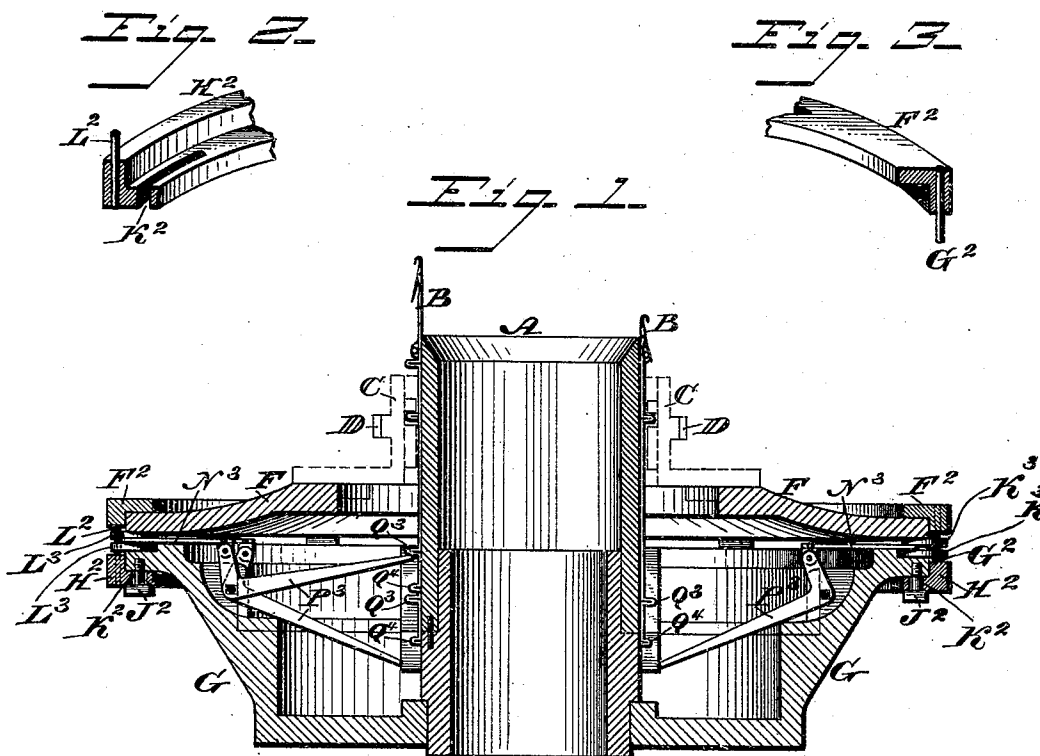
(No Model.)

7 Sheets—Sheet 1.

M. KIRSHNER.
KNITTING MACHINE.

No. 479,601.

Patented July 26, 1892.



WITNESSES:

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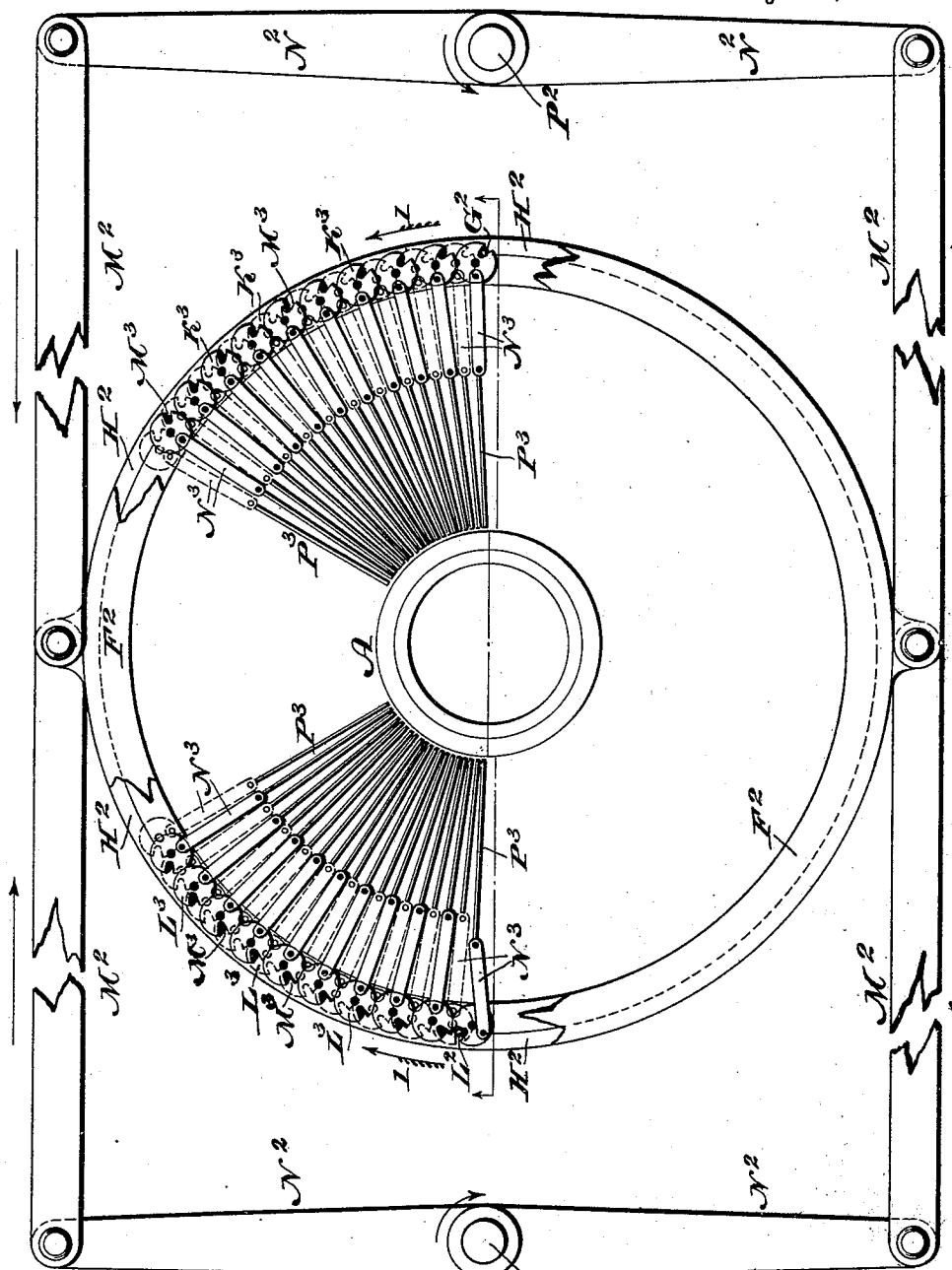
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7 Sheets—Sheet 2.

M. KIRSHNER.
KNITTING MACHINE.

No. 479,601.

Patented July 26, 1892.



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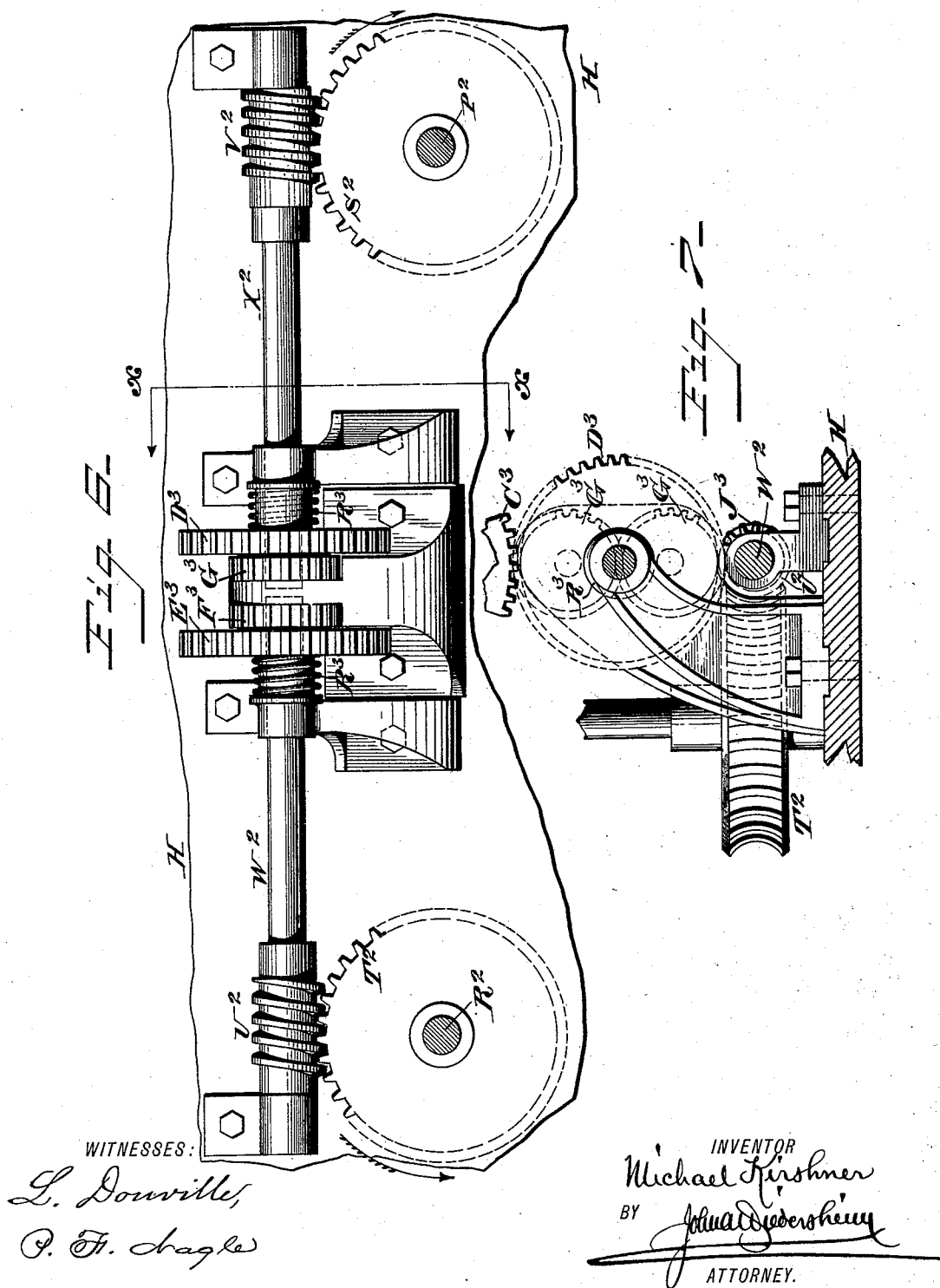
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7 Sheets—Sheet 3.

M. KIRSHNER.
KNITTING MACHINE.

No. 479,601.

Patented July 26, 1892.



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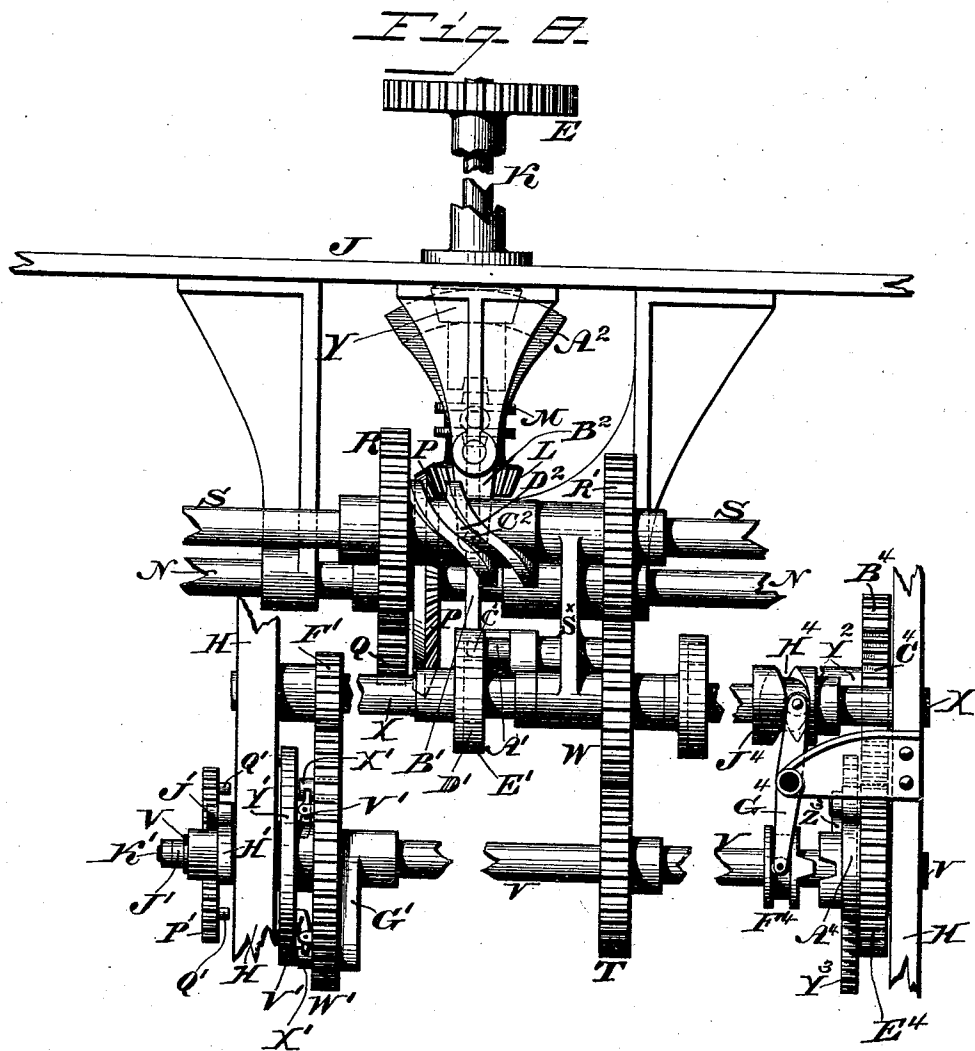
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7 Sheets—Sheet 4.

M. KIRSHNER.
KNITTING MACHINE.

No. 479,601.

Patented July 26, 1892.



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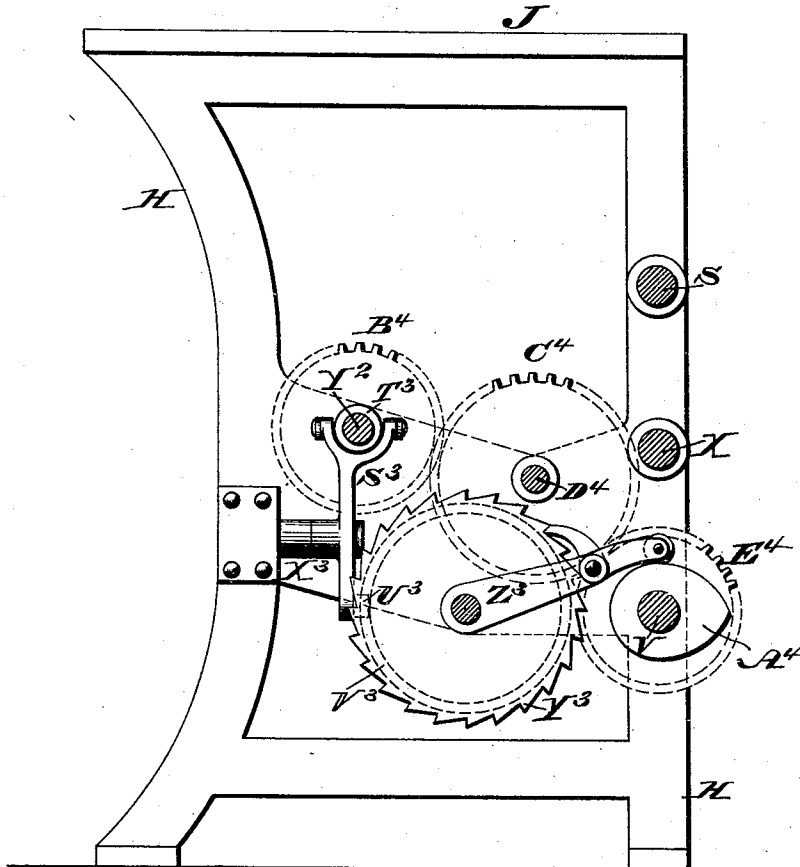
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M. KIRSHNER.
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Fig. 5.



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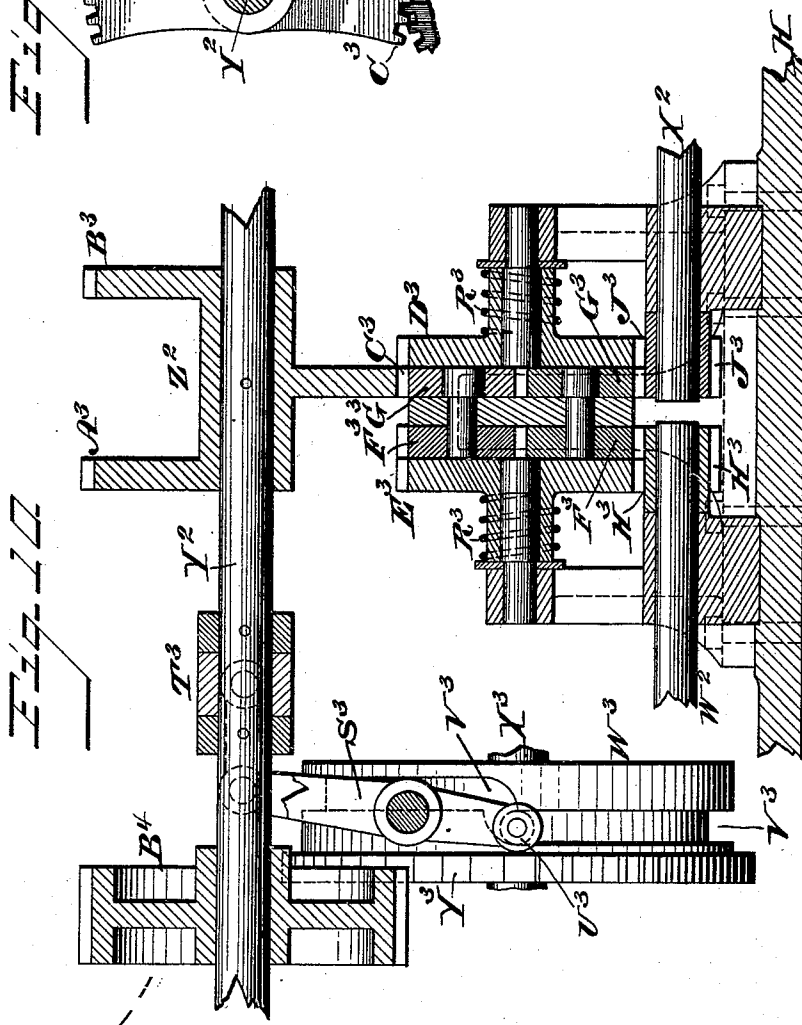
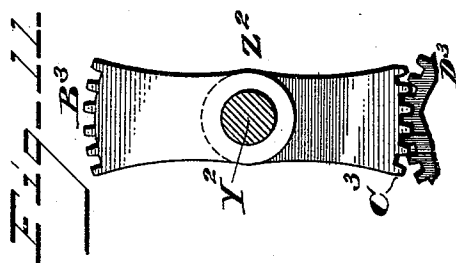
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7 Sheets—Sheet 6.

M. KIRSHNER.
KNITTING MACHINE.

No. 479,601.

Patented July 26, 1892.



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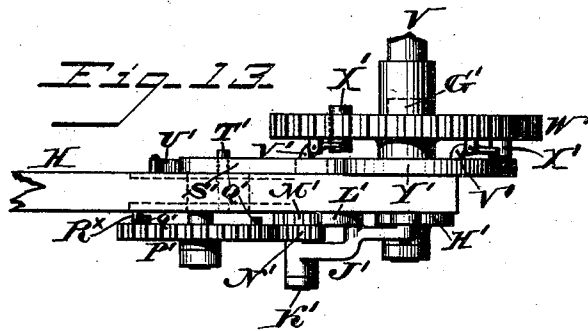
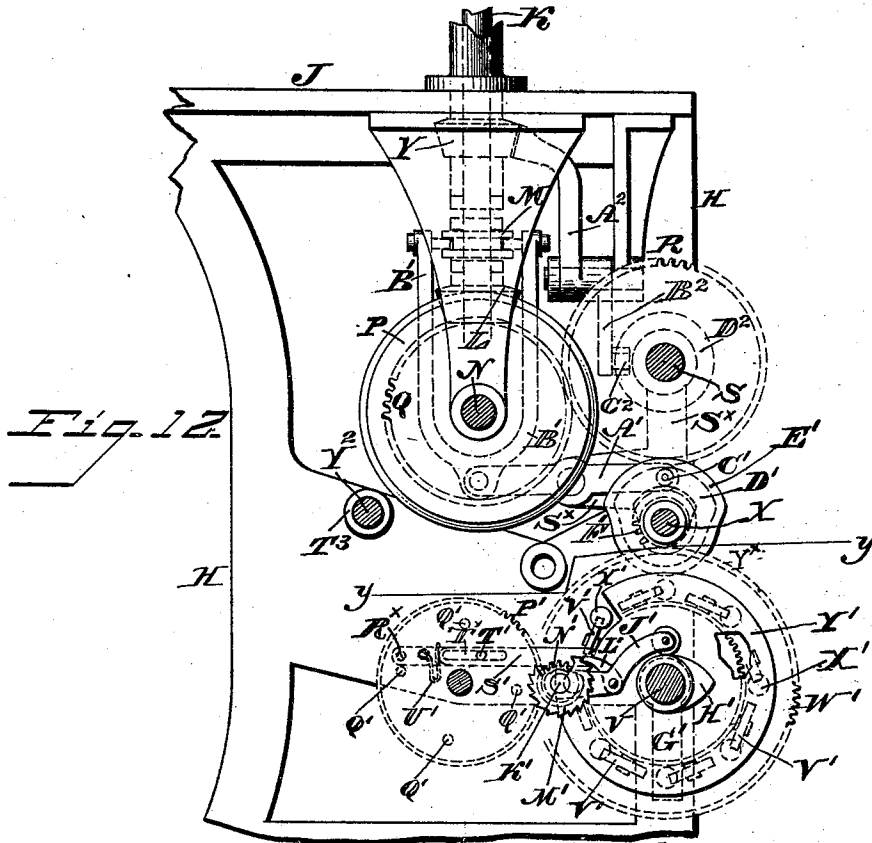
(No Model.)

7 Sheets—Sheet 7.

M. KIRSHNER.
KNITTING MACHINE.

No. 479,601.

Patented July 26, 1892.



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UNITED STATES PATENT OFFICE.

MICHAEL KIRSHNER, OF PHILADELPHIA, PENNSYLVANIA.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 479,601, dated July 26, 1892.

Application filed January 24, 1891. Serial No. 378,950. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL KIRSHNER, a subject of the Czar of Russia, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Knitting-Machines, which improvement is fully set forth in the following specification and accompanying drawings.

My invention relates to improvements in circular-knitting machines, and has for its object to provide improved means for automatically and alternately changing the motion of the cam-cylinder from a rotary to an oscillating movement, and also to provide improved means for regulating the time of each of said movements; and for this purpose it consists of mechanism substantially as hereinafter described and claimed.

It further has for its object to provide improved means for automatically removing the required needles of the needle-cylinder in knitting the heel and toe portions of a stocking; and for this purpose it consists of the mechanism substantially as hereinafter described and claimed.

It further consists of the combination of parts hereinafter set forth.

Figure 1 represents a vertical section of a portion of a circular-knitting machine embodying a part of my invention. Figs. 2 and 3 represent, respectively, perspective views of portions of the lower and upper rings of the throwing-out mechanism. Fig. 4 represents a perspective view of detail portions of the throwing-out mechanism. Fig. 5 represents a plan view of a portion of the said throwing-out mechanism, showing the oscillating rings with the operating-levers therefor and the disks with connected levers for raising the needles on an enlarged scale. Fig. 6 represents a horizontal view of a portion of the operating mechanism for the rings on an enlarged scale. Fig. 7 represents a vertical section on line *x x*, Fig. 6. Fig. 8 represents a side view of a portion of the operating mechanism of the device. Fig. 9 represents a vertical section of a portion of the machine, showing a portion of the means for operating the throwing-out mechanism. Fig. 10 represents a vertical section of a portion of the throwing-out mechanism on an enlarged scale.

Fig. 11 represents an end view of a detail portion thereof. Fig. 12 represents a vertical section of the mechanism for operating the cam-cylinder. Fig. 13 represents a plan view on line *y y*, Fig. 12.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings, A designates a needle-cylinder having the needles B vertically movable in grooves thereon, and C designates a cam-cylinder for raising and lowering said needles, said cylinders being of any usual and well-known construction. The cam-cylinder C is provided with a surrounding gear-wheel D, which is engaged by a rotary gear-wheel E, the operating mechanism for which will be hereinafter described, and is supported on a bed F of the frame G. H designates a frame, on the top J of which the said frame G is located.

To impart a continuous rotary motion to the cam-cylinder during the knitting of the main or leg portion of a stocking, the following-described mechanism is employed: The gear-wheel E is secured to a vertical shaft K, which carries a bevel gear-wheel L, loosely mounted on its lower end, and a clutch mechanism M, rotatable with said shaft and adapted to engage said bevel gear-wheel.

On a shaft N, journaled in the frame H, are secured a bevel gear-wheel P and a gear-wheel Q, the former wheel engaging the bevel gear-wheel L on the vertical shaft K and the latter meshing with a gear-wheel R on a shaft S, parallel with said shaft N. The said shaft S has also thereon the gear-wheel R', connected with the gear-wheel T of the main driving-shaft V by means of the gear-wheel W on an intermediate shaft X. The said main driving-shaft V receives motion from any suitable motor by any usual and well-known means.

To shift the clutch M from engagement with the bevel gear-wheel L and into engagement with a boss or collar on a bevel gear-wheel Y, loosely mounted on the shaft K, so as to stop the continuous motion of the shaft K and impart oscillating motion thereto, the following-described mechanism is employed: Pivoted to a suitable support consisting of a hanger S', loosely connected with the shafts

S and X, is a lever A', having a yoke B' pivotally attached to one end, the said yoke having pins fitting in a peripheral groove in the clutch M, so that the clutch can rotate without rotating the yoke, the other end of the lever being provided with a stud or pin C', fitting in a cam-groove D' on the side of a cam E', the said cam being secured to a gear-wheel F', loosely mounted on the shaft X.

On the main driving-shaft V is secured an arm G' and a cam H', the latter when rotated being adapted to raise and lower the roller end of a lever J', which is pivoted at its other end to a stud K' and carries a pawl L', adapted to engage the teeth of a ratchet-wheel M', loosely mounted on said stud K' and secured to a pinion N', which latter engages with a gear-wheel P', suitably journaled in the frame H.

Projecting from the side of the gear-wheel P' are a number of removable pins Q', adapted to bear against a pin or projecting portion R^x of a double bar S', located on both sides of the frame H, and having its respective parts connected by a pin T', which is guided in a slot T^x of the frame H. A spring U', attached to the said frame, bears against a shoulder on the bar S', so as normally to keep one end thereof in a recess or cut-away portion Y^x of a disk Y', which is also secured to the said frame.

On the shaft V is loosely mounted a gear-wheel W', to the side of which is pivoted a series of levers V', each having an end inserted in a corresponding end of a pin X', movable in an opening in the said gear-wheels and adapted when projecting from the side of the said wheel opposite from that on which the said levers V' are secured to be in the path of the arm or carrier G'. The said levers are held so as to keep the pins from projecting in the path of said carrier by means of the said disk Y', except at said recess Y^x, when the bar S' is drawn therefrom by reason of the contact of a pin Q' therewith. The said sliding bar S' when not engaged by a pin Q' is held by the spring U' in or at said recessed portion Y^x, so as to be in contact with and bear against one end of a lever V' opposite said recess; but when the bar is withdrawn from the said recess one end of a lever V' enters the same, thereby moving its pin at the other end, so as to project in the path of the carrier. The pins Q' may be inserted in different positions in the gear-wheel P', so as to regulate the intervals of time between their engagement with the pin R^x of the bar S', and thereby control the time of the projecting of a pin X', and consequently of the rotation of the gear-wheel W' and the shifting of the cam E' and the lever A' with the clutch M.

A² designates a pivoted segmental piece having a toothed rim engaging the bevel gear-wheel Y and provided with an arm B², having a pin C², which works in a cam-groove D² on the shaft S, so that the rotation of said shaft will oscillate the said arm and segment,

thereby imparting oscillating motion to said bevel gear-wheel Y and also to the shaft K when the clutch M is connected with the said bevel gear-wheel Y.

The mechanism employed for throwing out and in the needles on each side necessary in forming the pockets for the heel and toe portions is as follows: F² and H² designate two oscillating rings, the upper one F² of which is adapted to move on the rim of the bed F and has a projecting portion provided with a downwardly-projecting pin G², and the lower one H² is guided on the outer edge of the frame G by means of the bolts J², passing through the slots K² in said ring and secured in the frame G, and has an upward-projecting pin L². The one set of rods M² is connected to ears upon or otherwise secured to the sides of the ring F², and the other set of said rods is in like manner attached to ring H², and also to the levers N², secured to the vertical shafts P² and R², which are on opposite sides of the needle-cylinder and have suitable bearings in the frame H. On the shafts P² and R², respectively, are the worm-wheels S² and T², meshing with the worms U² and V² on the horizontal shafts W² and X². Motion in opposite directions is conveyed from the rotary shaft Y², parallel with the driving-shaft and journaled in the frame H to the said shafts W² and X² by means of the forked segmental piece Z², secured on said shaft Y² and having toothed outer edges A², B², and C², respectively, an intermediate train of gearing consisting of the gear-wheels D² E², having suitable bearings on arms or other projecting portions of the frame H, and the pairs of pinions F² G², loosely mounted on their shafts, each of said pinions being of one-half the diameter of the gear-wheels D² and E² and also journaled on a portion or attachment of the said frame H. The two pinions of the same pair mesh with each other, and the said pairs of pinions and the gear-wheels D² E² are adapted to mesh with the tooth-rims A², B², and C² of the segmental piece Z² and with pinions H² J² on the shafts W² and X², respectively. It will be seen that when the parts are in the position shown in Fig. 10 the rotation of the shaft Y² will rotate the shafts X² and W² in opposite directions, thereby moving the shafts P² and R², with the rings F² H², in opposite directions, so that the pins G² and L² of the said rings will travel in the direction of the arrows 1 1, Fig. 5.

Journaled in and located between the frames F and G are two series of disks K² and L², each series having half of its disks secured to the upper frame and half to the lower frame, each series being respectively in the path of travel of the pins G² and L² and each of the said disks having a recess M², adapted to receive a pin and as the same is advanced be rotated thereby, so as to operate an arm N², which is attached to an angle-lever P², and when moved in one direction will so operate said lever as to contact with a heel or project-

ing portion Q³ on the needle B and lift the said needle and when moved in the opposite direction will cause the said lever to contact with a shorter and lower heel Q⁴ and depress or lower the needle. Springs R³ on the hubs of the gear-wheels D³ and E³ and bearing against the said wheels and the frame H serve to keep the said gear-wheels and the pinions F³ and G³ in proper position for engagement with the segmental piece Z². The parts are so timed that the time between the movement of adjacent disks by a pin is equal to the time of an oscillation of the said cylinder, so that at each oscillation of said cylinder a needle is thrown either in or out on each side of the half of the needle-cylinder, so as to form the pocket for the heel or toe portion.

To reverse the motion of the rings, so as to lower the needles B, which had been thrown out, and bring them into operation, the shaft Y² is moved endwise, so as to bring the toothed rim C³ in such position that when rotated it engages with the pinion F³ and the toothed rim B³ engages with the gear-wheel D³, whereby each of the shafts X² and W² is rotated in an opposite direction from that in which it was rotated before the shaft Y² was shifted or moved endwise. To accomplish this lateral movement of the said shaft Y², a yoke S³, pivoted to the frame and having arms with pins fitting in a grooved collar T³, which is secured to the said shaft, is employed. The said yoke has also a pin U³, fitting in a cam-groove V³ on a wheel W³, which is loosely mounted on a stud X³, attached to one end of the frame H. Secured to the said wheel W³, so as to rotate the same, is a ratchet-wheel Y³, which is rotated by means of a rising-and-falling pawl-lever Z³, operated by the rotation of a cam A⁴ on the driving-shaft V. The shaft Y² is rotated by means of a gear-wheel B⁴ thereon, which meshes with an intermediate gear-wheel C⁴ on the shaft D⁴, the latter wheel meshing with a gear-wheel E⁴, loosely mounted on the main driving-shaft V and connected therewith by a clutch F⁴, rotatable with said shaft. It will be seen that the ratchet-wheel Y³ has the proper number of teeth coinciding with the oscillations of the cam-cylinder and the sections of the ring, so that the shaft Y² will be shifted or moved endwise, as desired, when the throwing out or throwing in of the needles is to be accomplished.

The clutch F⁴, which is keyed on the shaft V so as to have lateral movement thereon, as well as to rotate therewith, is operated by a lever G⁴, pivoted to a portion of the frame H and having a yoke with pins in a peripheral groove of the said clutch. The other end of the lever G⁴ carries a pin moving in a cam-slot H⁴ of a collar J⁴, secured to the shaft X, said cam-slot being so formed that the lever G⁴ will be oscillated, so that the clutch F⁴ will engage the wheel E⁴ when the cam E' on the shaft X is operated, so as to cause the clutch M on the shaft K to be free from the bevel gear-wheel L, and the said clutch F⁴ will be

free from the said wheel E⁴ when the said clutch M is in engagement with the said bevel gear-wheel L.

The operation of the machine is as follows: The main driving-shaft V communicates rotary motion to the cam-cylinder C by means of the gear-wheels T, W, R', R, and Q, bevel-wheels P and L, clutch M, gear-wheel E, and the gear-wheel D on the cam-cylinder. The time of the continuance of said motion is regulated by the time of the engagement of the clutch M with the bevel-wheel L, and this latter is controlled by the movement of the grooved cam E', which operates the lever A', shifting the said clutch. The successive movements of the cam E' are regulated by the arrangement or location of the pins Q' in the wheel P', whereby the bar S' is freed, as desired, from a lever V', so that a pin X' will project from the wheel W' and be in the path of the carrier or arm G' on the shaft V. If the pins are arranged at equal distances apart, it will be seen that the times of the shifting or turning of the cam E' will be uniform, so that the time of the clutch M being engaged with the bevel-wheel L will be equal to the time it is disengaged therefrom. The contact of the pins Q' with the projecting portion R^x of the bar S' will cause the shoulder thereon in contact with the spring U' to bear against and compress the same while said pin is in contact and bears against said projection R^x. During the continuous rotary motion of the cam-cylinder the tubular leg or main portion or the foot portion of a stocking may be knit. The parts of the machine are so timed that when it is required to knit a pocket for the heel or toe portion the shifting or turning of the cam E' disengages the clutch M from the bevel gear-wheel L and engages it with the bevel gear-wheel Y, so that oscillating motion is communicated to the shaft K, and thus to the cam-cylinder, by means of the oscillating segment A², with pin C², the rotary shaft S, with cam-groove D², and the train of gear-wheels R', W, and T, the latter wheel T being on the driving-shaft V. At the time of the said turning of the cam E' the pin on the lever G⁴, which is in the cam-groove H' of the collar J', is moved, owing to the conformation of said groove, so that the said lever is vibrated, thereby moving the clutch F⁴ on the main driving-shaft, so as to connect it with the loose gear-wheel E⁴, and thus communicate motion by means of the gear-wheels C⁴ and B⁴ to the shaft Y². The segmental piece Z² thereon operates the pinions G³ and gear-wheel E³, so as to convey rotary motions to the shafts X² and W² and the worms V² and U², respectively, in opposite directions, thereby by means of the worm-wheels S² and T² rotating the shafts P² R², with their levers N², in opposite directions from each other. The movement of the levers N² operates the rods M², thereby turning the rings F² and H² in the directions of the arrows 1, Fig. 5, thus bringing the pins G² and L² successively in

the recesses M^3 in the series of disks L^3 and K^3 , respectively, so that a disk on each side or of each series is rotated, thereby operating the connected arms N^3 and levers P^3 , and thus lifting a needle B on each side, throwing it out of the way of the cam-cylinder. Before narrowing begins, however, it will be understood one-half of the needles are thrown out of action. The parts are so timed that between each oscillation of the cam-cylinder each of the pins G^2 and L^2 rotates a disk and is in readiness to rotate the adjacent one. When it is required to throw in the needles which had been thrown out, so as to complete the pocket, the shaft Y^2 is shifted by means of the lever S^3 and the cam-groove wheel W^3 , the latter being operated by the ratchet-wheel Y^3 , connected therewith, the pawl-lever Z^3 , and the cam A^4 , the latter being on the driving-shaft V , and the said parts arranged as hereinbefore described. The shifting or endwise movement of the shaft Y^2 brings the toothed rim C^3 of the segment Z^2 in engagement with the pinions F^3 and the rim B^3 in engagement with the gear-wheel D^3 , so that the motion of the shafts X^2 and W^2 will be reversed, thus causing a reverse motion to be communicated to each of the shafts P^2 and R^2 and to the rings F^2 and H^2 , so that the pins G^2 and L^2 will move backward or outward from each other and successively engage from the inner side the disks of each of the two series of disks, so as to throw in and in the opposite order the needles previously thrown out, the said needles being engaged by the levers P^3 on the smaller and lower projecting portions or heels Q^4 . When the pocket for the heel or toe is completed, the cam E' is again oscillated by the mechanism hereinbefore described, so as to disengage the clutch M from the bevel gear-wheel Y and re-engage it with the bevel gear-wheel L , and thereby impart rotary motion to the shaft K and the cam-cylinder C . At the same time the lever G^4 is operated by the contact of its pin with the wall of the groove H^4 , so as to disconnect the clutch F^4 from the wheel E^4 , and thus stop the motion of the wheels C^4 and B^4 and the shaft Y^2 , thereby stopping the motion of the shafts X^2 and W^2 , and consequently of the shafts P^2 and R^2 and the rings F^2 and H^2 during the rotary movement of the cam-cylinder.

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

1. A knitting-machine having a cam-cylinder with a gear-wheel, a shaft with a gear engaging the cam-cylinder gear-wheel, a bevel gear-wheel loosely mounted on said shaft, the bevel gear-wheel Y , loosely mounted on said shaft and having mechanism to reciprocate the same, a clutch on said shaft and rotatable therewith, a main driving-shaft, a train of gearing connected with said driving-shaft and said first bevel gear-wheel, an oscillating

lever adapted to shift said clutch, a cam for operating said lever, a wheel loosely mounted on the driving-shaft and adapted to operate the said cam and carrying pins with connected levers, a spring-bar and a disk controlling said levers, and a rotary wheel operated by the rotation of the driving-shaft and provided with pins for actuating the said spring-bar, said parts being combined substantially as described.

2. The combination of a rotary shaft with a cam thereon and rotary therewith, a gear-wheel loosely mounted on said shaft and provided with levers connected with pins movable in openings in said wheel, an arm projecting from said shaft and adapted to engage a projecting pin on said wheel, a pivoted lever with a pawl, the ratchet-wheel M' , having the connected gear-wheel N' , the gear-wheel P' , having pins projecting therefrom, a spring-controlled bar with projections adapted to be engaged by said pins on the last-mentioned gear-wheel, and a cam with an attached gear engaging with the first-mentioned gear-wheel, substantially as described.

3. In a knitting-machine, a needle-cylinder with needles movable therein, a main driving-shaft, a cam-cylinder with an oscillating cam, rotary rings with pins thereon, disks engaged by said pins, and pivoted levers connected therewith, said parts being combined substantially as described.

4. A knitting-machine having a needle-cylinder with needles provided with double heels, oscillating rings, disks engaged by said rings, and levers connected to said disks, one of each of the levers engaging a single needle and alternately engaging the two heels thereof to raise and lower the same, thereby automatically throwing out of and into action needles of the needle-cylinder required to be lifted out of the way of the cam-cylinder during the forming of a pocket in a tubular piece of fabric, said parts being combined substantially as described.

5. A knitting-machine having a needle-cylinder with needles therein, oscillating rings having suitable supports and provided with pins, disks with recesses in which said pins engage, so as to rotate the said disks, arms connected with said disks, levers attached to said arms which engage the needles, and mechanism, substantially as described, for operating said rings, said parts being combined as stated.

6. The combination of a needle-cylinder with needles movable thereon, rings having projecting pins and movable on suitable supports, pivoted disks with recesses in which said pins move, arms connected to said disks, levers connected to said arms and having their ends adapted to engage the said needles, a cam-cylinder with mechanism, substantially as described, for oscillating the same, and mechanism for imparting a motion to said rings, so as to move said pins from one

disk to the adjacent one during an oscillation of the cam-cylinder, substantially as described.

7. The combination of a rotary shaft, a segmental piece with toothed rims, two gear-wheels of equal diameters, two sets of pinions, each pinion being of one-half the diameter of one of the said gear-wheels, and two rotary shafts, each having a pinion to engage with one of the first-mentioned gear-wheels and with one pinion of the corresponding set of pinions, said segmental piece having one of its rims engaging one pinion of one of said sets of pinions and another rim engaging the gear-wheel pertaining to the other set of pinions, substantially as described.

8. The combination of a rotary shaft, mechanism, substantially as described, for moving said shaft endwise in its bearings at intervals of time, a bifurcated segmental piece secured on said shaft and having toothed rims, two gear-wheels of equal diameters, and two sets of pinions, each pinion of one-half the diame-

ter of one of the gear-wheels, and two rotary shafts having pinions meshing with said gear-wheels and sets of pinions, substantially as and for the purpose set forth.

9. The combination of a main driving-shaft, a train of gearing, a bifurcated segment secured to the shaft of the last wheel of said train and having triple gear-rims, two rotary gear-wheels suitably journaled, two shafts having gear-wheels thereon and engaging said rotary gear-wheels, and two trains of gearing between said first-mentioned gear-wheels, one wheel of each train meshing with the gear-wheel on the corresponding shaft, one rim of said triple gearing engaging alternately with the two trains and each of the other rims being adapted to engage with the rotary gear of its respective train, substantially as described.

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Witnesses:

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