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Patented July 24, 1900.

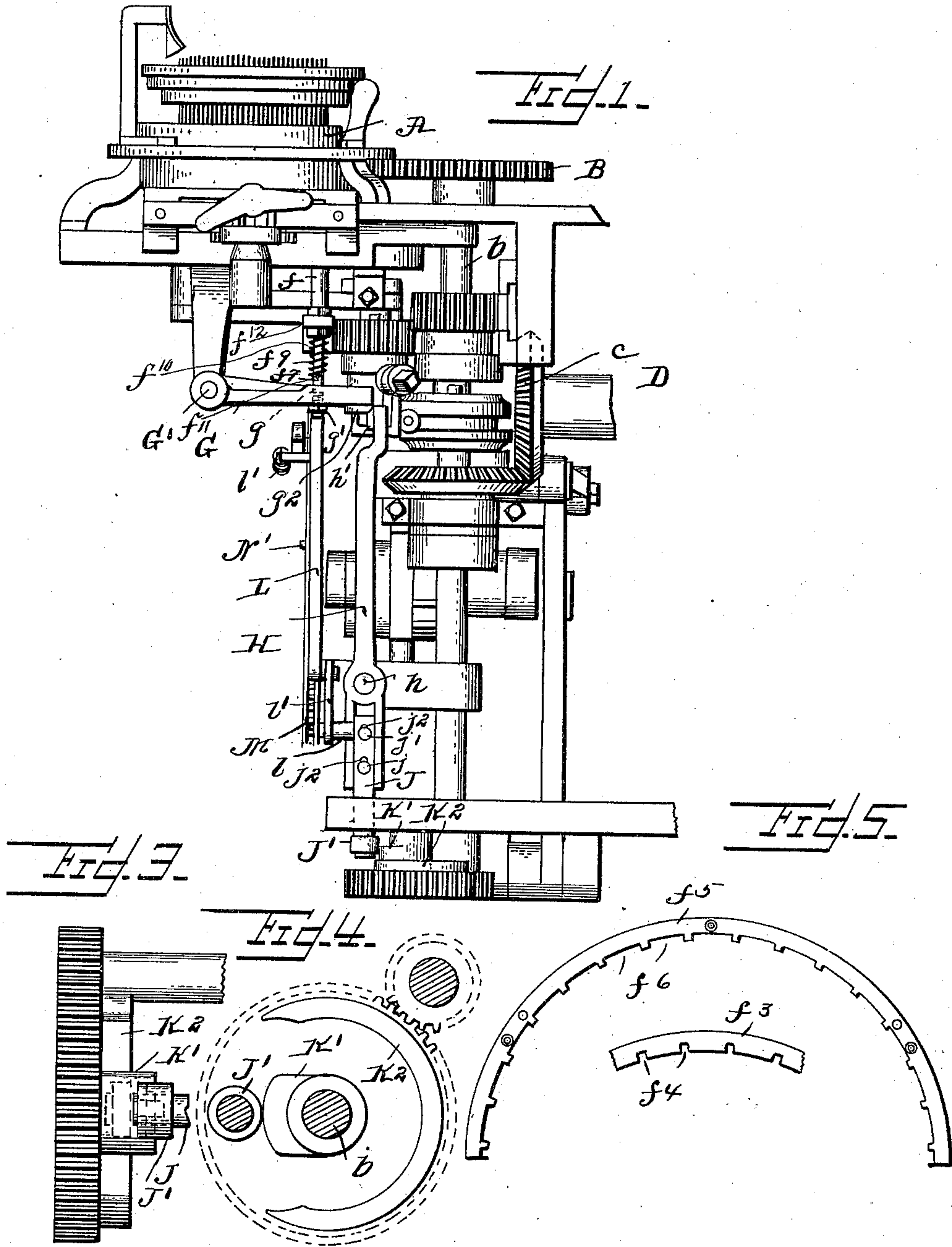
H. A. HOUSEMAN.

CIRCULAR KNITTING MACHINE.

(Application filed May 19, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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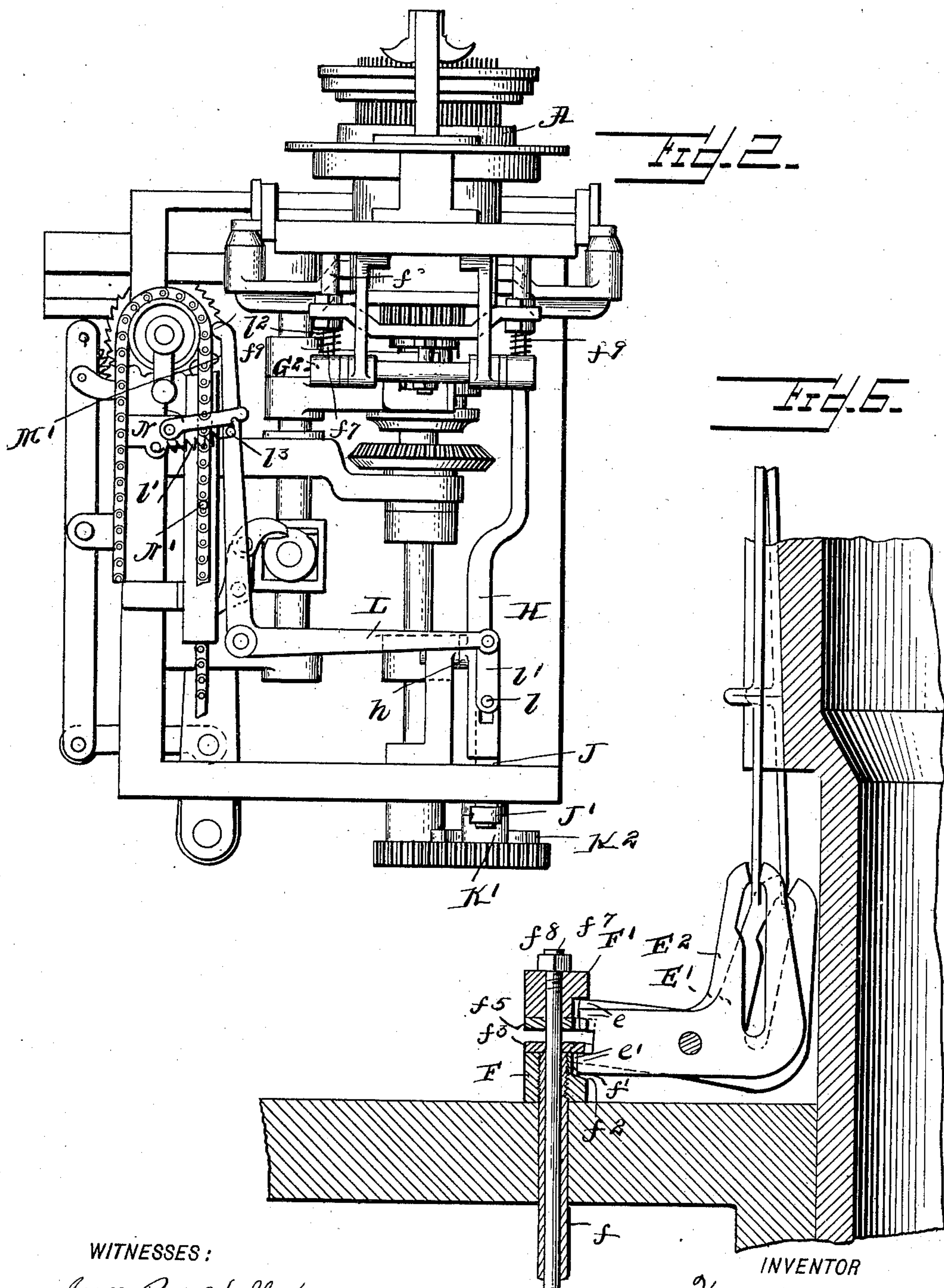
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WITNESSES:

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UNITED STATES PATENT OFFICE.

HARRY A. HOUSEMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
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CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 654,347, dated July 24, 1900.

Application filed May 19, 1900. Serial No. 17,209. (No model.)

To all whom it may concern:

Be it known that I, HARRY A. HOUSEMAN, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Circular-Knitting Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object certain improvements in circular-knitting machines; and its purpose is to provide mechanism whereby certain of the needles may be thrown in and out of action for predetermined rotation of the cam-cylinder in the production of an open-work or lace fabric and to vary the needles acted on without changing the needle-levers.

For the general construction of the circular-knitting machine to which my improvements have been added reference may be had to Letters Patent No. 531,518, issued to me April 30, 1895. I have illustrated in the accompanying drawings so much of the machine of that patent as is necessary, together with my improved mechanism attached thereto.

In the drawings, Figure 1 is a side elevation of part of a knitting-machine with my improved device attached thereto. Fig. 2 is an end view. Fig. 3 is a side elevation of the operating-cam and its driving-gear. Fig. 4 is a plan view of the same. Fig. 5 is a plan view of the pattern-plates. Fig. 6 is a section through a portion of the cylinder, showing the operating-levers and their connections.

The machine of Patent No. 531,518, as is well known, consists of an operating cam-cylinder A, which is driven by the gear B upon the shaft *b*, which shaft *b* is rotated by means of the bevel-gear *c* on the driving-shaft D. The needles are held in levers *E'* and *E*². The levers *E'* control these needles, which in the manufacture of circular goods, such as stockings, are during the formation of the heel and toe thrown out of action. In the operation of this machine, as is fully set out in the patent mentioned before, the levers *E'* are at the desired point in the knit-

ting automatically operated upon to throw them out of action by a plate *F*, in which the tails of the levers *E'* rest, the plate having depending rods *f*, which are operated upon by mechanism described in said patent to move the rods and plate. In order to operate upon the desired number of levers *E'* and their corresponding needles to throw certain of the needles in and out of action for predetermined rotation of the cam-cylinder, I add the following mechanism to this part of the machine.

I make my levers *E'* with bifurcated ends *e e'*. The plate *F* is formed with a cut-away portion *f'*, beveled at its lower surface *f*², in which the end *e'* rests. Upon the top of this plate *F* is a pattern-plate *f*³, removably secured thereto and which projects into the space between the ends *e e'* of levers *E'*. In this plate *f*³, corresponding to the levers desired to be acted upon in the formation of the open or lace work of the fabric, are orifices *f*⁴ of a size sufficient to allow the tail *e'* of lever *E'* to pass up through them. For the rods *f*, connected to the plate *F*, I use tubes. Superimposed upon the pattern-plate *f*³ is a second pattern-plate *f*⁵, removably secured to the plate *F'*. The plate *F'* has a cut-away portion in which the end *e* of lever *E'* rests. The pattern-plate *f*⁵ has a portion which projects into the space between the ends *e e'* of the levers *E'*, and the thickness of the plates *f*³ *f*⁵ is equal to the space between said ends. The upper surface of this plate *f*⁴ is beveled. In this pattern-plate *f*⁵, corresponding to the levers which are not desired to be acted upon in the formation of the open or lace work of the fabric, are cut-away portions *f*⁶ of a size sufficient to allow the tails *e'* of the levers *E'* to pass through. Secured to the plate *F'* by nuts *f*⁸ are the rods *f*⁷ and *f*⁹, which pass through orifices in the pattern-plates *f*⁵ and *f*³ and plate *F* and through the tubes *f*. The lower end of rod *f*⁷ passes into an orifice *g* in the lever *G*, and by means of a nut *g'* the vertical height of the rod *f*⁷ may be adjusted. This lever *G* is secured to the rock-shaft *G'*. The lower end of rod *f*⁹ is correspondingly secured to a lever *G*², which is also secured to the rock-shaft *G'*. The end of lever *G* opposite the shaft *G'* has upon it the cam-plate

g^2 . Upon the rods f^7 and f^9 are the springs f^{10} , secured between pins f^{11} on the rods and the fork f^{12} , supporting the ends of tubes f .

H is a lever pivoted to the frame of the machine at h and having at one end the cam-plate h' , adapted to operate the cam-plate g^2 . When the lever G is in the position shown in Fig. 1, the rods f^7 f^9 are lowered and the needles acted on by the plate F' are in action. When the plate F' is moved to the position shown in Fig. 6, the cam-plate h' operates on the cam-plate g^2 and through it upon the lever G, lifting the rods f^7 f^9 and elevating plate F' and certain of the needle-levers E' , throwing those needle-levers and their needles out of action. I operate this lever H as follows: j j are pins upon the lever H below the pivot-point h . J is a superposed plate having a roller J' at its lower end and slots j^2 j^2 , through which the pins j j' project. K' K^2 are two cams secured upon the face of the gear-wheel K. The cam K' projects from the face of the gear-wheel a greater distance than does cam K^2 . The roller J' is normally in such position that it rests against the cam K' at a point above the cam K^2 . The cam K' is so formed that in the revolution of the wheel it maintains the lever H in the position shown in Fig. 1 or returns it to that position. In order to bring the roller J' under the influence of both cams K' and K^2 and remove it from such influence, I provide the following mechanism: l is a projection from plate J, which by means of link l' is connected to bell-crank lever L, one arm of which has at its end the toe-piece l^2 and below the end the pin l^3 , to which is connected a spring l^4 , which normally holds the bell-crank L and the plate J in the position shown in Fig. 1 in contact only with the cam K' . In this position the toe-piece l^2 is in line with a pattern-chain M upon the shaft m . Upon this chain is the lug M' . This lug in its movement strikes the toe-piece l^2 , moving the bell-crank L against the action of the spring l^4 , depressing the plate J, and bringing the roller J' into operative relation with both cams K' and K^2 at different portions of the gear-wheel K.

In the specific illustration shown in the drawings the gear-wheel K is intended to make one revolution for three revolutions of the cam-cylinder, and, as shown, the cam K' controls during one-third of the revolution and the cam K^2 during two-thirds of the revolution when both are acting. Thus when the bell-crank has been acted on by the lug on the pattern-chain, as just described, the lever H will be acted on to throw the predetermined needles out of action for two revolutions of the cam-cylinder and in action for one revolution. The lever L is locked in its position after action upon it by the lug M' on the pattern-chain by reason of the pivoted latch N, which by gravity engages the pin l^3 . The latch N is released and the bell-crank L returned to its initial position by the projection N' on the pattern-chain M, which strikes

the latch N, lifting it, and the spring l^4 draws the bell-crank L to its initial position, lifting the plate J, bringing the roller J' into action only with the cam K' , and the cam K' will operate the lever H and the plate F' to bring the levers E' into action. The position of the cam K' with reference to the gear K is such as to make it operative, so that the needles will be thrown into action at the proper time. With my mechanism in order to arrange which of the needles are to be thrown in and out of action during the formation of lace or open work it is only necessary to arrange the pattern-plates f^3 and f^5 —that is, provide orifices in the plate f^3 corresponding to the tails of the levers E' desired to be thus operated and orifices in the plate f^5 corresponding to the tails of the levers E' not desired to be then operated. By having a series of these plates with orifices at different points change of pattern may be obtained by merely changing the pattern-plates. While I have described the cams K' and K^2 as being such that in one revolution thereof the cam K^2 acts through two-thirds of the revolution and the cam K' one-third and that they are designed to run as one revolution for three revolutions of the cam-cylinder, this may be varied, as it may be desirable to have the needle stitch every second course or only every fourth course, and this would only require a change of extent of rotation and relative revolution of the cams.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In a circular-knitting machine, the combination with the needles and operating-levers, provided with bifurcated ends for said needles, of a plate, extending below said levers having a notched pattern-plate attached thereto extending between the bifurcated ends of the levers, a superposed plate, extending above said levers, having a notched pattern-plate extending between the bifurcated ends of the levers, the notches in one pattern-plate corresponding to certain of the levers and the notches in the other pattern-plate corresponding to the other levers and means to move the superposed plate with its pattern-plate vertically.

2. In a circular-knitting machine of the character described, in combination with the needles and operating-levers, provided with bifurcated ends, for said needles, of a pair of superposed pattern-plates extending between the bifurcated ends of the levers, one only of the pattern-plates between the bifurcations of each lever having an orifice corresponding to the tail of said lever and means to move the superposed plate with its pattern-plate vertically.

3. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod

rests, a third lever adapted in its movement in one direction to raise said second lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said third lever being normally in alinement with the cam of greater extent, a pattern-chain, a lug upon said chain and intermediate mechanism between the third lever and the pattern-chain adapted when struck by the lug to move said lever into alinement with both cams.

4. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said third lever being normally in alinement with the cam of greater extent, a pattern-chain, a lug upon said chain and intermediate mechanism between the third lever and the pattern-chain adapted when struck by the lug to move said lever into alinement with both cams, and means to lock said third lever in said position.

5. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said third lever being normally in alinement with the cam of greater extent, a pattern-chain, a lug upon said chain and intermediate mechanism between the third lever and the pattern-chain adapted when struck by the lug to move said lever into alinement with both cams, means to lock said third lever in said position and a lug carried by said pattern-chain adapted to release said lock and allow the third lever to return to its initial position.

6. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a plate having a roller slidably secured in said third lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said roller being normally

in alinement with the cam of greater extent, a pattern-chain, a lug upon said chain and intermediate mechanism between the roller-plate and the pattern-chain adapted when struck by the lug to move said roller into alinement with both cams.

7. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a plate having a roller slidably secured in said third lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said roller being normally in alinement with the cam of greater extent, a pattern-chain, a lug upon said chain and intermediate mechanism between the roller-plate and the pattern-chain adapted when struck by the lug to move said roller into alinement with both cams, means to lock roller in said position.

8. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a plate having a roller slidably secured in said third lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said roller being normally in alinement with the cam of greater extent, a pattern-chain, a lug upon said chain and intermediate mechanism between the roller-plate and the pattern-chain adapted when struck by the lug to move said roller into alinement with both cams, means to lock roller in said position, and a lug carried by said pattern-chain adapted to release said lock and allow the roller to return to its initial position.

9. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said third lever being normally in alinement with the cam of greater extent, a bell-crank connected with said third lever, a spring acting upon said bell-crank to hold the third lever in its normal position, a pattern-chain, a lug upon said pattern-chain, the end of said bell-crank being in alinement with said lug

and when struck by it moved against the spring to bring the third lever in alinement with both cams.

10. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said third lever being normally in alinement with the cam of greater extent, a bell-crank connected with said third lever, a spring acting upon said bell-crank to hold the third lever in its normal position, a pattern-chain, a lug upon said pattern-chain, the end of said bell-crank being in alinement with said lug and when struck by it moved against the spring to bring the third lever in alinement with both cams, a locking-lever adapted to interlock with said bell-crank in said position.

11. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said third lever being normally in alinement with the cam of greater extent, a bell-crank connected with said third lever, a spring acting upon said bell-crank to hold the third lever in its normal position, a pattern-chain, a lug upon said pattern-chain, the end of said bell-crank being in alinement with said lug and when struck by it moved against the spring to bring the third lever in alinement with both cams, a locking-lever adapted to interlock with said bell-crank in said position, and a lug carried by said pattern-chain adapted to release said locking-lever and allow the spring to act to return the bell-crank to its initial position.

12. In a circular-knitting machine, the combination with a needle and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a plate having a roller slidably secured in said third lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said roller being normally in alinement with the cam of greater extent,

a bell-crank connected with said roller-plate, a spring acting upon said bell-crank to hold the roller-plate in its normal position, a pattern-chain, a lug upon said pattern-chain, the end of said bell-crank being in alinement with said lug and when struck by it moved against the spring to bring the roller in alinement with both cams.

13. In a circular-knitting machine, the combination with a needle, and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a plate having a roller slidably secured in said third lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said roller being normally in alinement with the cam of greater extent, a bell-crank connected with said roller-plate, a spring acting upon said bell-crank to hold the roller-plate in its normal position, a pattern-chain, a lug upon said pattern-chain, the end of said bell-crank being in alinement with said lug and when struck by it moved against the spring to bring the roller in alinement with both cams, a locking-lever adapted to interlock with said bell-crank in said position.

14. In a circular-knitting machine, the combination with a needle, and operating-lever for the said needle, of a plate upon which the end of said lever rests, a rod connected to said plate, a second lever upon which the rod rests, a third lever adapted in its movement in one direction to raise said second lever, a plate having a roller slidably secured in said third lever, a rotatable cam-disk provided with two cams at different parts thereof, said cams adapted to move the third lever in opposite directions, one of said cams extending beyond the other, said roller being normally in alinement with the cam of greater extent, a bell-crank connected with said roller-plate, a spring acting upon said bell-crank to hold the roller-plate in its normal position, a pattern-chain, a lug upon said pattern-chain, the end of said bell-crank being in alinement with said lug and when struck by it moved against the spring to bring the roller in alinement with both cams, a locking-lever adapted to interlock with said bell-crank in said position, and a lug carried by said pattern-chain adapted to release said locking-lever and allow the spring to act to return the bell-crank to its initial position.

In testimony of which invention I have hereunto set my hand at Philadelphia, Pennsylvania, on this 8th day of May, 1900.

HARRY A. HOUSEMAN.

Witnesses:

M. F. ELLIS,

J. M. SHINDLER, Jr.