

(No Model.)

4 Sheets—Sheet 1.

L. N. D. WILLIAMS.

PICKER OPERATING MECHANISM FOR KNITTING MACHINES.

No. 575,191.

Patented Jan. 12, 1897.

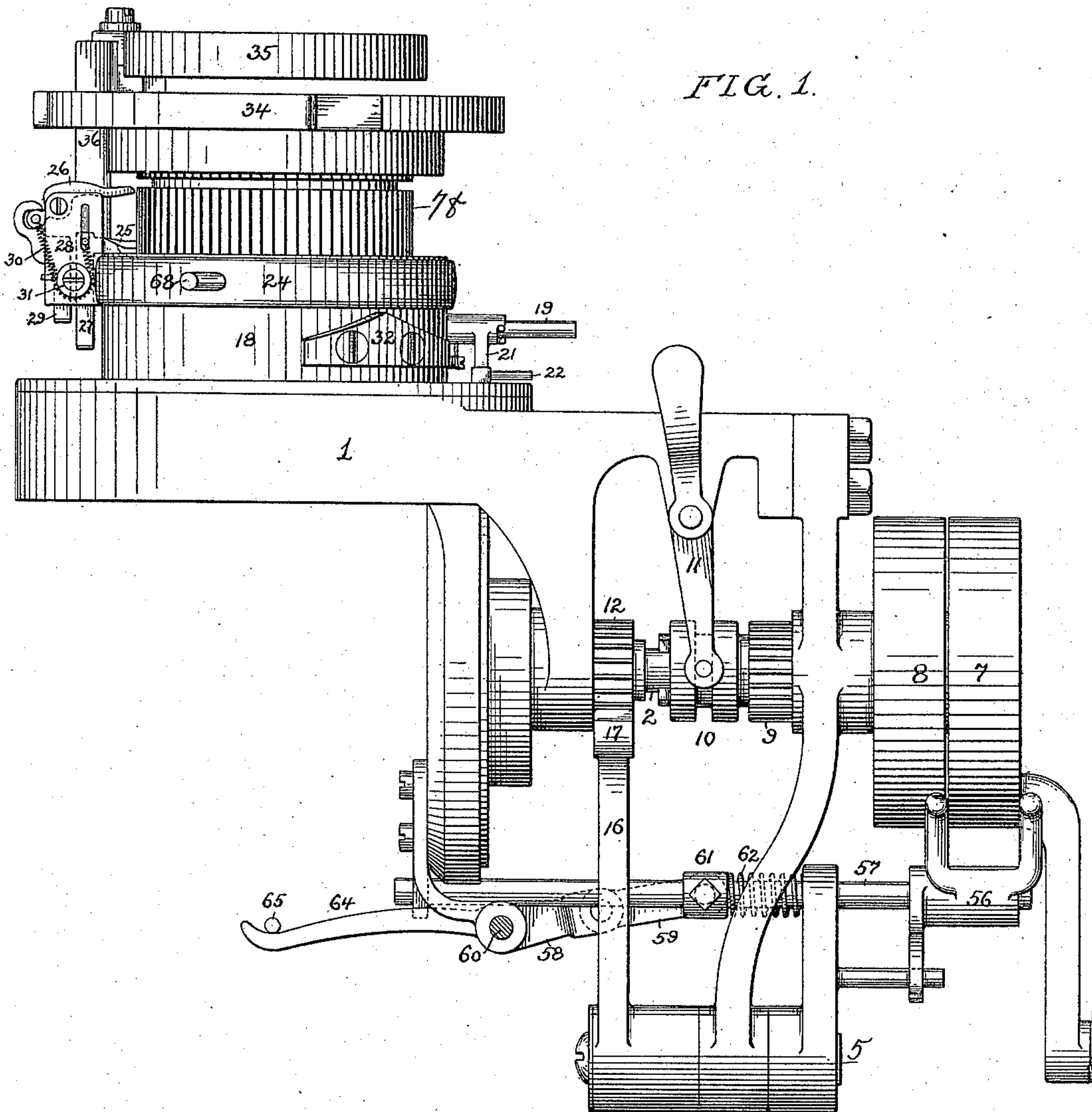
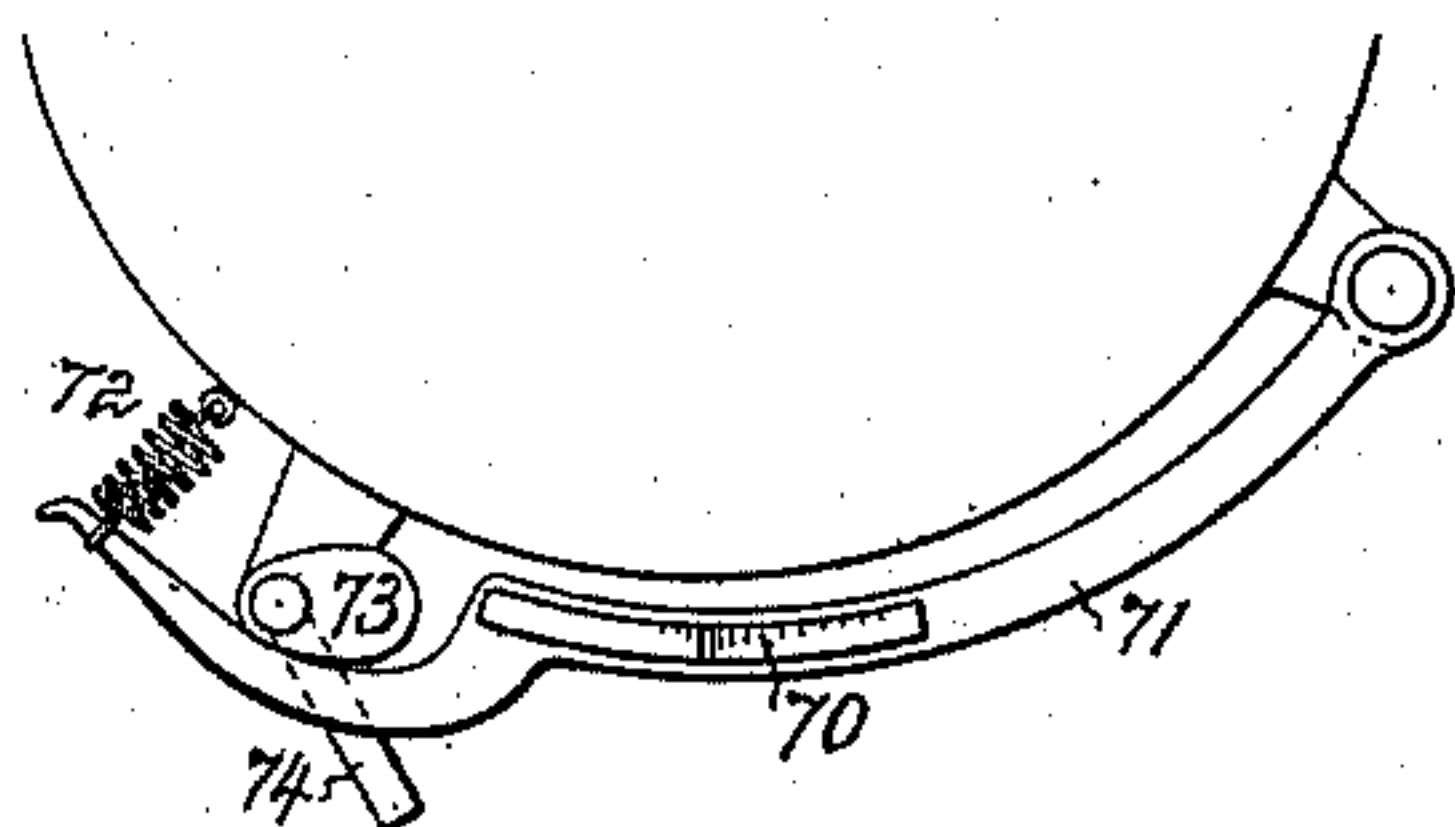


FIG. 1.

FIG. 10.



Witnesses:
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Will. A. Barr.

Inventor:
Louis N. D. Williams
by his Attorneys
Howson & Howson

(No Model.)

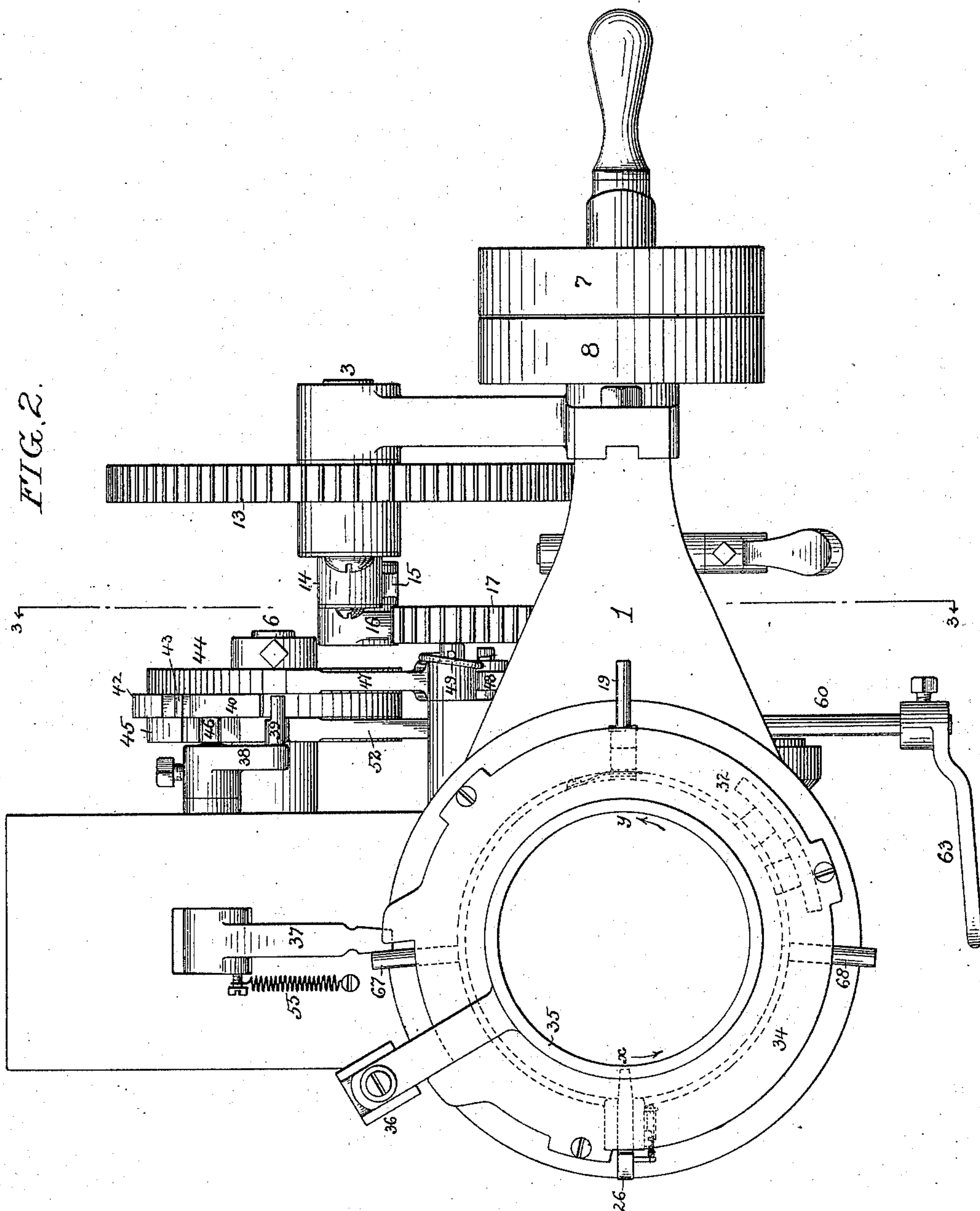
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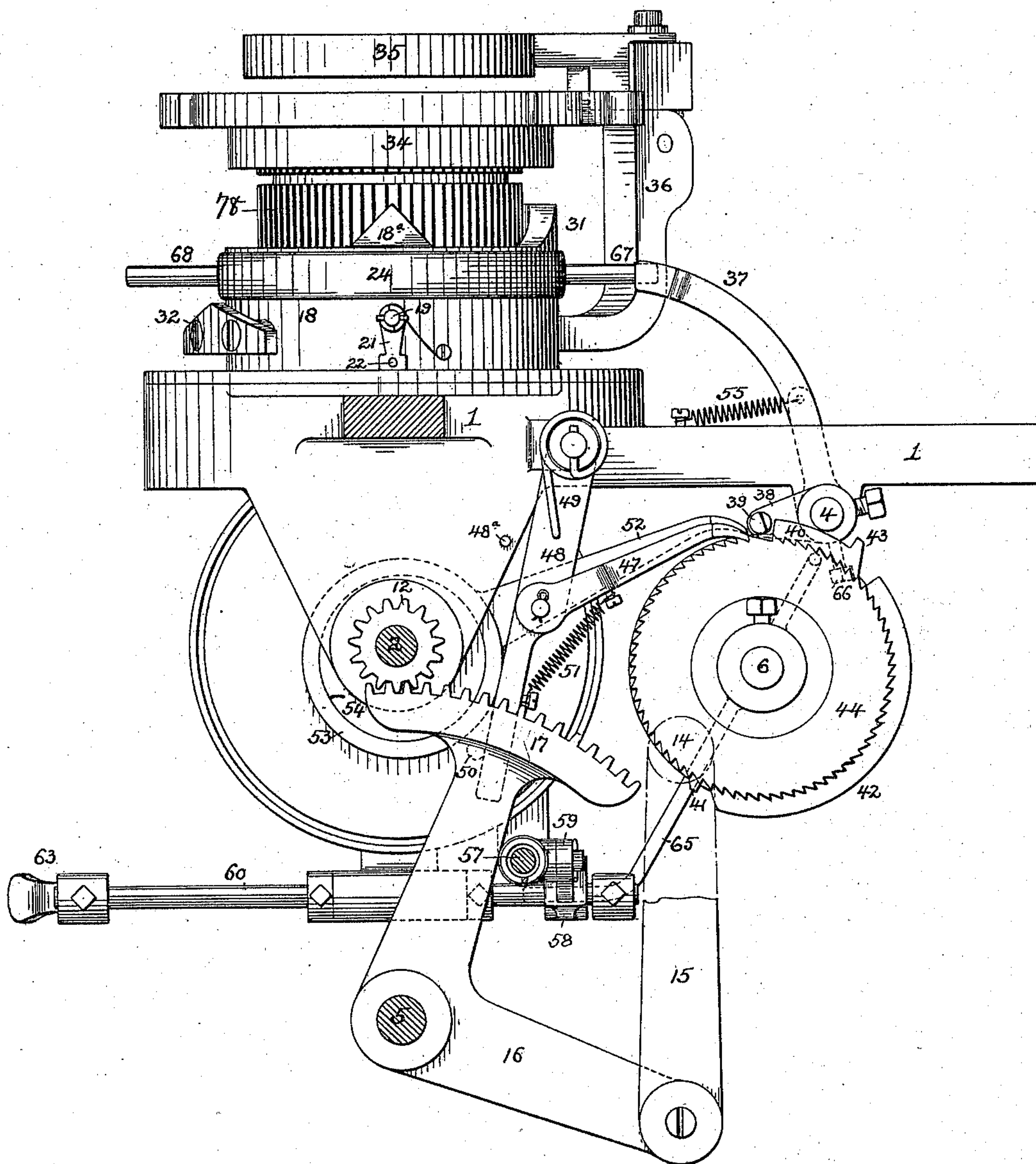
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PICKER OPERATING MECHANISM FOR KNITTING MACHINES.

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FIG. 3.



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FIG. 4.

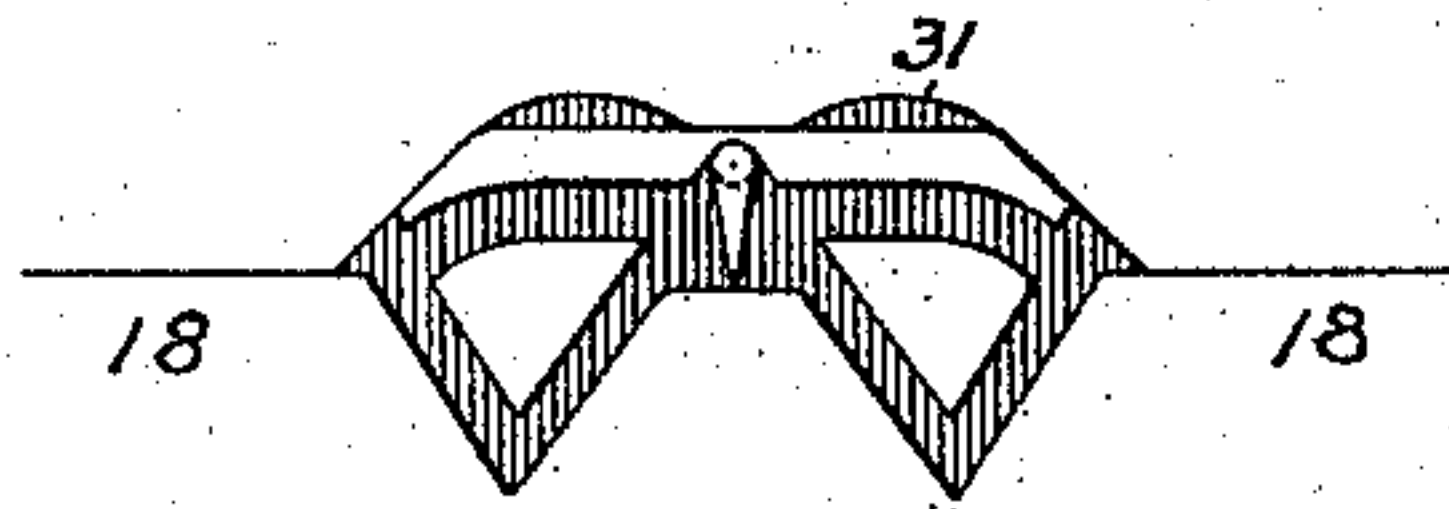


FIG. 11.

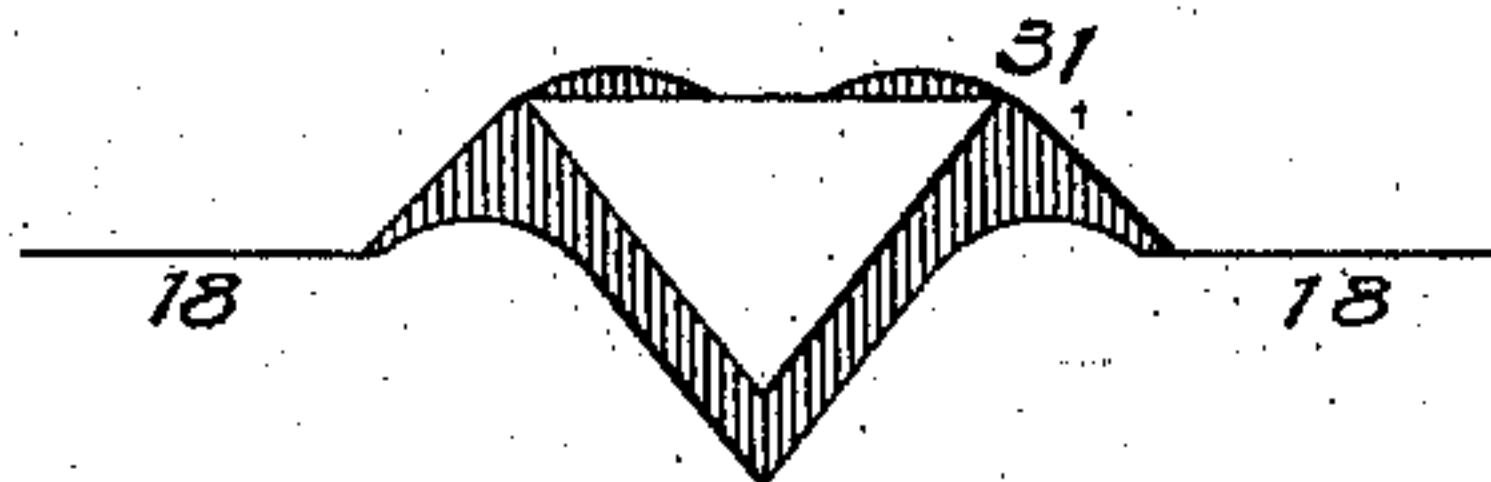


FIG. 5.

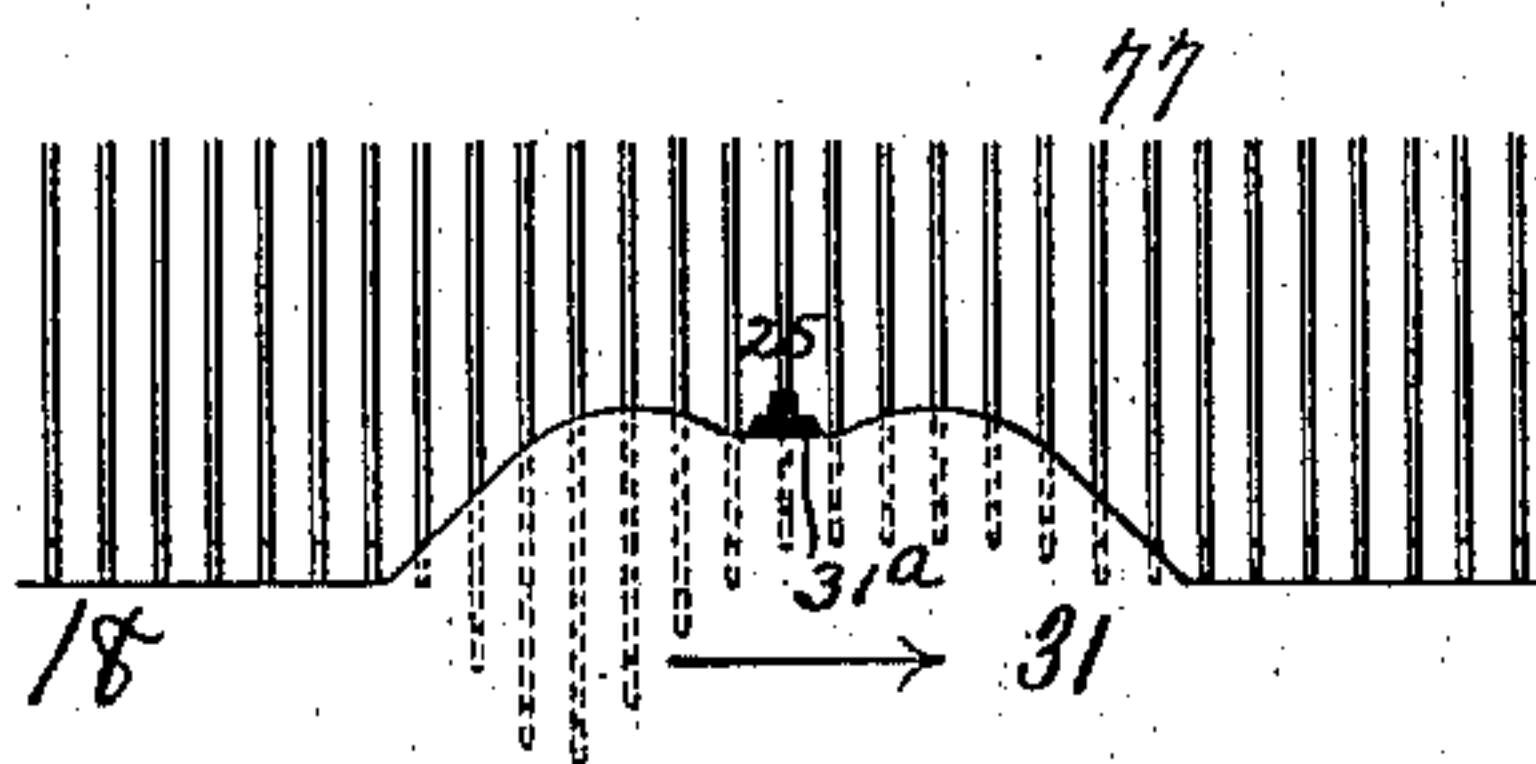


FIG. 6.

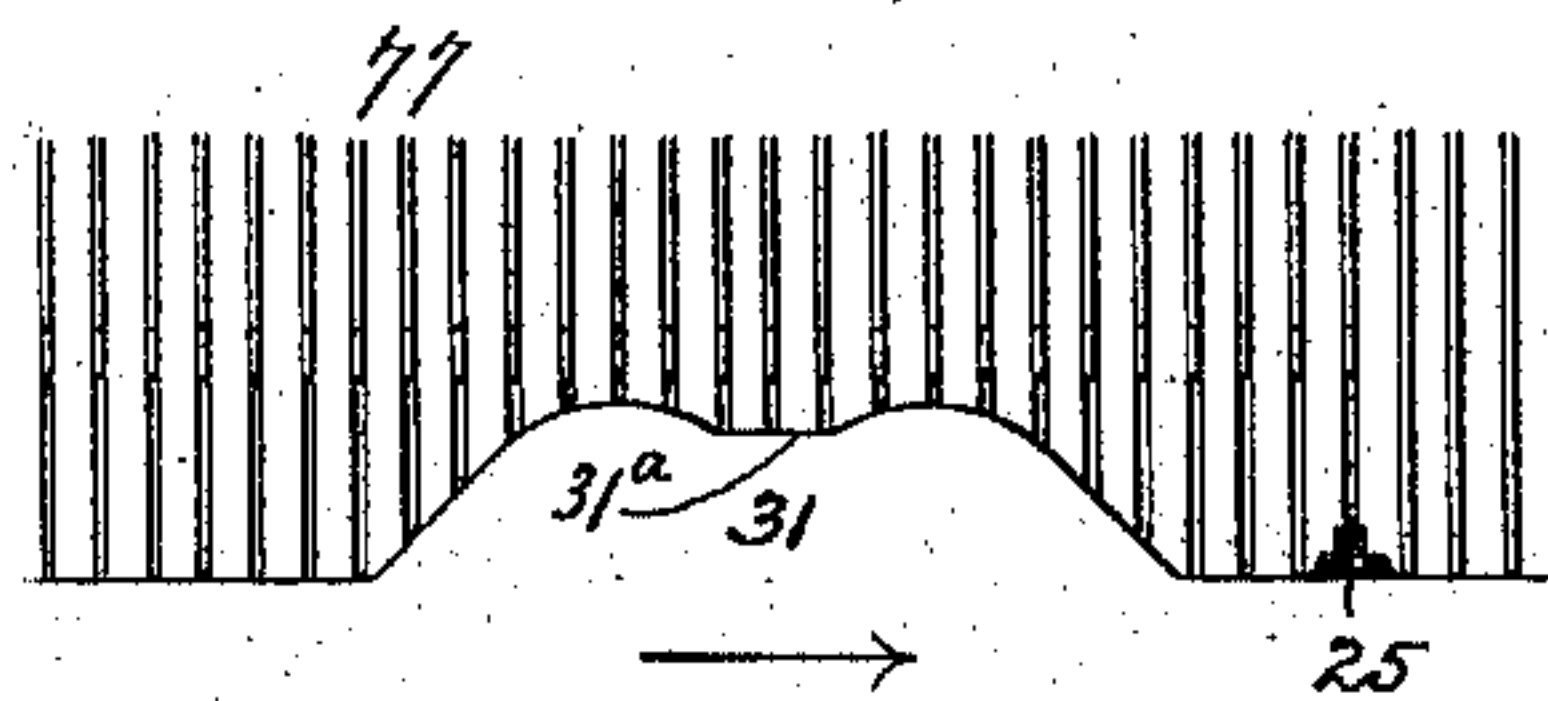


FIG. 7.

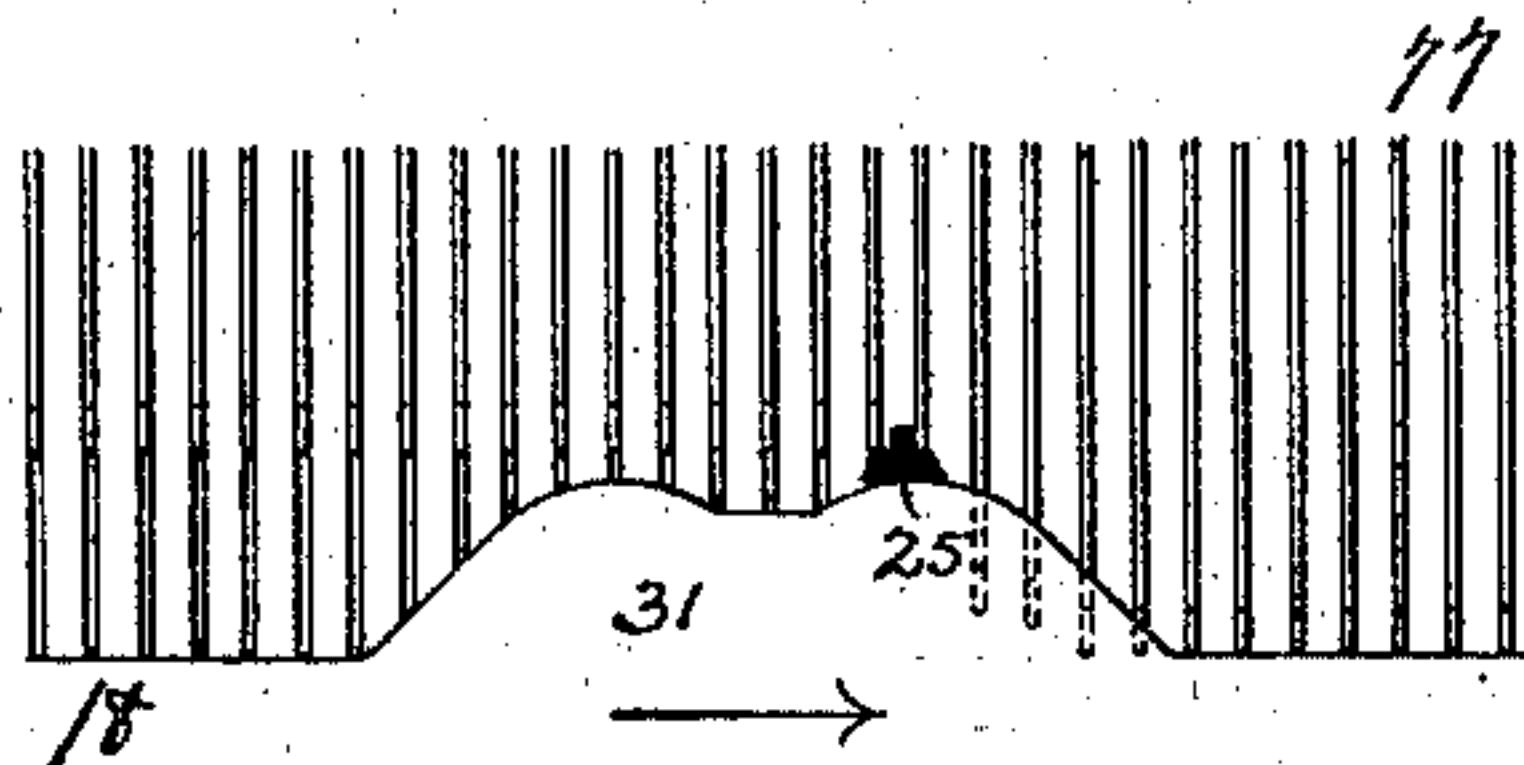


FIG. 8.

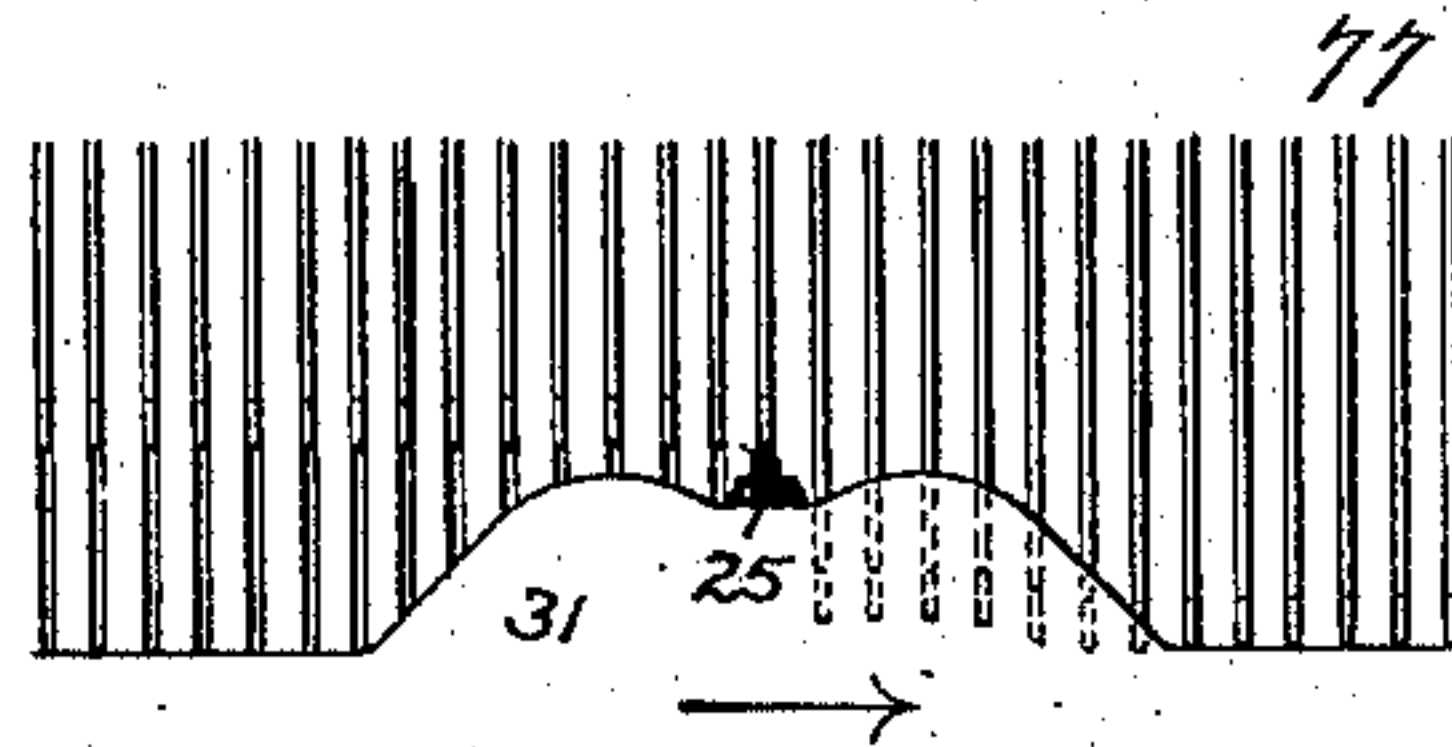
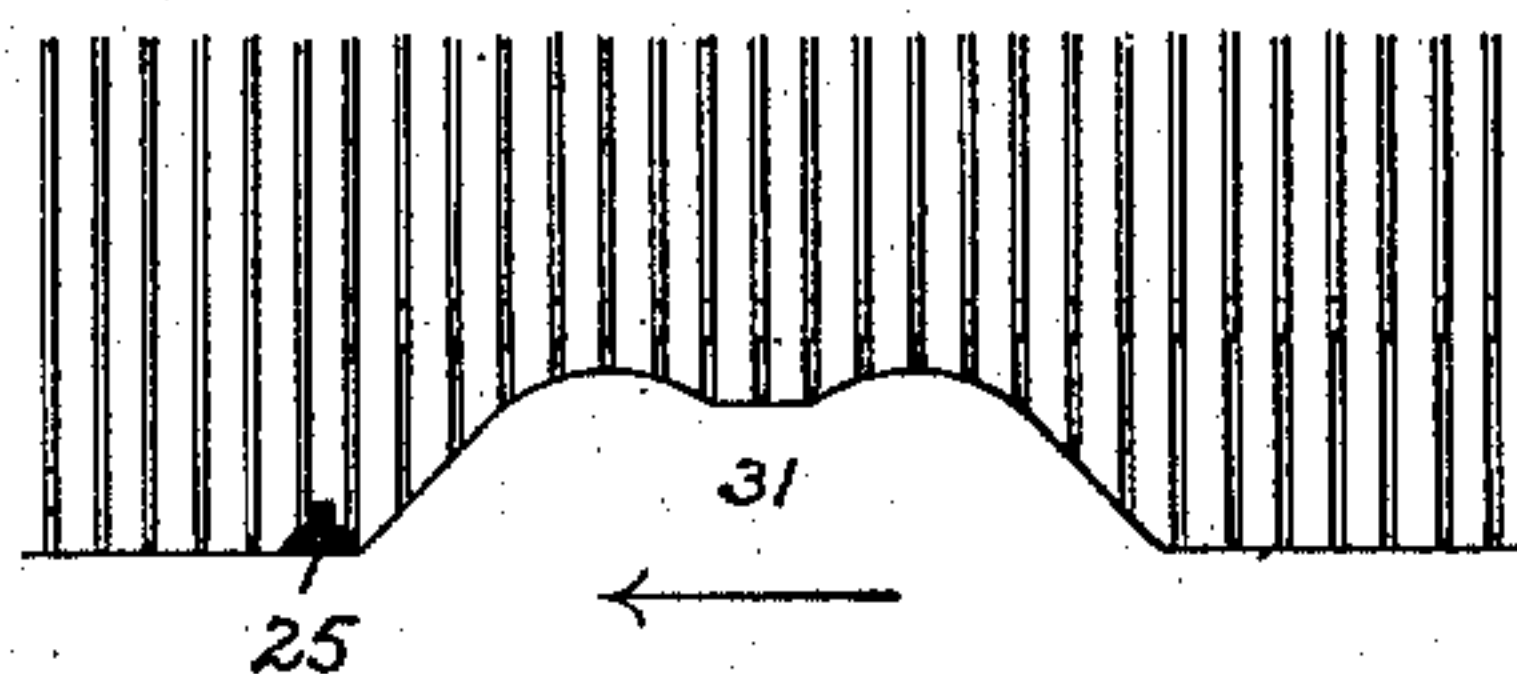


FIG. 9.



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UNITED STATES PATENT OFFICE.

LOUIS N. D. WILLIAMS, OF ASHBOURNE, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO ROBERT W. SCOTT, OF PHILADELPHIA, PENNSYLVANIA.

PICKER-OPERATING MECHANISM FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 575,191, dated January 12, 1897.

Application filed December 14, 1895. Serial No. 572,114. (No model.)

To all whom it may concern:

Be it known that I, LOUIS N. D. WILLIAMS, a citizen of the United States, residing in Ashbourne, Pennsylvania, have invented certain
5 Improvements in Picker-Operating Mechanism for Knitting-Machines, of which the following is a specification.

The object of my invention is to provide a
10 simple machine of the semiautomatic or three-quarter automatic class for knitting socks or stockings with seamless heels and toes, the machine employing, for the purpose of moving the needles successively out of and into
15 action at the opposite ends of the fashioning-set, needle-picking devices of a character resembling those set forth in my Patent No. 521,066, dated June 5, 1894.

In the accompanying drawings, Figure 1 is a front view of sufficient of a knitting-machine to illustrate my present invention, the
20 needles being omitted. Fig. 2 is a plan or top view of the same. Fig. 3 is a transverse section on the line 3-3, Fig. 2. Fig. 4 is a view of one of the cam mechanisms of the
25 machine. Figs. 5 to 9, inclusive, are views illustrating the various positions of the lifting-picker. Fig. 10 is a view illustrating a modification of part of the invention, and Fig. 11 is a view illustrating a modified form
30 of knitting-cam.

The fixed bed or table of the machine is represented at 1, and this table has depending hangers for a series of shafts 2, 3, and 4 and for a pair of fixed studs 5 and 6. The
35 shaft 2 is the main driving-shaft, and on the outer end of this shaft is a sleeve having a fast pulley 7 and a loose pulley 8, this sleeve being adapted to turn freely on the shaft and having at its inner end a pinion 9, which can
40 be clutched to the shaft 2, when desired, by means of a clutch-sleeve 10, the latter being operated by a lever 11. Loosely mounted on the shaft 2 is another pinion 12, which can likewise be clutched to the shaft by means of
45 the clutch-sleeve 10 when the latter is moved away from the pinion 9. The pinion 9 meshes with a spur-wheel 13 on the shaft 3, and this spur-wheel has a crank-pin 14, which is connected by a rod 15 to one arm of a bell-crank
50 lever 16, the other arm of which has a toothed segment 17 meshing with a pinion 12. Con-

tinuous rotary motion can thus be imparted to the pinion 9 and reciprocating or back-and-forth motion to the pinion 12, and like movements can be imparted to the shaft 2 by moving the clutch-sleeve into engagement either
55 with the pinion 9 or the pinion 12, as desired.

The shaft 2 drives the cam-cylinder 13 of the machine by means of the usual bevel-gearing, and said cam-cylinder has cams, such
60 as shown in Fig. 4, (and similar to those of the patented machine before referred to,) for imparting the knitting movement to the needles, that is to say, the vertical rising-and-falling movement of the needles necessary to cause
65 them to catch the thread and draw the stitches, the cams being such that the needles can be raised so that their bits will be out of the path of the cams, and the needles will therefore be rendered inoperative.
70

Certain of the needles, say those throughout about one-half of the needle-cylinder, have longer bits than the others, and these needles can, when necessary, be raised out of action by lifting a special cam 18*, so constructed as
75 to act only upon the long-bitted needles, the remaining or shorter-bitted needles continuing in action. This is a well-known construction in knitting-machines and forms no part of my invention, but I have shown the means
80 whereby the cam for lifting the long-bitted needles is raised and lowered. These means comprise a stem 19, projecting through a slot in the cam-cylinder 18, and having hung to its outer end a lever 21 with projecting pin 22.
85 When the cam is depressed, the lever occupies a horizontal position, but when it is desired to throw the long-bitted needles out of operation the cam is lifted by raising the stud 19, and the lever is moved to a vertical
90 position beneath said stud, so as to support the cam in the elevated position, as shown in Fig. 3, the projecting pin 22 serving as a ready means of moving the lever either into position beneath the stud 19 or out from under
95 the same.

Frictionally mounted on the cam-cylinder 18 is a ring 24, which carries the needle-picking devices, these devices consisting of a lifter 25 and a depressor 26. The lifter consists of
100 an arm or finger projecting from the upper end of a stem 27, which is suitably guided in

a frame 28, secured to the ring 24, and the depressor consists of a lever hung to said frame and acted upon by the forked upper end of a stem 29, which is likewise vertically guided in the frame 28, both the lifter-stem and depressor-stem being normally drawn downward by means of a spring 30, passing around a collar 31 on the frame 28, one end of said spring being connected to a pin on the lifter-stem 27 and the other end being connected to a pin on the outer arm of the depressor-lever 26.

On the top of the cam-cylinder is a cam 31, which has on its inner side the knitting-cams before referred to, and mounted upon the cam-cylinder below the ring 24 is a cam 32, which occupies a position so much outwardly beyond the cam-cylinder that it is adapted to act upon the depending depressor-stem 29.

Surrounding the upper end of the needle-cylinder 33 is a ring 34, intended to carry the usual radially-moving web-holders, and above said ring 34 is a guide-ring 35, having an eye for directing the thread to the needles, said ring being carried by an arm which is pivoted to a bracket 36 on the cam-cylinder, so that the ring 35 can be thrown up out of the way when it is desired to remove one needle-cylinder and replace it with another.

The shaft 4 has an upwardly-projecting curved arm 37 and another arm 38 with projecting pin 39, which is adapted to be acted upon by a series of cams 40, 41, 42, and 43, forming part of a cam-disk, mounted so as to be free to turn on the stud 6. Secured to or forming part of this cam-disk is a ratchet-wheel 44 and a disk 45 with a series of ratchet-teeth 46, the teeth of the ratchet-wheel 44 being engaged by a pawl 47, carried by an arm 48, which is hung to a pin on the fixed frame and moved in one direction by a spring 49, coiled around the hub of the arm and in the opposite direction by a pin 50, projecting from the bell-crank lever 16, the pawl being held down in engagement with the ratchet by means of a spring 51 and backward movement of the arm 48 being limited by contact of the same with a pin 48^a or other suitable stop. The pawl 52 is adapted to engage with the ratchet-teeth of the disk 45, and said pawl is secured to or forms part of an eccentric-sleeve 53, adapted to an eccentric 54 on the shaft 2. A spring 55 acts upon the arm 37, so as to tend to maintain the pin 39 of the arm 38 constantly in the path of the operating-cams therefor.

A belt-shifting fork 56 is carried by a laterally-guided rod 57 and is normally held in the position shown in Fig. 1, so as to direct the driving-belt onto the fast pulley 7, by means of a pair of toggle-levers 58 and 59, the lever 58 being carried by a shaft 60, adapted to a fixed bearing on the frame of the machine, and the lever 59 being hung to a collar 61, which is secured to the shipper-rod 57 and is acted upon by a spring 62, tending to move said shipper-rod, so as to shift the belt

from the fast pulley to the loose pulley. As long as the toggle-levers 58 and 59 are in line with each other, however, the thrust of the spring is resisted thereby, but as soon as the connecting-pin of the toggle-levers is lifted, so that said levers are not in line with each other, they fail to offer sufficient resistance to the thrust of the spring and the latter moves the shipper-rod, so as to shift the belt.

The shaft 60 has an arm 63, whereby the levers 58 and 59 can be moved by hand at any time, so as to either permit the shifting of the belt from the fast to the loose pulley or so as to move the belt back from the loose pulley onto the fast pulley again, and said shaft 60 also has an arm 64, which provides for the automatic operation of the levers 58 and 59, so as to permit of the shifting of the belt from the fast to the loose pulley and the consequent stoppage of the machine.

The machine may be stopped after knitting the desired length of leg for the foot of the stocking by using for this purpose the ordinary tripper-rod actuated by a weight hung to the knitted web. I also provide for an independent operation of the belt-shipper, so as to move the belt from the fast pulley to the loose pulley, by mounting upon the stud 6 a lever 65, the lower end of which is adapted to act upon the arm 64, while its upper end is hooked for engagement with a pin 66, projecting from the hub of the arm 37.

Projecting from the picker-ring 24 are two pins 67 and 68, and when the arm 37 is depressed its upper end is brought into the path of these pins and serves by contact with either of them as a stop for preventing further movement of the picker-ring with the cam-cylinder.

When the machine is knitting round and round for the production of tubular web, the pin 39 rests upon the cam 40. Hence the arm 37 occupies an elevated position and offers no obstacle to the free rotation of the picker-ring 24, the lifter 25 being elevated and resting in a notch or recess 31^a in the top of the cam 31, as shown in Fig. 5, so as to travel above the bits of the needles, which rest upon the top of the cam-cylinder 18. The cam-disk remains stationary with the parts in this position, owing to the fact that during the formation of round-and-round work the pawl 47 bears upon a long tooth of the ratchet-wheel 44, and hence imparts no forward movement thereto. When the desired length of tubular work has been produced, the machine is stopped automatically by the tripping of the belt-shifter by means of the tripper-rod acted on by the weight on the knitted web, as before described. The attendant then raises the cam for lifting out of action the long-bitted needles and moves forward the ratchet-wheel 44, so as to carry the long tooth from under the end of the pawl 47, as shown in Fig. 3, this same action withdrawing the cam 40 from beneath the pin 39 and permitting the arm 37 to drop into range of the pins 67 and 68. The

machine is then turned by hand, so as to effect the lifting out of action of the long-bitted needles, and at the same time the movement of the ring 24 is arrested by contact of the arm 37 with the pin 67, as shown in Fig. 2, so that the cam 31 is withdrawn from beneath the lifter 25, and the latter is permitted to drop onto the top of the cam-cylinder, so as to be in position to act upon the picker-bits of the needles, which remain in action, as shown in Fig. 6. The clutch-sleeve 10 is then shifted into engagement with the reciprocating or to-and-fro pinion 12, and the machine is started by moving the belt back onto the fast pulley 7. The needles remaining in action are those around that half of the machine from x to y in the direction of the arrows, Fig. 2, and the first reciprocation of the cam-cylinder brings the lifting-picker 25 into contact with the bit of the first active needle at that end of the set represented at the left hand in Fig. 2, the cam-cylinder moving in the direction of the arrow. The rotation of the picker-ring 24 is thereby arrested, and the cam 31 passes under the lifter 25 and raises the same and with it the needle with which it is in engagement, as shown in Fig. 7. As soon as the high portion of the cam 31 passes from under the lifter, however, the latter is pulled down into the recess 31^a of the cam by the spring 30, as shown in Fig. 8, and thus clears the bit of the elevated needle and permits the picker-ring and pickers to continue their rotation with the cam-cylinder. This movement continues for a half-turn of the picker-ring or until the pin 68 of the same comes into contact with the arm 37, the lifter being then adjusted beyond the last needle of the acting set at the right-hand side of the machine or at the point y of Fig. 2. As the movement of the cam-cylinder continues the cam 31 is completely withdrawn from beneath the lifter 25 and the latter drops, as shown in Fig. 9, so as to be in position for engagement with the bit of the acting needle at the end y of the set when the direction of rotation of the machine is reversed. When this operation takes place, the lifter comes into engagement with the bit of said acting needle at the end y of the set, is arrested thereby, and is then lifted by the cam 31 on the reverse motion of the latter, so as to raise said end needle out of action, the lifter then dropping into the recess 31^a of the cam, so as to be slightly below the bit of the raised needle, and then continuing its travel with the cam until the picker-ring completes its half-turn and the pin 67 is again brought into contact with the arm 37, whereupon the lifter is lowered by the withdrawal of the cam from beneath the same and these operations are repeated, so that needle after needle at the opposite ends of the acting set will be raised out of action and the desired narrowing of the web will be effected.

In lifting the needles out of action the picker acts in advance of the knitting-cams,

which are on the inner side of the cam 31, but in picking the needles into action again the knitting-cams should act in advance of the picker. Hence after the desired narrowing has been effected by throwing needles out of action and before commencing to widen the web by bringing these needles again into action there should be a change in the relations of the pickers and knitting-cams to effect the change in action just referred to. The knitting-cams and the needle-picking mechanism are therefore adjustable one in respect to the other, a feature of my invention which, it will be evident, is not limited to a machine having the specific needle-picking mechanism which I have shown and described, but is applicable as well to other forms of machine.

On the reciprocation of the machine after the lifting up of the last narrowing-needle at the end y of the set the arm 37 is lifted by the action of the cam 41 upon the pin 39, so that the pin 67 does not come into contact with the same. In consequence of this the lifter rides around on the cam 31 until the pin 67 has passed the arm 37. Before the movement of the machine is reversed, however, the arm 37 again drops into the path of the pin 67 by reason of the pin 39 having left the cam 41. Hence said pin 67 now strikes the arm 37 on the side opposite that which it previously struck and the cam 31 passes on to a position in advance of the pickers. This same action brings the cam 32, which was before in such a position that it never came into range of the depressor-stem 29, into such position that it will, by the reciprocation of the cam-box, act upon said depressor-stem and operate the depressor 26. The arm 37 is then immediately lifted out of the way of the pin 67 by the action of the cam 42, and the picker-ring moves forward with the cam-cylinder until the lifter is arrested by contact with the depressed bit of the first needle of the acting set at the left-hand end x of the set. The cam 32 then acts upon the stem of the depressor 26, so as to cause it to depress the first inactive needle and on the next reciprocation the same operation takes place at the opposite end of the acting set, and so on until all of the inactive fashioning-needles have been again brought into action and the heel or toe pocket is completed. When this has been done, the arm 37 is again dropped into action by the fall of the pin 39 from the cam 42, and remains in the depressed position long enough to strike the pin 67 of the cam-ring and arrest the movement of the latter until the cam 31 has been moved beneath the lifter 25, so as to raise the same to the position shown in Fig. 5, whereupon the arm 37 is again lifted out of action by the cam 43. This cam 43 is higher than either of the cams 40, 41, or 42, and it consequently moves the hub of the arm 38 to such an extent that the projecting pin 66 of the same strikes the lever 65 and operates the belt-shifter, so as to effect

the shifting of the belt onto the loose pulley and the stoppage of the machine. The lever 21 is then thrown down, so as to permit of the descent of the cam 18^a and of the depression of the needles around the inactive half of the machine, and the clutch 10 is then thrown into engagement with the pinion 9 and the shaft 2 turned by hand until the cam 43 is withdrawn from beneath the pin 39 in order to permit the operation of the belt-shifter necessary to shift the belt from the loose pulley to the fast pulley. During the first part of the rotative movement of the machine the cam-disk is operated by means of the eccentric 54, eccentric-sleeve 53, and pawl 52, the latter acting upon the toothed disk 45 and continuing to move the same, the cam-disk, and the ratchet 44 until the long teeth of the latter and of the disk 45 are brought under the respective pawls 47 and 52, whereupon further movement of the cam-disk ceases. During this time the lever 16, arm 48, and pawl 47 are also in action, but the teeth on the disk 45 are coarser than those on the ratchet 44, and the throw of the pawl 52 by the eccentric 54 is correspondingly greater than the throw of the pawl 47, so that the cam-disk is actuated more quickly than by the ratchet-wheel, this operation continuing only during the formation of the few continuous courses after the completion of the toe.

The cam 40 is of considerable extent, so as to permit of the desired number of turns of the machine for forming said series of circular courses after the completion of the toe, the pawl 52 resting upon the long tooth of the disk 45 and stopping the rotation of said disk just before the pin 39 reaches the end of said cam 40.

The object of using the disk 45 with its coarse teeth is to permit of the use of the high cam 43, for one movement of the cam-disk must carry the pin 39 from the bottom to the top of this cam, and if the extent of each movement of the cam-disk was only equal to one of the fine teeth of the ratchet-wheel 44 the face of the high cam 43 would be so abrupt that it would not lift the pin. By the use of the coarse-toothed disk 45, however, I am enabled to impart such an extended movement to the cam-disk when the cam 43 is brought into action that the inclined face of the cam can be of such an angle as to easily raise the pin 39.

While I prefer to use the construction of picker-ring, stop-pins, and stop-arm in connection with the two picker-operating cams described, because it permits of a continuous automatic operation of the machine from the starting of the heel or toe to the finishing of the same, such construction is not absolutely essential to the broadest embodiment of my invention and may be changed in machines of the semiautomatic class, in which the operation of the machine is arrested midway in

the formation of the heel or toe, that is to say, when the narrowing operation has been completed. In this case the same cam can be used to operate both the lifter and depressor, for opportunity is afforded for adjusting said cam by hand from one position to the other when the machine is stopped after narrowing, and also for giving the machine several complete turns, so as to introduce extra courses into the heel and instep at the center of the heel, as set forth in Williams and Swinglehurst's patent, No. 552,806, dated January 7, 1896.

In Fig. 10 I have shown one instance of such an adjustable cam, the latter being represented at 70 and being mounted upon an arm 71, hung to the cam-cylinder, and acted upon by a spring 72 and by a cam 73, so that the cam 70 can be moved into a position beneath the stem 27 of the lifter or into a position beneath the stem 29 of the depressor. This operation can also be rendered automatic, if desired, by causing the arm 37 to act at the proper times upon a pin 74, projecting from the cam 73. In this case, of course, the picker-operating cam must be independent of the regular knitting-cams.

Knitting-cams such as shown in Fig. 11 can be used instead of those shown in Fig. 4 in that class of machines in which the thread-guide is movable in respect to the cam-cylinder. It will also be evident that needle-picking devices embodying the salient features of my present invention can be used upon a machine having a straight needle-bed and a straight reciprocating cam-box instead of the needle-cylinder 78 and circular cam-box which I have shown in the drawings. Hence in some of my claims I have used the general terms "needle-carrier" and "cam-carrier" to indicate either construction.

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

1. A knitting-machine in which a needle-carrier and its needles, a cam-carrier and provision for operating the latter, are combined with needle-picking devices comprising two elements, namely, a picker-carrier frictionally mounted upon the cam-carrier and having a needle-lifting picker and a needle-depressing picker, and cam mechanism mounted upon the cam-carrier so as to travel therewith, one of said elements being adjustable in respect to the other whereby either the lifter or depressor can be operated.

2. A knitting-machine in which a needle-carrier and its needles, a cam-carrier and provision for operating the latter, are combined with needle-picking devices comprising a picker-carrier frictionally and adjustably mounted upon the cam-carrier, and having a needle-lifting picker and a needle-depressing picker, and cams traveling with the cam-carrier, one for raising the needle-lifter and the other for lowering the needle-depressor.

3. The combination in a knitting-machine, of a needle-carrier and its needles, a cam-carrier, provision for operating the latter, knitting-cams and needle-picking mechanism adjustable one in respect to the other in the direction of movement of the movable carrier, such adjustment being independent of that required to effect the successive picking of the needles, and independent cams, one for acting on the pickers during the widening operation and the other for acting on the pickers during the narrowing operation, whereby in picking the needles out of action the picking mechanism may be caused to act in advance of the knitting-cams, while in picking needles into action the knitting-cams may be caused to act in advance of the picking mechanism.

4. A knitting-machine in which a needle-carrier and its needles, a cam-carrier, and provision for operating the latter, are combined with a picker-carrier frictionally mounted upon the cam-carrier, and having a needle-lifting picker and a depressing-picker, a cam structure traveling with the cam-carrier, and an adjustable stop whereby the relations of the picker-carrier and cam mechanism may be changed.

5. A knitting-machine in which a needle-cylinder and its needles, a cam-cylinder, and provision for operating the latter, are combined with a picker-ring frictionally mounted upon said cam-cylinder and having a needle-lifting picker and needle-depressing picker, cams on the cylinder for raising the lifter and lowering the depressor, and a movable stop for arresting the movement of the picker-ring with the cam-cylinder.

6. A knitting-machine in which are combined a needle-cylinder and its needles, a cam-cylinder, provision for operating the latter, a picker-ring frictionally mounted upon said cam-cylinder and having a needle-lifting picker and a needle-depressing picker, cams on the cam-cylinder for raising the lifter and lowering the depressor, a pair of pins projecting from the picker-ring, and a stop movable into and out of range of said pins.

7. A knitting-machine in which are combined a needle-carrier and its needles, a cam-carrier, a picker-carrier frictionally mounted upon said cam-carrier and having a needle-lifting picker and a needle-depressing picker, cam mechanism on the cam-carrier for raising the lifter and lowering the depressor, a stop for varying the relation of said cam mechanism and pickers, a cam-disk, intervening devices whereby said cam-disk is

caused to actuate said stop, and provision for operating the cam-carrier and cam-disk. 60

8. A knitting-machine in which are combined a needle-carrier and its needles, a cam-carrier, a picker-carrier having a needle-lifting picker and a needle-depressing picker, cam mechanism on the cam-carrier for raising said lifter and lowering said depressor, a movable stop whereby the relation of said cam mechanism and the pickers can be varied, a belt-shifter, a cam-disk, devices whereby said disk is caused to actuate said stop, devices whereby one of the cams of the disk is caused to operate the belt-shifter, and provision for actuating the cam-carrier and cam-disk. 70

9. A knitting-machine in which are combined a needle-cylinder and its needles, a cam-cylinder, a picker-ring frictionally mounted upon said cylinder and having a needle-lifting picker and a needle-depressing picker, cam mechanism on the cam-cylinder for raising said lifter and lowering said depressor, an adjustable stop for varying the relation of said cam mechanism and the pickers, a cam-disk for operating said stop, rotating and reciprocating devices for the cam-cylinder of the machine, and two sets of ratchet-and-pawl mechanism for operating said cam-disk, one of said mechanisms being operated by the rotating devices of the machine, and the other being operated by the reciprocating devices of the machine. 85

10. A knitting-machine in which a needle-carrier and its needles, and cams for actuating said needles so as to cause them to form stitches, are combined with needle-picking mechanism comprising a lifter and a depressor, with a lifter-cam for the picker located in the same radial plane as the knitting-cams, substantially as specified. 95

11. A knitting-machine in which the needle-carrier and its needles, and cams for actuating said needles so as to cause them to form stitches, are combined with needle-picking mechanism comprising a lifter and depressor, a cam for operating the lifter located in the same radial plane as the knitting-cams, and a cam for operating the depressor located in a different radial plane, substantially as specified. 105

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses. 110

LOUIS N. D. WILLIAMS.

Witnesses:

FRANK E. BECHTOLD,
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