(No Model.)

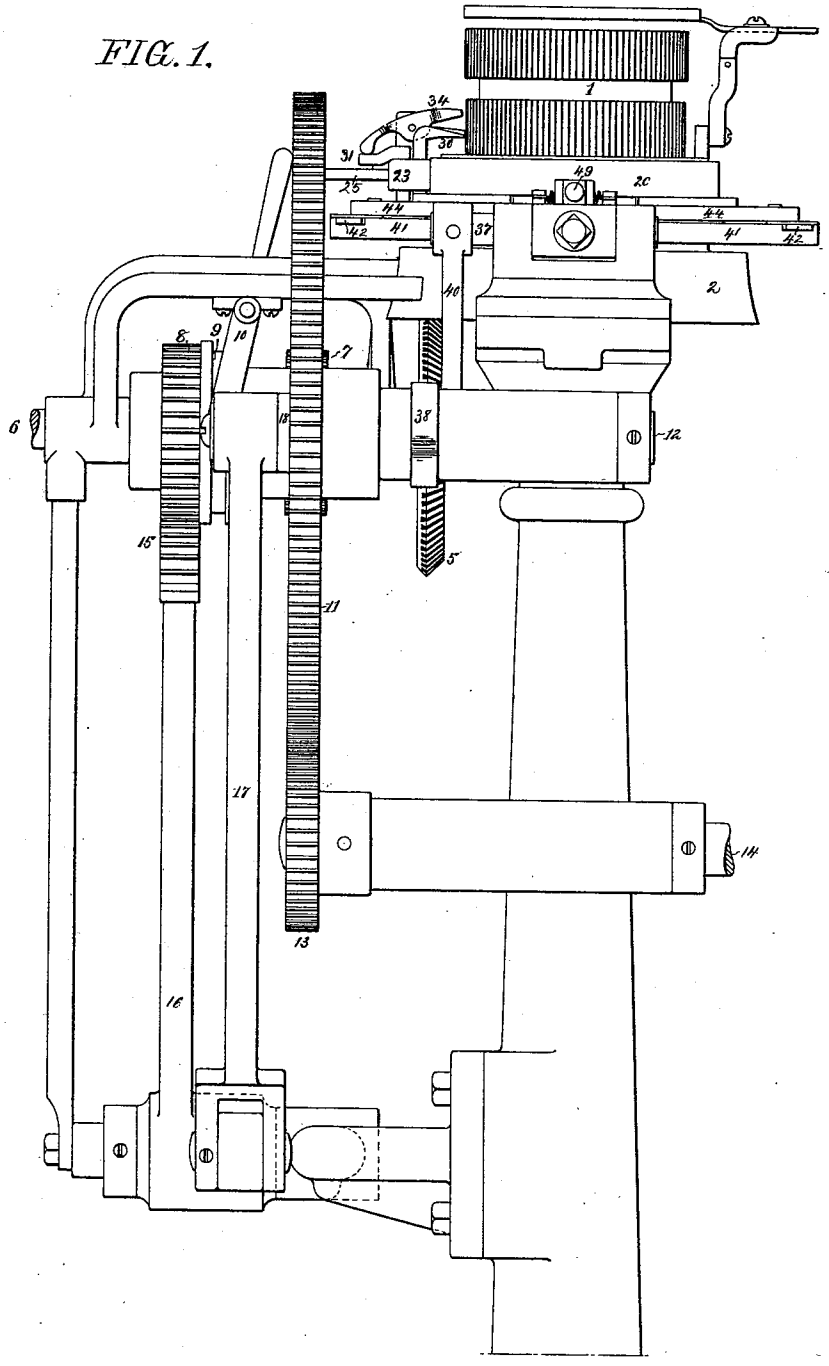
4 Sheets—Sheet 1.

L. N. D. WILLIAMS.

KNITTING MACHINE.

No. 521,066. Patented June 5, 1894.

FIG. 1.



Witnesses:
C. A. Turner
Frank E. Beckwith

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

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.)

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L. N. D. WILLIAMS.

KNITTING MACHINE.

No. 521,066. Patented June 5, 1894.

FIG. 2.

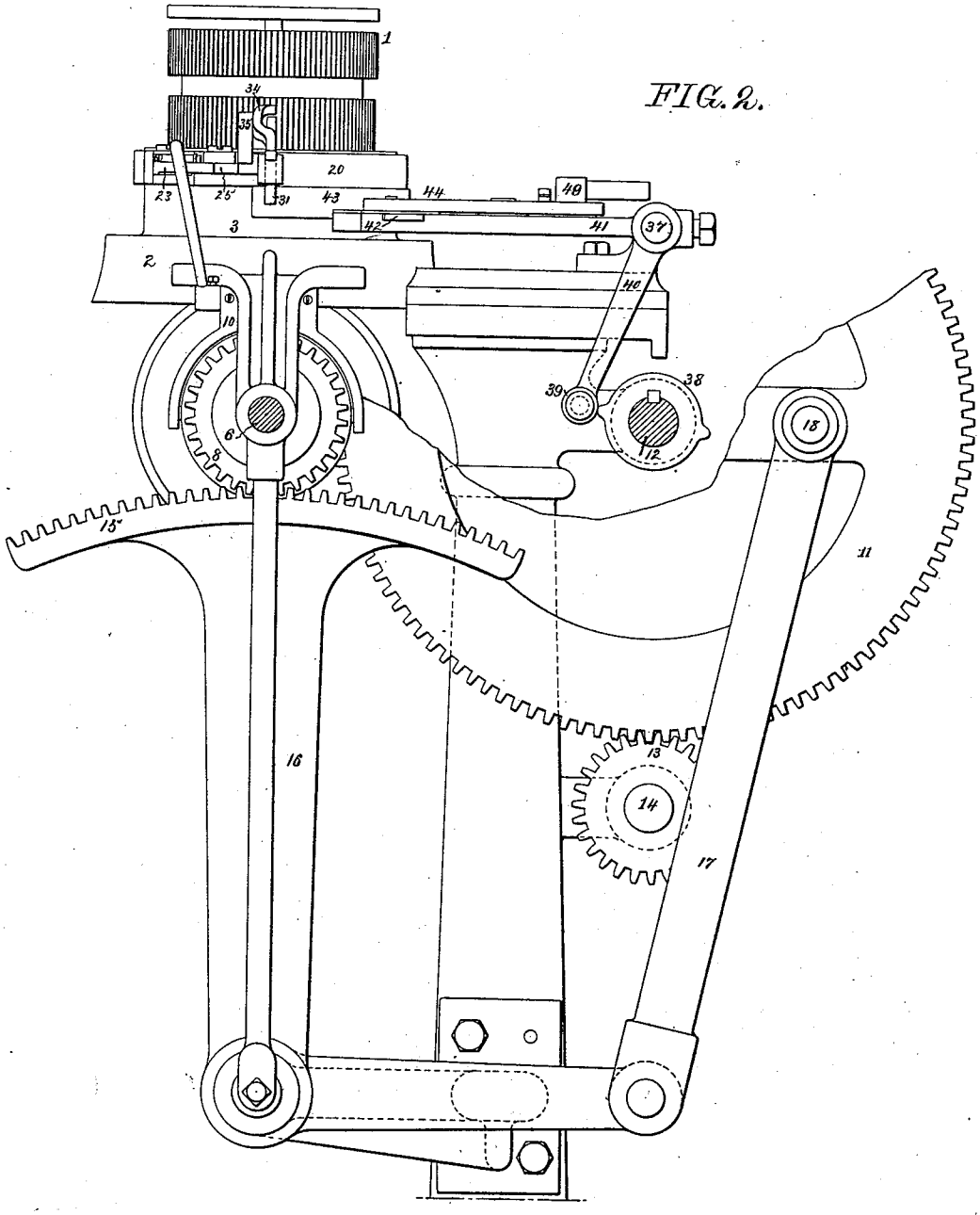
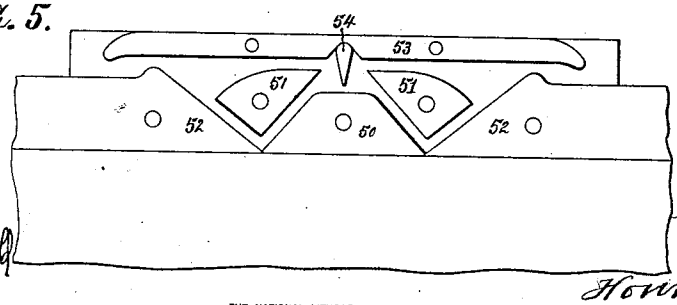


FIG. 5.



Witnesses:
K. D. Turner
Frank E. Reichhoff

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

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 3.

L. N. D. WILLIAMS.

KNITTING MACHINE.

No. 521,066. Patented June 5, 1894.

FIG. 3.

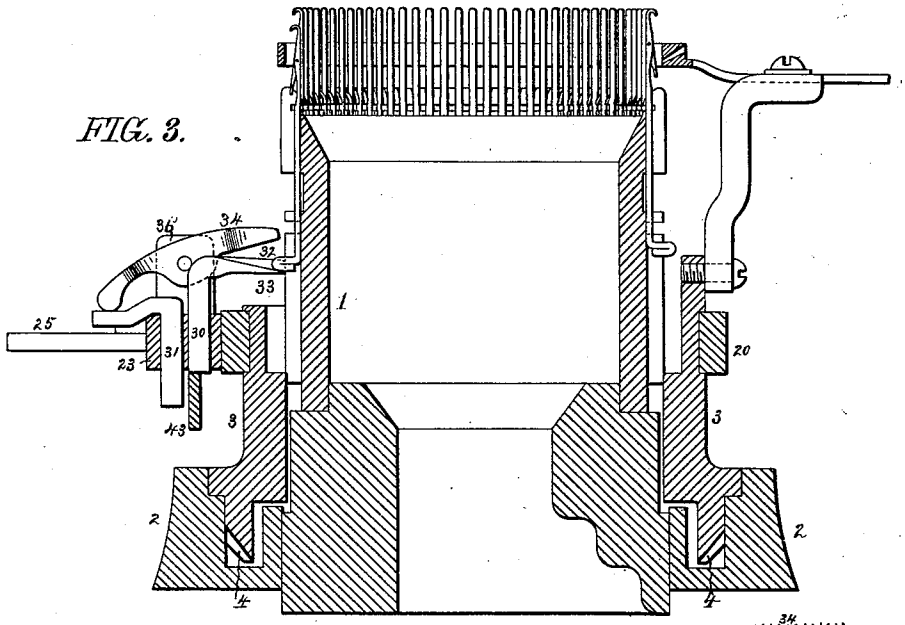


FIG. 4.

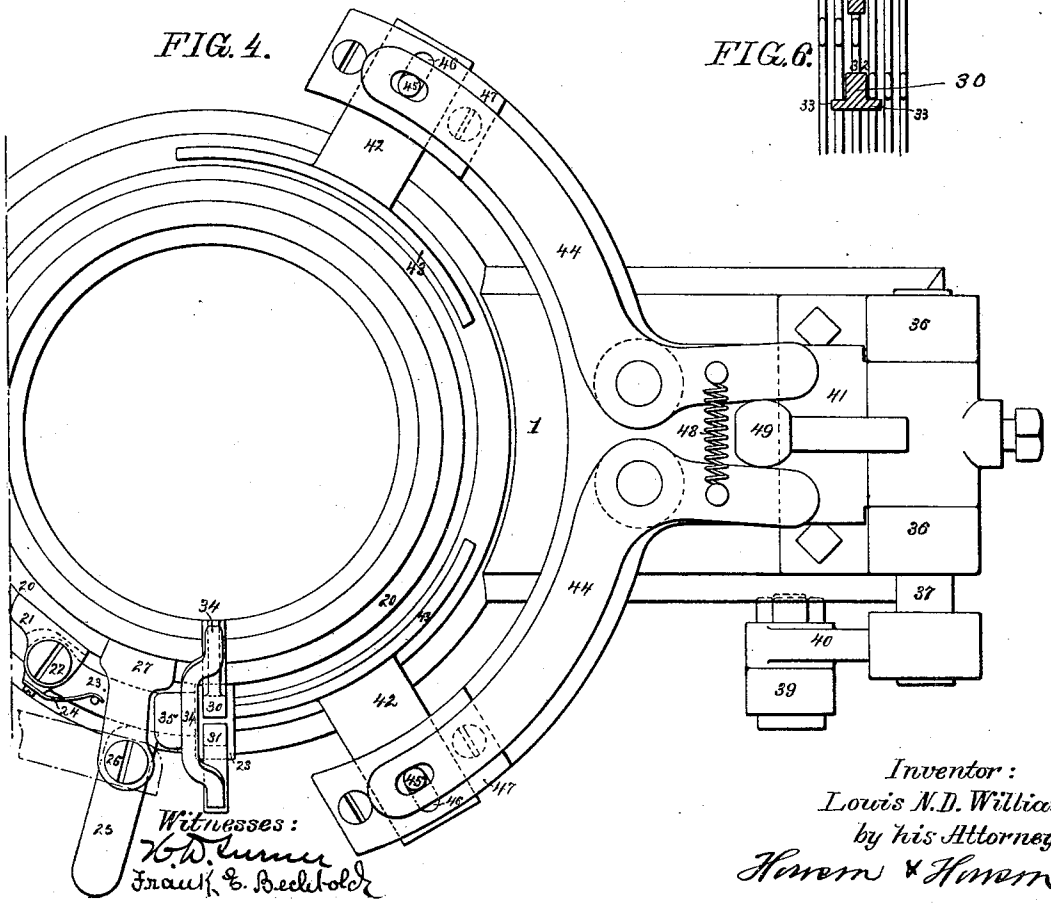
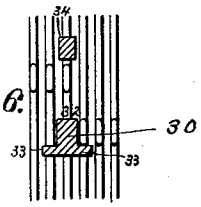


FIG. 6.



Witnesses:
H. W. Turner
Frank G. Beckhold

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

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 4.

L. N. D. WILLIAMS.

KNITTING MACHINE.

No. 521,066. Patented June 5, 1894.

FIG. 7.

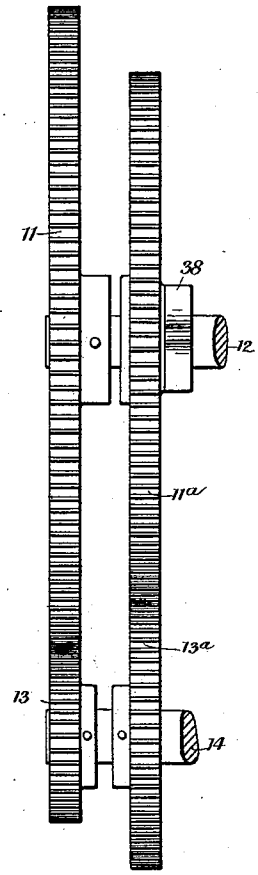
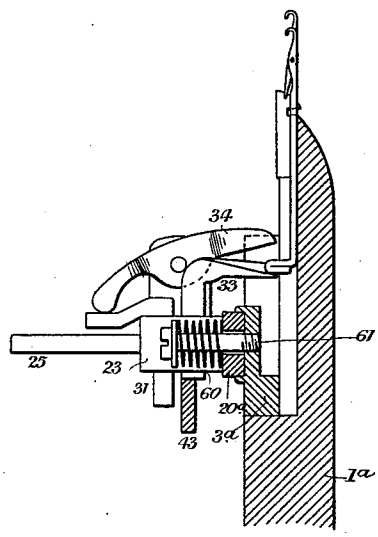


FIG. 8.



WITNESSES.
Hamilton D. Turner
Frank Bechtold

INVENTOR.
Louis N. D. Williams.
By his Attorneys.
Howson & Howson

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

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

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 521,066, dated June 5, 1894.

Application filed August 31, 1893. Serial No. 484,445. (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 Philadelphia, Pennsylvania, have invented certain Improvements in Knitting-Machines, of which the following is a specification.

My invention consists of certain improvements in the knitting machine for which Letters Patent No. 410,859 were granted to Robert W. Scott, on the 10th day of September, 1889, the object of my invention being to simplify the construction and render more effective the operation of the devices employed for picking the fashioning needles into and out of operative position. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1, is an end view of a knitting machine constructed in accordance with my present invention, the needle cylinder being for clearness shown without needles. Fig. 2, is a side view of the same, partly in section, and with some of the gearing broken away in order to show the parts behind it. Fig. 3, is a longitudinal section, on a larger scale, of the needle cylinder, cam ring, and some of the needle picking devices. Fig. 4, is a plan view of the cam box and needle picking devices. Fig. 5, is a view showing the cams of the cam box. Fig. 6, is an enlarged end view of parts of the pickers and of some of the needles; and Figs. 7 and 8, are views illustrating certain modifications in the construction of the machine.

The needle cylinder 1 is mounted in the fixed frame or head 2 of the machine so that it has no movement of rotation therein and the cam box 3 is mounted so as to rotate and has around its lower edge a bevel wheel 4 meshing with a bevel pinion 5 on a shaft 6 to which either a continuous rotating motion or a motion first in one direction and then in the opposite direction can be imparted, the character of the motion being dependent upon whether the continuously rotating pinion 7 or a back and forth movement pinion 8 is clutched to the shaft by the interposed clutch sleeve 9, it being understood that the pinions are loose on the shaft and the clutch sleeves splined thereto, so that by moving the clutch sleeve, by means of its lever 10, either of the pinions may be caused to operate the shaft 6.

Movement is imparted to the pinion 7 by a spur wheel 11 carried by a countershaft 12 and meshing with a pinion 13 on the driving shaft 14, and back and forth movement is imparted to the pinion 8 by means of a segment 15 formed upon one arm of a lever 16 hung to a suitable bearing on the frame of the machine, another arm of this lever being connected by a rod 17 to a crank pin 18 on the spur wheel 11.

A ring 20 is fitted between upper and lower shoulders on the cam box 3 and is thus confined vertically thereto, the ring having a frictional hold upon the cam box so that while it is caused to move with the cam box when such movement is not obstructed, it can slip when its movement meets with an obstruction sufficient to overcome its frictional hold upon the cam box.

To a bracket 21 on the friction ring 20 is hung, by means of a pin 22, one end of an arm 23, which is acted upon by a spring 24 tending to move the free end of the arm outward to an extent permitted by contact of the same with a cam lever 25, which is hung, by means of a pin 26, to a bracket 27 mounted upon the cam box, as shown in Fig. 4.

The free end of the arm 23 serves as a guide for a pair of pins 30 and 31, the upper end of the pin 30 being bent inward toward the needle cylinder of the machine and being recessed on its opposite sides so as to form a central rib 32 with a flange 33 projecting from each face of the same at the bottom, as shown in Fig. 6. The other pin 31 is bent outward at the upper end and acts upon one arm of a lever 34 which is hung to a stud 35 on the arm 23, the inner end of this lever 34 occupying a position directly above the central rib 32 of the pin 30 as shown in Figs. 4 and 6. The pin 30 and lever 34 constitute the needle pickers, the former for lifting the needles out of operative position, and the latter for depressing or restoring them as hereinafter set forth.

A projecting portion of the frame or head 1 has at the outer end bearings 36 for a rock shaft 37, to which a vibrating motion is imparted by a cam 38 on the shaft 12, this cam acting upon an antifriction roller 39 carried by an arm 40 which is secured to the shaft 37.

Secured to the central portion of the shaft 34 is a plate 41 forked at its inner end, and

mounted in each of these forks so as to slide radially in respect to the needle cylinder is a slide 42 having at its inner end a segmental lifter 43 sufficient in length to compass as many needles of the needle cylinder as constitute the fashioning needles at each end of the fashioning set, that is to say, the needles which are first thrown out of operative position and then brought into operative position again to narrow and widen the knitted web.

The slides 42 are under control of levers 44 hung to the vibrating plate 41, a slot near the outer end of each lever receiving a pin 45 which projects from the slide 42 through a guide slot 46 formed in the confining cap 47 on the arm of the plate 41.

The short arms of the levers 44 are drawn together by a spring 48 and are under control of a cam 49 the stem of which is adapted to an opening in the vibrating plate 41, so that the cam can be turned. When the cam 49 is in the position shown in Fig. 4 the short arms of the levers 44 are forced apart and the slides 42 are forced inward toward the cam box and the lifters 43 occupy positions in line with the inner pin 30 of the arm 23, but if the cam 49 is turned quarter way around it permits the short arms of the levers 44 to be drawn toward each other, thus drawing outward the slides 42.

The cam box 3 has a central lifting cam 50, draw down cams 51 on each side of the same, supplementary lift cams 52 beyond said draw down cams, a top or guard cam 53, and a pivoted toe cam 54 which can swing in contact with either of the draw down cams 51 in order to direct the needles thereto, the direction of swing depending upon the direction of movement of the cam box.

The operation of the machine is as follows:—When the cam box is rotating and the machine is producing round and round work the lever 25 is in the position shown by dotted lines in Fig. 4 so that the arm 23 is moved outward by its spring 24 to such an extent as to carry both of the pins 30 and 31 out of range of the lifters 43 which, it will be understood, have a constant rising and falling movement due to the constant vibration of the plate 41. When the formation of tubular web by round and round knitting is completed, a certain number of the needles of the cylinder are raised, as shown at the right hand side of Fig. 3, so that their bits are free from the control of the knitting cams and the direction of motion of the cam box is changed from a rotating to a reciprocating or to and fro motion by shifting the clutch sleeve 9. At the same time the lever 25 is turned to the position shown by full lines in Fig. 4 by any appropriate contrivance, as for instance by means of a pin carried by a lever acted on by a pattern chain, similar to that employed for operating the lever of the draw down cam in Letters Patent No. 484,610, dated October 18, 1892. The levers 44 are in the position shown in Fig. 4, hence when the arm 23 is thus pushed into operative position it brings the pin 30 into line with the lifters 43. Before the cam box reaches the limit of its first reciprocation the rib 32 of the picker 30 comes into contact with the bit of the depressed needles at the rear end of the acting set and the continued movement of the ring 20 with the cam box is thereby arrested, and while the ring is thus stationary the lifters 43 have a quick vertical reciprocation imparted to them so that the shoulder 33 which projects under the bit of the needle in contact with the rib 32 lifts said needle into inoperative position, the pin 30 then falling back by gravity with the lifter 43 as the latter descends. Before the cam box reaches the limit of its reciprocation in the opposite direction, the other side of the rib 32 strikes the bit of the depressed needle at the opposite end of the acting set and this is lifted out of operative position by the opposite flange 33 in the same manner, and the operation is thus proceeded with, the number of acting needles being reduced one by one on each reciprocation of the cam box, first at one end of the set and then at the opposite end. When the number of needles in action has been reduced to the desired extent the cam 49 is shifted so as to draw the lifters 43 outward into position beneath the pin 31, this operation taking place when the lifters are down so that the movement will not be interfered with by said pin 31. As shown in the drawings, the cam 49 is intended to be turned by hand, but in an automatic machine the movement of the cam at the proper times will be effected by a connection with some moving part of the machine, such connections forming no part of my present invention. During the time that the picker 30 was lifting the needles successively out of operative position the other picker formed by the inner end of the lever 34 remained stationary and traveled back and forth above the bits of the raised needles but as soon as the lifters 43 are shifted outwardly the condition of affairs is reversed, the picker 30 now remaining down and the picker 34 being operated by the pin 31. The picker 30, however, still acts as the stop for limiting the movement of the friction ring 20 with the cam box, but the stoppage of the picker 30 by contact with the end needle of the actuated set now brings the inner end of the picker 34 directly above the bit of the first adjacent raised or inoperative needle, for, as shown in Fig. 6, the width of the picker 30 is equal to the gage of three needles, and as the end of the picker 34 is directly above the central rib of the picker 30 it follows that when the latter is stopped by contact with the bit of one needle, the picker 34 will be in line with the next needle and will be in position to pull it down into operative position as soon as the pin 31 is raised by the action of the lifters 43. The amount of lift imparted to the needles by the picker 30 will be but slight, only sufficient, in fact, to permit the ends of the cam 53 to complete

the raising movement and the depression of the bits of the needles by the picker 34 need only be sufficient to carry them beneath the ends of said cam.

It will be observed that the cam 38 imparts two vibrations to the plate 41 for each turn of the shaft 12 and each complete back and forth reciprocation of the cam box so that there is the desired operation of the picker at each end of each reciprocating movement and the movement of the picker is extremely rapid, so that the desired picking of the needles will be effected during the limited time that the friction ring 20 is stationary at the end of each reciprocating movement.

A single acting cam may be used in place of the duplex cam if desired, by employing spur wheels 11^a, 13^a, as shown in Fig. 7, for instance to give it two rotations for each rotation of the spur wheel 11, thus imparting to the lifters 43 an even quicker movement than that due to the use of the duplex cam.

The friction ring mounted directly upon the cam box provides a most convenient and acceptable means for carrying the pickers back and forth and the simple moving of the lifters 43 from one position to another effects the reversal in the operation of the pickers without the use of any complicated cam mechanism whatever.

It will be evident that the essential features of my invention can be embodied in a straight machine as well as in a circular machine, a flat bar taking the place of the ring 20 in this case, and suitable devices being employed for holding said bar in frictional contact with the reciprocating cam box while the lifters 43 will, of course, be straight instead of segmental. In Fig. 8 I have shown such a construction, the bar 20^a being held in frictional contact with the cam box 3^a by means of a spring 60 interposed between the outer face of said bar 20^a and the head of a bolt 61 carried by the cam box, said bolt passing through a slot of suitable length in the bar. Of course it will be understood that as many of these bolts and springs will be employed as may be necessary to insure the proper friction between the cam box and the bar. In some of the claims I have therefore used the term needle carrier, instead of needle cylinder, to indicate either a cylinder or a straight needle bar.

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

1. The combination of the needle carrier and its needles, a cam box, a plate frictionally mounted upon said cam box, pickers carried by said plate and adapted to be stopped by contact with the needles, and means for operating said pickers, so as to throw the needles into and out of operative position, substantially as specified.

2. The combination of the needle carrier and its needles having bits, a cam box, pickers, one consisting of a shouldered lifter and the other of a depressor above the center of said lifter, a carrier for said pickers having a frictional connection with the cam box, whereby said pickers may be stopped by contact with the bits of the needles, and means for moving the pickers in line with the movement of the needles, substantially as specified.

3. The combination of the needle carrier and its needles having bits, a cam box, a pair of pickers comprising a lifter and a depressor, each adapted to act upon the bits of the needles, a carrier having a frictional connection with the cam box whereby said pickers are carried across the needles until stopped by contact of one of the pickers with a needle bit, means for moving the pickers in line with the movement of the needles, and means for moving them laterally toward and from the needle bits so as to throw them into and out of action, substantially as specified.

4. The combination of the needle carrier and its needles, a cam box, a pair of pickers adapted to be stopped by contact with the needles, a carrier for said pickers, having a frictional connection with the cam box lifter plates whereby the pickers are operated at each end of the travel of their carrier, and means for vibrating said lifter plates, substantially as specified.

5. The combination of the needle cylinder and its needles, a cam box, a friction ring mounted on said box, a pair of pickers carried by said ring and adapted to be stopped by contact with the needles, a pair of segmental lifters, a plate carrying said lifters, and means for operating said plate, substantially as specified.

6. The combination of the needle cylinder and its needles, the cam box, means for rotating and reciprocating said cam box, a friction ring mounted on the box, a pair of pickers carried by said ring and adapted to be stopped by contact with the needles, a pair of segmental lifters for actuating said pickers, a vibrating lifter plate, and a continuously rotating cam for actuating said plate, substantially as specified.

7. The combination of the needle carrier and its needles, a cam box, a friction plate mounted thereon, pickers carried by said plate and adapted to be stopped by contact with the needles, lifter plates for acting on said pickers, a carrier for said lifter plates, means for vibrating said carrier and means for shifting the plates thereon so as to cause them to act on either picker, substantially as specified.

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

LOUIS N. D. WILLIAMS.

Witnesses:
CHAS. H. BANNARD,
FRANK E. BECHTOLD.