

(No Model.)

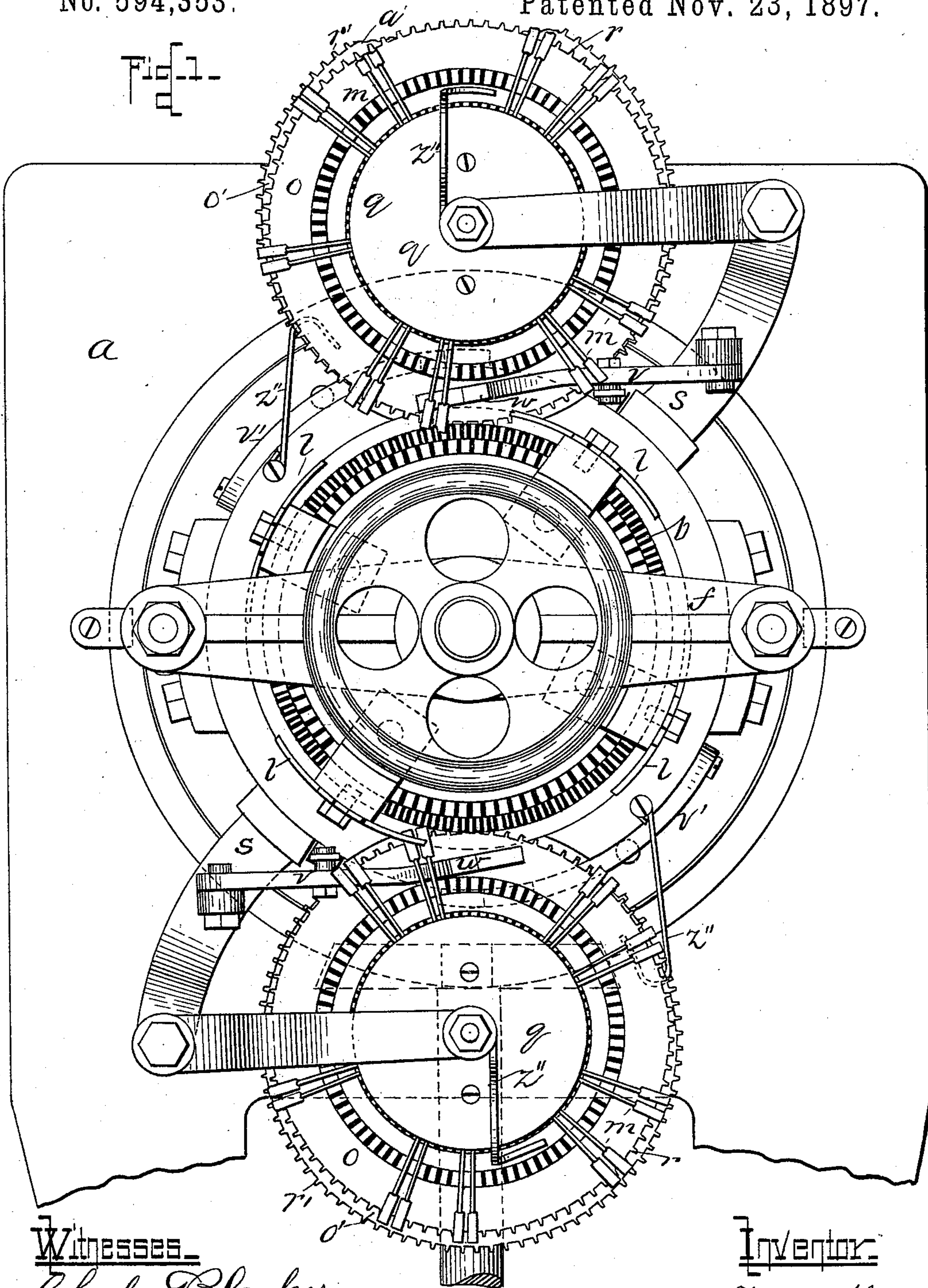
3 Sheets—Sheet 1.

F. H. MOON.
KNITTING MACHINE.

No. 594,353.

Patented Nov. 23, 1897.

Fig 1--



Witnesses

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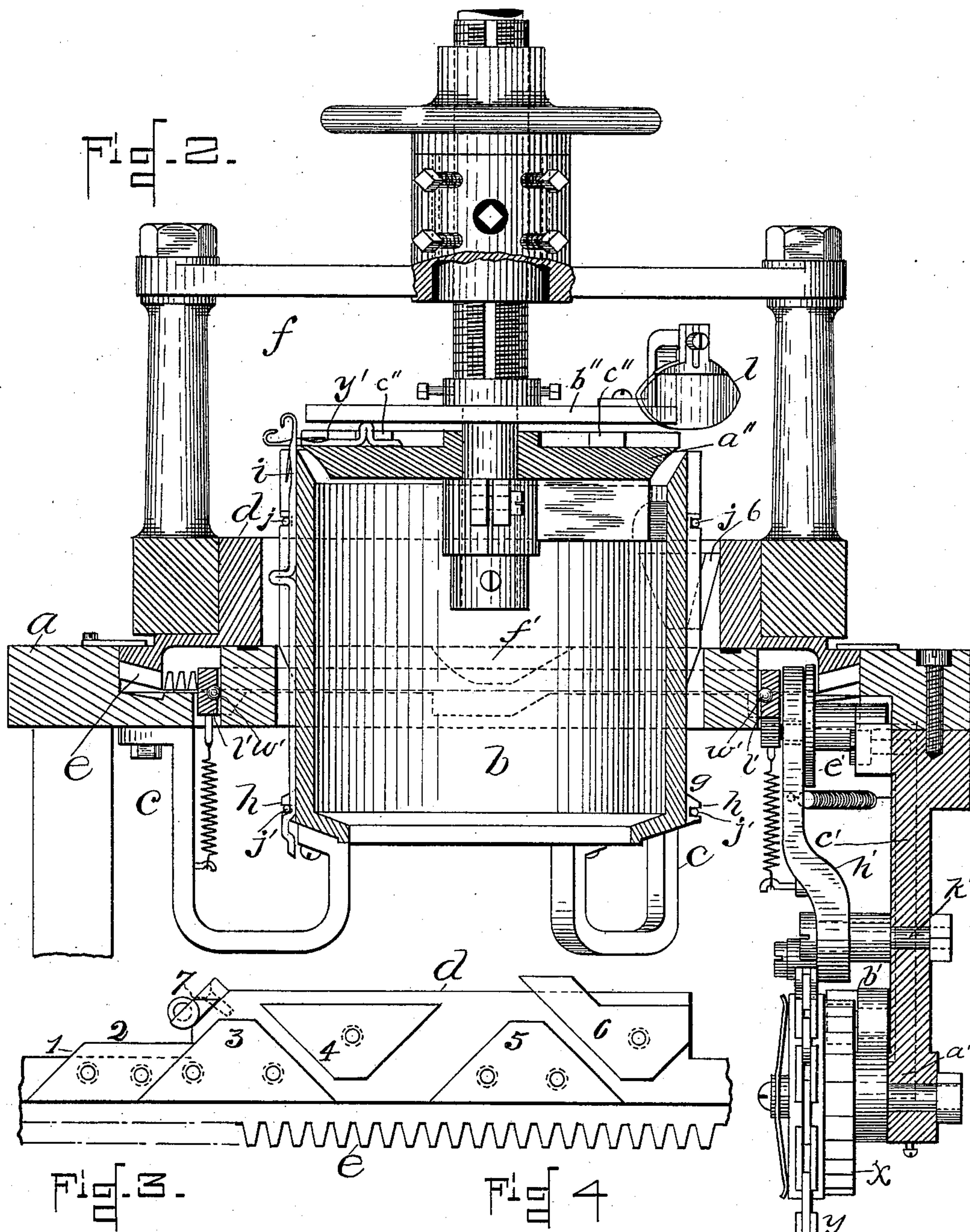
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3 Sheets—Sheet 2.

F. H. MOON.
KNITTING MACHINE.

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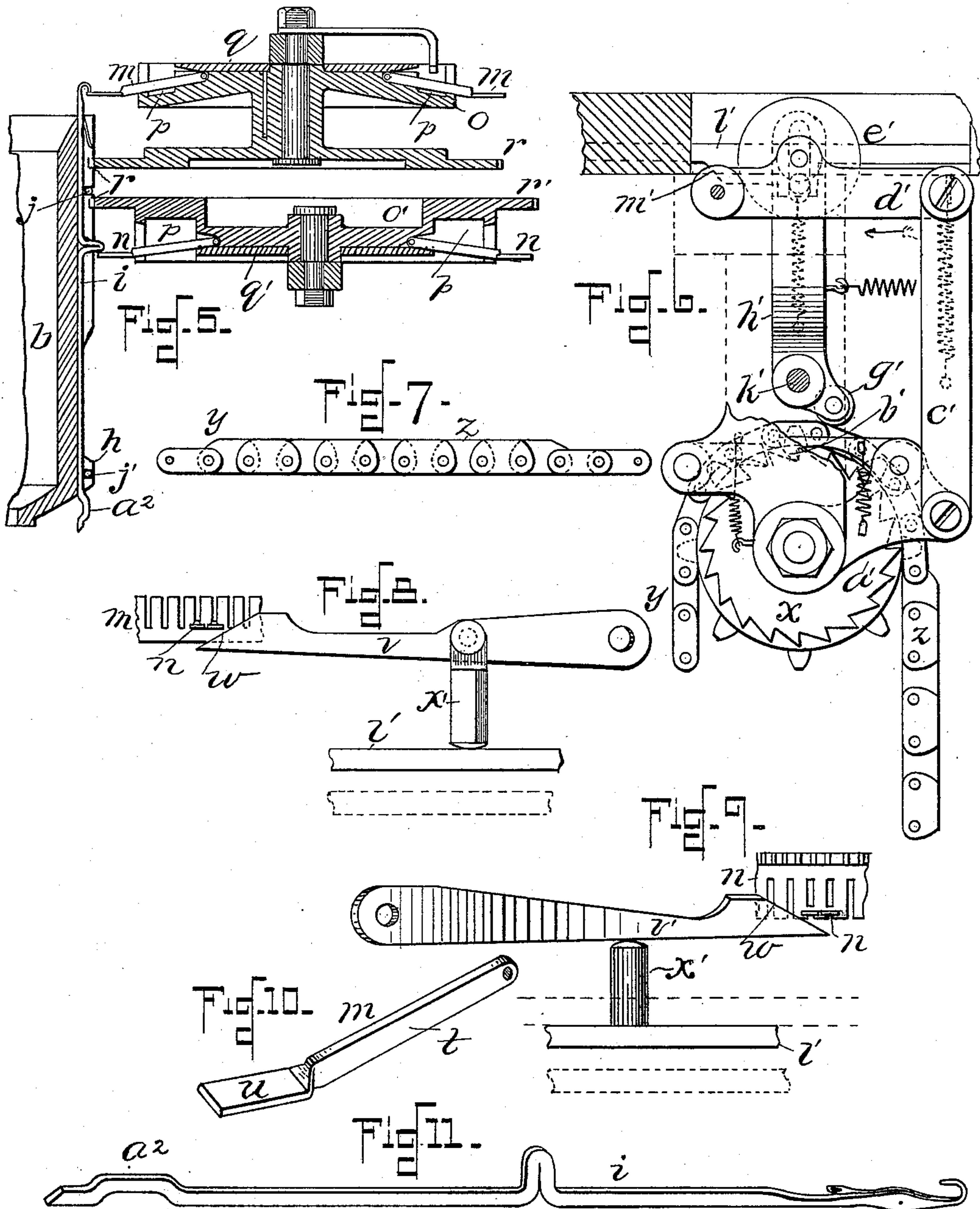
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3 Sheets—Sheet 3.

F. H. MOON.
KNITTING MACHINE.

No. 594,353.

Patented Nov. 23, 1897.



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UNITED STATES PATENT OFFICE.

FREDERICK H. MOON, OF HYDE PARK, MASSACHUSETTS, ASSIGNOR TO
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KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 594,353, dated November 23, 1897.

Application filed July 29, 1897. Serial No. 646,282. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK H. MOON, of Hyde Park, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a description sufficiently full, clear, and exact to enable those skilled in the art to which it appertains or with which it is most nearly connected to make and use the same.

This invention has relation to circular-knitting machines adapted to knit either a plain stitch or ribbed figured fabric. Some parts or features of the invention may, however, be employed on knitting-machines of other types or styles.

It is the object of the invention to provide improvements whereby knit webs of almost innumerable pattern or figure may be produced with exceedingly simple means and in a speedy and economical manner.

The invention consists for the most part of operating and controlling the operations of the needles to which, preferably, two or more colors or kinds of yarn are fed.

The invention also consists of several improvements incidental to the foregoing, all as is hereinafter shown, described, and claimed.

Reference is to be had to the annexed drawings, and to the letters and numerals marked thereon, forming a part of this specification, the same letters and numerals designating the same parts or features, as the case may be, wherever they occur.

Of the drawings, Figure 1 is a plan view of my improved machine complete, the needles not being shown as in place therein. Fig. 2 is a vertical central sectional view of the machine proper, the needles also being omitted from representation therein. Fig. 3 is a view of the needle-operating cams of the cam-cylinder, the same being shown as flat or developed. Fig. 4 is a detail view of parts which control the means for raising the cams for operating the needle-lifting fingers or pickers into operative position. Fig. 5 is a vertical sectional view through the picker-dials and a portion of the needle-cylinder, showing the construction and relationship of the parts and the manner in which the pickers act upon the needles to raise the same. Fig. 6 is an in-

side detail view showing the manner of operating the pattern-chain and the manner also in which the pattern-chain acts to control the means partly illustrated in Fig. 4. Fig. 7 is a side view of a portion of the pattern-chain. Figs. 8 and 9 are sectional detail views showing the means directly connected with the cam-levers for acting upon the picker-fingers and giving a clear understanding of how the said cam-levers are raised into position. Fig. 10 is a view of one of the pickers detached. Fig. 11 is a view of one of the needles detached.

In the drawings, *a* designates the bed of the machine, which may be supported upon legs or otherwise.

b is the needle-cylinder, supported in a stationary manner from the bed by the hangers *c* or in any other suitable way.

d is the cam-cylinder, constructed and arranged to be revolved around the needle-cylinder by means of a bevel-gear, (not shown,) which engages the bevel-teeth *e* on the bottom of the cam-cylinder.

f is a yoke connected with the cam-cylinder and supporting the needle and cam-dials in proper position at the top of the needle-cylinder, and also supporting the yarn-carriers and yarn-guides, adapted to revolve with the cam-cylinder and cam-dial. The needle-dial may be held from revolving with the yoke in the usual way, and some other parts not fully or distinctly shown or described in detail may be understood as of any suitable known construction.

The exterior of the needle-cylinder is turned down at its lower part, as at *g*, and an annular grooved rib *h* is formed thereon, which rib is vertically grooved in accordance with the upper part of the needle-cylinder for the reception of the cylinder-needles *i*, the latter being held in position by the annular springs *j j'*, arranged in the annular groove of the rib *h* and a like groove formed around the upper portion of the needle-cylinder.

The needles *i* have the usual heels *k* formed thereon to be engaged by the knitting-cams and reciprocated vertically to take yarn from a yarn-guide *l* and form a new loop and cast off the old one.

In order to accomplish the objects of the

present machine, certain or any of the needles are raised in predetermined order, so that they may escape the drawing-down action at any one of the yarn-feeds, and that while
 5 yarn may be laid upon them below their latches they will not form such yarn into a loop; but when the loop really on the needle is drawn through a new loop in the hook and cast off the said yarn laid thereon below the
 10 latch will be cast off and simply float on the back of the fabric and not be knit into the latter at the point at present under consideration.

Referring to Fig. 3, it will be noted that as the cam-cylinder is revolved the heel of each
 15 of the needles will pass from the ledge upon which it normally rests (if the cam-cylinder should be provided, as it usually is, with such ledge) up the preliminary incline or cam 1, so as to be acted upon, if need be, by the pick-
 20 ers, to be presently described. Then if not acted upon by a picker it passes along on the horizontal face 2 of the said cam, up the inclined face, and over cam 3 to have the hook of the needle catch the yarn from the yarn-
 25 guide, thence across and down the inclined face of cam 4, by which it is caused to form a new loop, thence across to and up over the cam 5, where it again catches the yarn from another yarn-guide, and from thence against
 30 the inclined face of the cam 6, by which it is depressed to normal position, so as to enable it to be acted upon again substantially as before described.

In case it should be desired to have the
 35 hook of the needle miss taking a yarn from the yarn-guide, as before mentioned, it may be raised when its heel reaches the horizontal surface 2 of the cam 1, so that its heel will pass over the guard-cam 7 and above the cam
 40 4, with the effect of merely laying the yarn on the stem of the needle below the latch, the needle-heel passing on to be engaged by the cam 6, the upper end of which projects above the path of the needle-heel when raised and
 45 so depresses the needle to normal position, as before stated. The spring guard-cam is of such construction that it may yield should a needle-heel strike its point and switch the needle either up or down, and so prevent
 50 what would otherwise be a breakage.

l, as before noted, designates the yarn-guides, of which there may be four, as shown in Fig. 1, or more or less, which yarn-guides I
 55 propose to construct entirely of glass in order to prevent wear and in order that the devices and things back of them may readily be seen by the operator from the front. These yarn-guides will be supplied with yarns varying in color or kind, as may be desired, and it is this
 60 variation in colors or kinds of yarn in connection with my means for operating the needles that enables me to accomplish the objects of the invention.

The cylinder-needles are raised in desired
 65 order by what I term "pickers" or "picker-fingers" *m n*, some of which pickers engage the hooks of the needles and others the heels,

as is clearly shown in Fig. 5, in which figure I have shown one manner of constructing, supporting, and actuating the pickers.

o o' designate the picker-dials, provided with radial inclined grooves in which pickers are arranged, the latter being provided on their inner ends with holes through which a
 70 spring-wire hoop or ring is passed, so as to properly pivot the pickers and hold them in place. A broad annular groove *p* may be formed in the face of each picker-dial in order to give greater freedom of movement of the
 75 pickers in their radial grooves. Caps or plates *q q'* are secured to the faces of the picker-dials *o o'* to keep the pickers from becoming dislodged from proper position, and the outer
 80 edges of the said plates may be inclined or provided with inclined radial grooves corresponding to the aforesaid radial grooves in the dials. Each picker-dial has a toothed
 85 wheel *r r'* compounded with it, the teeth of which wheels are adapted to engage the ribs or partitions between the vertical grooves of
 90 the needle-cylinder and as the cam-cylinder revolves to effect a revolution of said dials, it being understood that the picker-dials are supported by arms *s* or other suitable means
 95 connected with the cam-cylinder.

The pickers are formed with vertically-flattened shanks *t* and with horizontally-flattened outer operative ends *u*, so that the said outer
 100 ends of the pickers in the upper dial *o* may engage the hooks of the needles and raise the latter, while the outer ends of the pickers in the lower dial *o'* may engage the heels of the
 105 needles and effect the same results. The teeth of each dial *o o'* are out of time with the ribs of the needle-cylinder, while the teeth of the dials are numbered to be out of time with each other.

v v designate pivoted arms, each provided with a cam *w*, extending in the path of movement of the pickers, so as to raise the latter
 110 as they pass over the said cam and cause them to raise the needles, as aforesaid. When the cam-arms are down, the pickers will be inoperative, but when they are raised they will effect the raising of the outer ends of the
 115 pickers and through them the needles, as stated. The cam-arms may be raised and lowered by the means next to be described.

x is a ratchet-wheel supported by the frame of the machine, with which ratchet-wheel
 120 there is compounded a sprocket-wheel, over which there runs a sprocket pattern-chain *y*, having high or raised links *z* and lower links *z'*. An arm *a'*, pivoted on the bearing-stud of the ratchet-wheel, carries a pawl *b'*, which
 125 engages the teeth of the said ratchet. Connected with the outer end of the said arm *a'* is a vertical link *c'*, which is pivoted at its upper end to the outer end of a link *d'*, pivoted at its inner end to some stationary means.
 130 A roller *e'* is supported on a pin on the link *d'*, and the said roller is arranged in the path or line of movement of a cam *f'* on the cam-cylinder, so that each time the cam-cylinder

revolves the said cam acts to operate the pawl b' to cause it to move the ratchet-wheel to the extent of one tooth. When the ratchet and sprocket wheels are so operated as to bring a raised link z under the antifriction-roller g' on the angular arm of a lever h' , pivoted or fulcrumed at k' , it will rock the said lever on its pivot, so as to move the upper end of the vertical arm in the direction of the arrows. (See Figs. 4 and 6.)

l' designates a ring supported outside of the needle-cylinder and movable circumferentially on its bearings. The bottom of the said ring is provided with inclined or cam projections m' , which are adapted to ride upon parts of the ring-support and so raise the ring to a position in which it will rest upon the lower faces of its cam parts. Antifriction-rollers n' may be provided to lessen the impediment to the movement of the ring l' . A pin r' projects from the ring through a slot s' in the upper end of the vertical arm h' , so that when the said arm is moved in the direction of the arrows, Fig. 4, it will move the ring l' in the same direction. A spring t' moves the arm m' in a direction opposite to the arrow, and a spring u' operates with a tendency to draw the ring l' downward. Balls w' may be interposed between the ring and the frame to render the vertical movement of the ring easy and prevent the same from binding.

Connected with the cam-levers v v' are standards x' , having a connection, as shown, between said levers and the said ring, so that as the ring is raised the levers are raised, and when the ring is lowered the levers will fall by their own gravity, or they may be drawn down by springs.

Thus far I have described the machine as equipped with two picker-dials and their equipments, as shown in Fig. 5, and it is obvious that the invention may be thus used for simple patterns, but two or more pairs of picker-dials may be employed, as is shown in Fig. 1, for more intricate patterns or for accomplishing more work in a given time.

Suppose now that a machine should be constructed as thus far described and be equipped with two pairs of picker-dials and their equipments and that four feeds or yarn-guides should be employed, as shown in Fig. 1, each yarn-guide being supplied by a suitable colored yarn, and the machine should be started with the cam-levers v v' down. Plain knitting would be performed until a raised link z should be brought under the antifriction-roller g' , so as to shift the ring l' and raise the said cam-levers, when the pickers acting upon the needles would raise the same as they came in contact with the needles in the order predetermined by the arrangement of the pickers in the picker-dials. In this case the needles can be made to knit the yarn into the face of the fabric or allow it to float on the back and so form the face of the fabric with any desired figure—such as diamonds, squares, and the like—or with figured lines running diag-

onally to each other, or with figures of diamonds within diamonds, and so on to an almost innumerable extent, all as will be readily understood by those skilled in the knitting art without further description or explanation.

In case it should be desired to knit what would be the floating threads on the back of the fabric, as hereinbefore described, into the body of the fabric dial-needles y' may be employed in the dial of the knitting-machine at such points as are opposite to or to one side of the vertical needles raised out of action. This will further tend to vary the pattern or figure of the fabric produced by the machine, as will also be understood by knitting artisans without further amplification.

In Fig. 2, a'' designates the dial supporting the dial-needles y' in its radial grooves. b'' is the rotary cam-dial, beneath which and above the dial on opposite sides are sets of needle-operating cams c'' c'' , represented by conventional lines. It will be understood that the number of sets of needle-operating cams on the cam-dial will correspond with the number of sets of needle-operating cams in the cam-cylinder and that the arrangement of the sets of cams described will be such as to secure their coöperation, all as is well known to makers and users of knitting-machines. In Fig. 3 one full set of needle-operating cams for the cam-cylinder is shown. Additional sets would be but a duplication of this set. One cam 6 of a second set is shown in Fig. 2.

Spring fingers or arms z'' may be employed to press down the picker-fingers after they have been raised if they do not fall readily by their own gravity.

The spring j in the groove of the rib h on the needle-cylinder tends to act upon the bulged or bent-out part a^2 on the lower end of the needle, so as to maintain the needle in raised position in case a thread should break or fail or any other thing should happen with a tendency to let the needle drop, it being understood that when the needle is raised by the picker-dial it passes the bend a^2 , which will pass above the spring j .

It is to be furthermore observed that with my machine the pickers may be kept entirely out of action and the needle-dial and needle-cylinder equipped with full sets of needles, so that a plain ribbed top may be knit to a fabric, such as a top to a stocking, while the balance of the stocking may be knit in plain figured stitch, or the ribbed work may be made figured as well as the body of the stocking, and both the body and top may be knit ribbed and in the order of one and one or two and one or any other order.

My invention is particularly adapted to the knitting of golf or bicycle stockings, though it may be employed in knitting any sort of a web where either combined ribbed and plain work or ribbed or plain work alone is desired to be knit, and where the work produced may

be either figured or plain, and when figured produced in figures of almost any design capable of being made by the knitting process.

Having thus explained the nature of the invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, it is declared that what is claimed is—

10 1. A knitting-machine comprising in its organization a needle-cylinder and its needles; a revoluble cam-cylinder, provided with needle-operating cams, as described; a picker-dial, adapted to revolve with the cam-cylinder, and provided with pickers adapted to engage certain of the needles to raise the same out of position for action thereon by the cams on the cam-cylinder; the said pickers being provided at their inner ends with holes; 15 a wire pivoting-hoop passed through the said holes to form a pivot for the pickers; a cap covering the central portion of the dial over the pivotal points of the pickers, and means for raising the pickers, the said picker-dial being adapted to engage the needle-cylinder and to be rotated thereby.

2. A knitting-machine comprising in its organization a needle-cylinder and its needles; a revoluble cam-cylinder provided with needle-operating cams, as described; a pair of picker-dials, adapted to revolve with the cam-cylinder, and provided with pickers in one dial adapted to engage the hooks of certain of the needles, and those in the other dial adapted to engage the heels of certain of the needles, to raise them out of position for action thereon by the cams on the cam-cylinder; and means for raising the pickers, the said picker-dials being adapted to engage the needle-cylinder and to be rotated thereby.

3. A knitting-machine comprising in its organization a needle-cylinder and its needles; a revoluble cam-cylinder provided with a plurality of sets of needle-operating cams, as described; a plurality of yarn-feeds; a plurality of pairs of picker-dials adapted to revolve with the cam-cylinder, and provided with pickers, in one dial of each pair adapted to engage the hooks of certain of the needles, and those in the other dial of each pair adapted to engage the heels of certain of the needles, to raise them out of position for action thereon by the cams on the cam-cylinder; and means for raising the pickers; the said picker-dials being adapted to engage the needle-cylinder and to be rotated thereby.

4. A knitting-machine comprising in its organization a needle-cylinder and its needles; a revoluble cam-cylinder, provided with needle-operating cams, as described; a picker-dial, adapted to revolve with the cam-cylinder, and provided with pickers adapted to engage certain of the needles to raise the same out of position for action thereon by the cams on the cam-cylinder; the said pickers being provided at their inner ends with holes; a wire pivoting-hoop passed through

the said holes to form a pivot for the pickers; a cap covering the central portion of the dial over the pivotal points of the pickers and means for raising the pickers, the said picker-dial being adapted to engage the needle-cylinder and to be rotated thereby, combined with a needle-dial and its needles, and a revoluble cam-dial provided with cams to operate the dial-needles.

5. A knitting-machine comprising in its organization a needle-cylinder and its needles; a revoluble cam-cylinder provided with needle-operating cams, as described; a pair of picker-dials, adapted to revolve with the cam-cylinder, and provided with pickers, in one dial adapted to engage the hooks of certain of the needles, and those in the other dial adapted to engage the heels of certain of the needles, to raise them out of position for action thereon by the cams on the cam-cylinder; and means for raising the pickers, the said picker-dials being adapted to engage the needle-cylinder and to be rotated thereby, combined with a needle-dial and its needles, and a revoluble cam-dial provided with cams to operate the dial-needles.

6. A knitting-machine comprising in its organization a needle-cylinder and its needles; a revoluble cam-cylinder provided with needle-operating cams, as described; a plurality of yarn-feeds; a plurality of pairs of picker-dials adapted to revolve with the cam-cylinder, and provided with pickers, in one dial of each pair adapted to engage the hooks of certain of the needles, and those in the other dial of each pair adapted to engage the heels of certain of the needles, to raise them out of position for action thereon by the cams on the cam-cylinder; and means for raising the pickers; the said picker-dials being adapted to engage the needle-cylinder and to be rotated thereby, combined with a needle-dial and its needles; and a revoluble cam-dial provided with needle-operating cams corresponding with the needle-operating cams in the cam-cylinder, to operate the dial-needles.

7. A picker-dial having radially-inclined grooves, pickers each having a vertically flat inner portion or shank provided on its inner end with a hole and having a horizontally flat outer end, combined with a spring hoop or ring passed through the said holes to hold the said pickers longitudinally in place, and a cap to hold the pickers in place transversely.

8. The combination, with the needle-cylinder provided with needle-grooves, needles therein, and needle-operating means, of a picker-dial toothed on its periphery to engage the needle-cylinder and to be rotated thereby, swinging pickers carried by the picker-dial to engage the needles and raise them, movable cams adapted to be raised into and lowered out of operative position with respect to the said pickers, and means for raising and lowering the said cams.

9. The combination, with the needle-cylinder provided with needle-grooves, needles

therein and needle-operating means, of a pair
of picker-dials toothed on their peripheries
and one arranged above the other and posi-
tioned to engage the needle-cylinder and to
5 be rotated thereby, swinging pickers carried
by the picker-dials—arranged in one dial to
engage the hooks of the needles and in the
other to engage their heels—to raise them,
movable cams adapted to be raised into and
10 lowered out of operative position with respect
to the said pickers, and means for raising and
lowering the said cams.

10. The combination, with a needle-cylin-
der provided with needle-grooves, needles
15 therein, and needle-operating means, of a

picker-dial toothed on its periphery to engage
the needle-cylinder and be rotated thereby,
swinging pickers in the picker-dials to engage
and pick or raise the needles, means to act
upon the said pickers to render them opera- 20
tive, and means to raise and lower the last-
mentioned means.

In testimony whereof I have signed my
name to this specification, in the presence of
two subscribing witnesses, this 7th day of 25
July, A. D. 1897.

FREDERICK H. MOON.

Witnesses:

ARTHUR W. CROSSLEY,
ANNIE J. DAILEY.