

(No Model.)

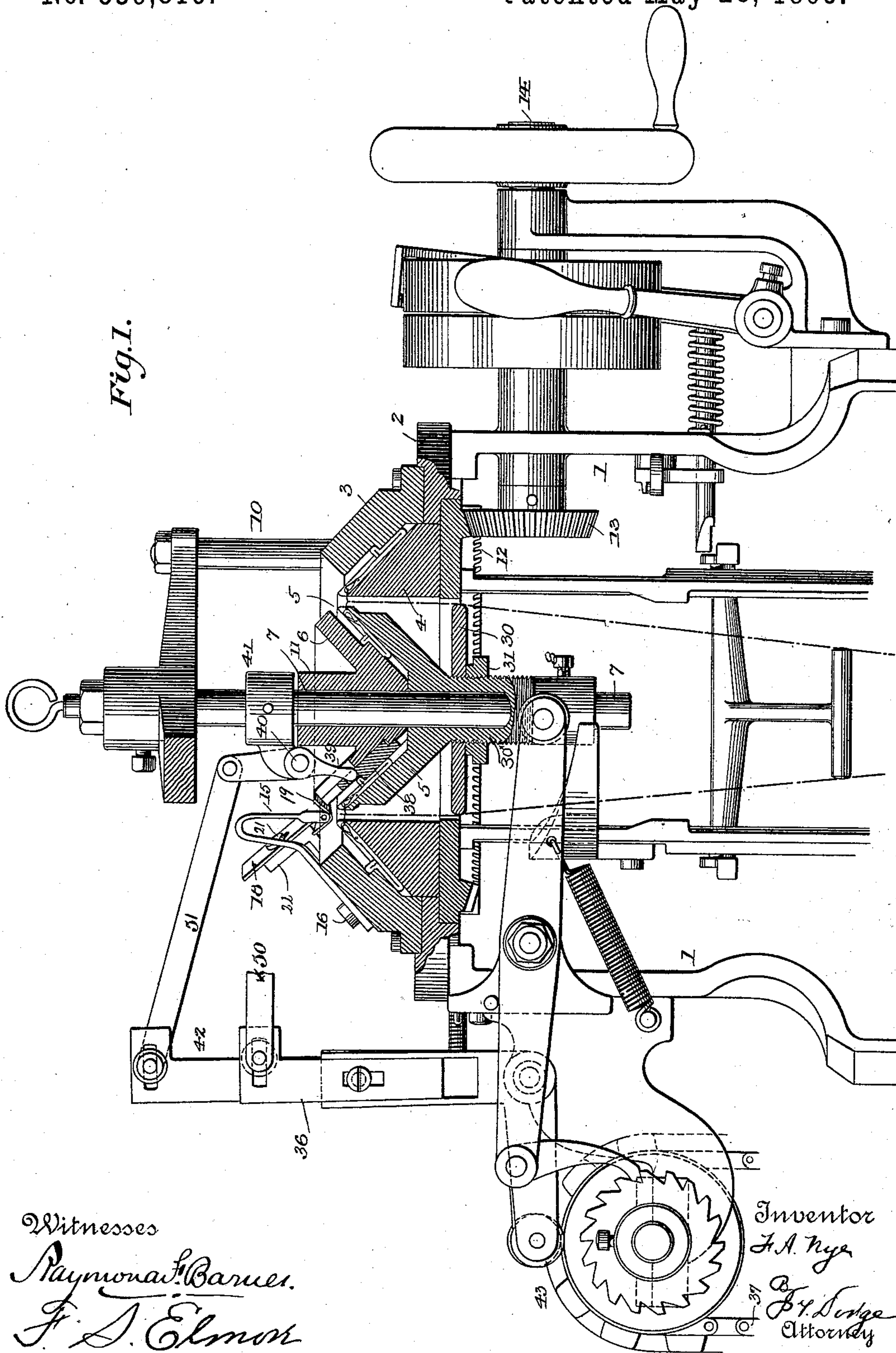
2 Sheets—Sheet 1.

F. A. NYE.  
KNITTING MACHINE.

No. 539,819.

Patented May 28, 1895.

Fig. 1.



Witnesses  
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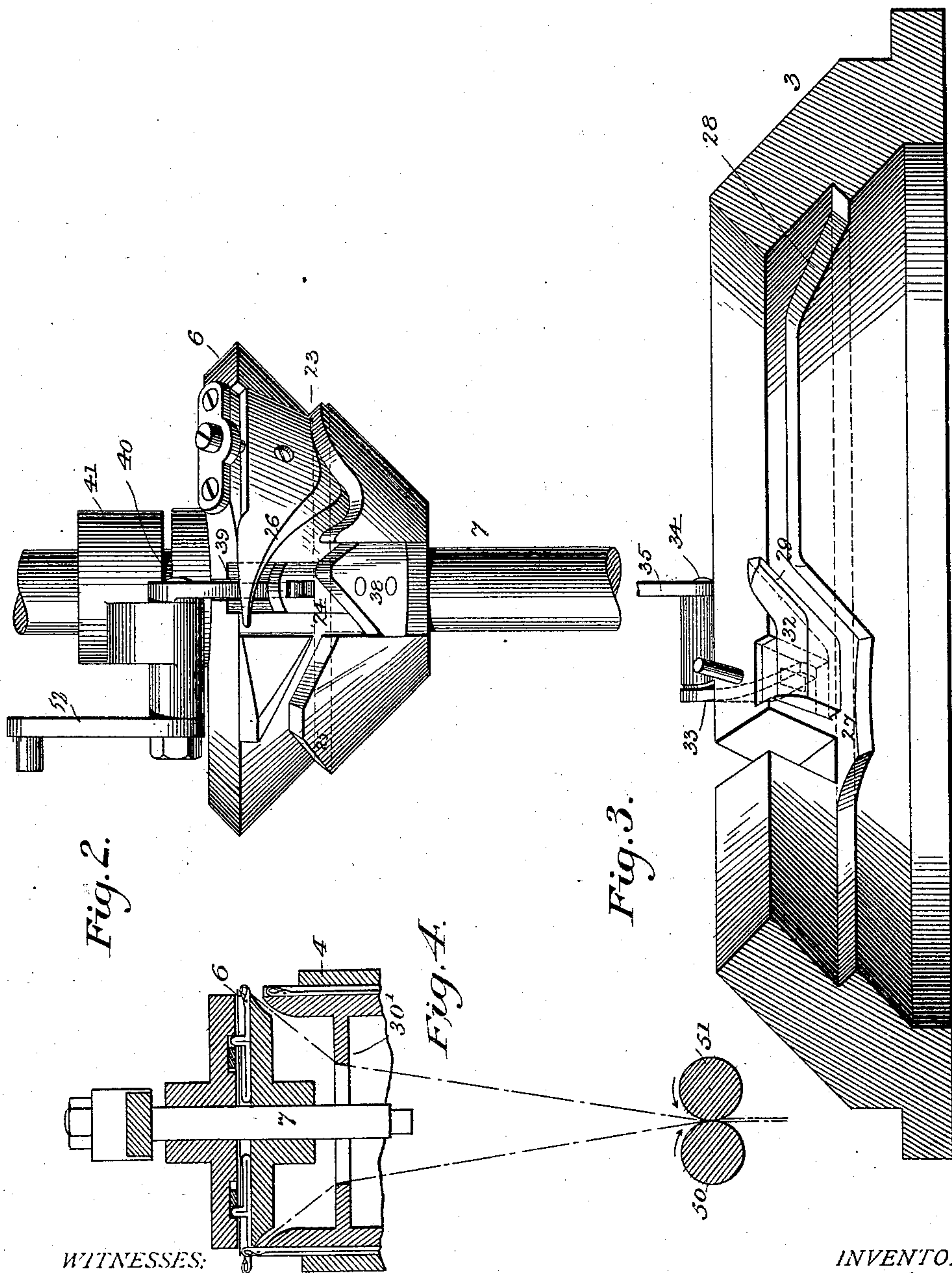


Fig. 2.

Fig. 3.

Fig. 4.

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# UNITED STATES PATENT OFFICE.

FRANK A. NYE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO NYE & TREDICK, OF SAME PLACE.

## KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 539,819, dated May 28, 1895.

Application filed April 17, 1894. Serial No. 507,887. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK A. NYE, of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Knitting-Machines, of which the following is a specification.

My invention has reference more particularly to knitting machines in which two sets of co-acting needles operate to produce a tubular ribbed fabric.

The objects of the present invention are to adapt machines of this description for the production of fabrics of a more uniform character than have been heretofore formed and in which the ribs will be formed on the inside and outside of the web alike, the result being that the elasticity of the fabric, which depends upon the disposition of the ribs, will be greatly increased.

With these ends in view my invention consists in combining with the dial and cylinder needles and with the cams for operating the same, disposed relatively to each other to act in the same radial plane on adjacent needles of the two sets to cause them to form and cast their loops simultaneously or substantially so, a work guide located relatively to the two sets of needles to direct the work in a plane or direction forming substantially equal angles with the operating needles of the two sets.

My invention also consists in the details of construction and combination of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is an elevation, partly in section, of a knitting-machine having my invention embodied therein. Fig. 2 is a side view of the dial-cams. Fig. 3 is a similar view of the cylinder-cams. Fig. 4 is a sectional view showing my improved work-guide when applied to a machine in which the dial is horizontal and flat and the cylinder vertical.

My invention may be applied to either a single feed machine or one in which provision is made for a plurality of feeds, but in the accompanying drawings it is shown in connection with a single feed machine in which the yarn passes from a single yarn guide and is supplied to the needles. In its fundamental features the machine is substantially identical with the machines now in common use

comprising a dial, and a cylinder both provided with needles operated by cams.

Referring to the drawings, 1 represents the upper portion of the frame comprising two vertical standards sustaining the operating mechanism and supporting on their upper ends a fixed annular plate 2 to which is bolted a conical cylindrical shell 3 containing on its interior the cams for operating the cylinder needles. The annular plate is formed to receive and retain a conical rotary needle cylinder 4, having in its outer surface a series of grooves for the reception of the needles, which latter are reciprocated to form the stitch by encountering the cams on the conical shell when the cylinder is rotated.

5 represents a dial in the form of an inverted hollow cone having on its interior, a series of grooves to receive the needles which are reciprocated to form the stitches by encountering cams fixed to the outer surface of a fixed dial plate 6 in the form of a hollow inverted cone. The conical dial is mounted to rotate upon a central vertical post 7 and rests upon the upper edge of a collar 8, which is fixed near the lower end of the post. The post at its upper end is fixed to a crosstree which is sustained a slight distance above the frame on the upper ends of two standards 10, extending upward from the frame.

The conical dial plate 6 containing the fixed cams is provided with an upwardly extending collar 11, which surrounds the central vertical post and is fixed thereto by a set screw or by other suitable means.

The conical cylinder containing the needles is provided on its under edge, as shown, with bevel gear teeth 12, which are adapted to be engaged by a bevel pinion 13 on the inner end of a horizontal rotary shaft 14 mounted in the frame and provided on its outer end as usual with a driving pulley and an idler. When the shaft is rotated, it causes the conical needle cylinder to revolve, and this motion is transmitted to the conical dial by contacting lugs carried by the two parts.

The yarn is fed to the two sets of needles by a yarn guide 15, which has its free end perforated to receive the yarn, and which is arranged adjacent to the needles, the fixed end of the guide being secured to the outer side



of the conical shell by a set screw 16. In front of this yarn guide is located a latch opener, consisting of a plate 18, having at its lower end an angular lip 19, which lip is provided at its front end with a lateral finger. The plate is sustained so that its angular lip will extend adjacent to the yarn guide in front of the same.

The plate 18 about midway of its length is provided with a longitudinal slot through which a bolt 21 extends into the bent end of a bracket or arm 22, which is bolted to the outer side of the fixed cylindrical shell. As a result of this connection of the arm with the plate, the latter can be moved and fixed in different relative positions according to the conditions encountered in practice. It will thus be seen that the latch opener and yarn guide are separate from one another and are independently adjustable, the yarn guide being capable of adjustment around the bolt which secures it to the cylindrical cam shell, while the latch opener is adjustable on its bracket arm, as above described.

On reference to Fig. 2 it will be seen that the outer side of the fixed dial plate is provided with a shoulder 23, which is interrupted at 24, at which point the operating cams are located. These cams are of such form that they will, by being engaged by the heels of the needles, cause the needles to rise at 25 to receive the yarn and be depressed by a cam 26 to form the loop and cast the previous stitch.

On reference to Fig. 3 it will be seen that the conical shell 3 is provided on its interior, like the dial, with a surrounding shoulder which is interrupted at 27, at which point are located the stitching cams, comprising a cam 28 for elevating the needles to receive the yarn and a cam 29 for lowering them to form the loop and cast the previous stitch.

The relative positions of the two sets of cams on the dial and cylinder are such that the needles of both sets will be depressed and cast their loops simultaneously. This feature and the action of the needles incident thereto, in connection with the peculiar work guide hereinafter described I deem of great importance for the reason that when the loops or stitches are thus cast simultaneously, both sets of needles will draw the yarn with the same degree of tension, and as a result the structure of the fabric will be uniform throughout, or in other words the ribs will appear the same on both the interior and the exterior of the fabric.

In order that the tension on the fabric due to the work take-up shown in Fig. 4 in the form of two co-acting feed rolls 50, 51, may be applied in such manner as to affect the stitches of both sets of needles alike, I provide a work guide 30. This guide is in the form of a circular disk or plate having an interiorly threaded opening to receive a sleeve

30<sup>x</sup> depending from the conical dial, the sleeve being threaded and the disk screwed thereon. In a machine having the dial and cylinder of the form herein shown, this disk is of such size that its edge will extend in a circular path vertically beneath the point at which the needles co-operate to form the stitches so that the work as it is formed being drawn by the take-up, will first encounter the edge of the disk and cause the pull to be exerted equally on the stitches of both sets of needles. In order that the disk may be securely held in its proper position, I provide a binding nut 31, which is screwed on to the sleeve tightly against the disk when the latter is in place.

In Fig. 4 I have shown my invention applied to a machine in which the dial plate is horizontal and flat and the cylinder vertical. In this case the relative positions of the cams are such that, as in the first instance, the needles of both sets will cast their stitches simultaneously, thus insuring an equal tension and consequently a resulting fabric of uniform character. In this case the work guide instead of causing the pull on the work to be applied in a vertical direction, is in the form of a reducing ring 30', which is of such form that as the work passes through it, the pull will be exerted at an angle as shown, in order to allow for the change in the form and relative arrangement of the cylinder and dial. The pull of the work take-up at this angle, which is practically the same with respect to both sets of needles, insures an equal tension on the stitches of both sets of needles, as in the first instance.

In the present case the machine is shown provided with the usual movable depressing cam for the cylinder for forming the "slack course," and the movable throw-out cam for the dial for producing the "welt." The depressing cam is shown at 32, as engaged by the inner end of a finger 33 extending through an opening in the cylindrical shell, its outer end being mounted on one end of a rock shaft 34, to the opposite end of which an arm 35 is fixed, which latter is connected by a link 50 to the upper end of an elbow lever 36. The lower end of the elbow lever is provided with a roller overlying a pattern chain 37, the chain being formed in the usual manner to operate the depressing cam at predetermined times to produce the "slack courses" in the fabric.

The movable throw-out cam is shown at 38 as being mounted to slide upward and downward in a groove in the outer face of the dial plate 6. It is operated by a finger 39, extending through a slot in the dial plate and carried on one end of a rock shaft 40, mounted in bearings in a collar 41 fixed to the central post 7, before alluded to. The opposite end of the rock shaft is provided with an arm 52 which is connected by a link 51 to the upper



end of an elbow lever 42, the lower end of the lever having a roller overlying a pattern chain 43, which latter is so constructed that at the proper time the cam will be withdrawn to form the "welt" in the usual manner.

The fabric produced by a machine embodying my invention, the ribs being formed the same on both sides, possesses a far greater degree of elasticity than if the ribs were formed on one side differently from the other, the elasticity of such fabric depending on the arrangement and disposition of the ribs. The ribs are of such form in cross section that they lie closer together than has been the case heretofore, the fabric thus presenting a uniform, regular and pleasing appearance distinctly different from a fabric made on other circular machines.

The invention, as before stated, is applicable also to machines employing a plurality of feeds, in which case it would simply necessitate a duplication of the cams; their forms and relative arrangement, however, being the same as in the case of single feed machines hereinbefore described.

Having thus described my invention, what I claim is—

1. In a knitting machine the combination with the dial and cylinder needles, and with the cams for operating the same, disposed relatively to each other to act in the same radial plane on adjacent needles of the two sets to cause such needles to form and cast their loops simultaneously, or substantially so, and a work guide located relatively to the two sets of needles to direct the work in a plane or direction forming substantially equal an-

gles with the operating needles of the two sets.

2. In a knitting machine the combination of the cylinder and its needles, the central post extending through the cylinder, the dial mounted on said post and formed with a depending sleeve or extension, and a circular work guide mounted on said sleeve or extension.

3. In a knitting machine the combination of the cylinder, the central post extending through the cylinder, the dial mounted on said post and formed with a depending sleeve or extension, and the circular work guide mounted on said sleeve or extension and vertically adjustable thereon.

4. In a knitting machine the combination of the frame, the fixed cylindrical cam shell, the rotary cylinder provided with needles, the rotary dial provided with its needles and formed with a central opening, the fixed central post sustained by the frame and extending through the opening in the dial, the sleeve depending from the dial, and threaded exteriorly, the dial plate fixed to the central post above the dial and having the cams for operating the needles, and the work guiding disk formed with a threaded opening to receive the sleeve on the dial.

In testimony whereof I hereunto set my hand, this 28th day of February, 1894, in the presence of two attesting witnesses.

FRANK A. NYE.

Witnesses:

JOSEPH B. GODSHALL,  
JOHN C. BREWIN.