

(No Model.)

N. W. PIERCE.
KNITTING MACHINE.

No. 388,786.

Patented Aug. 28, 1888.

Fig. 1.

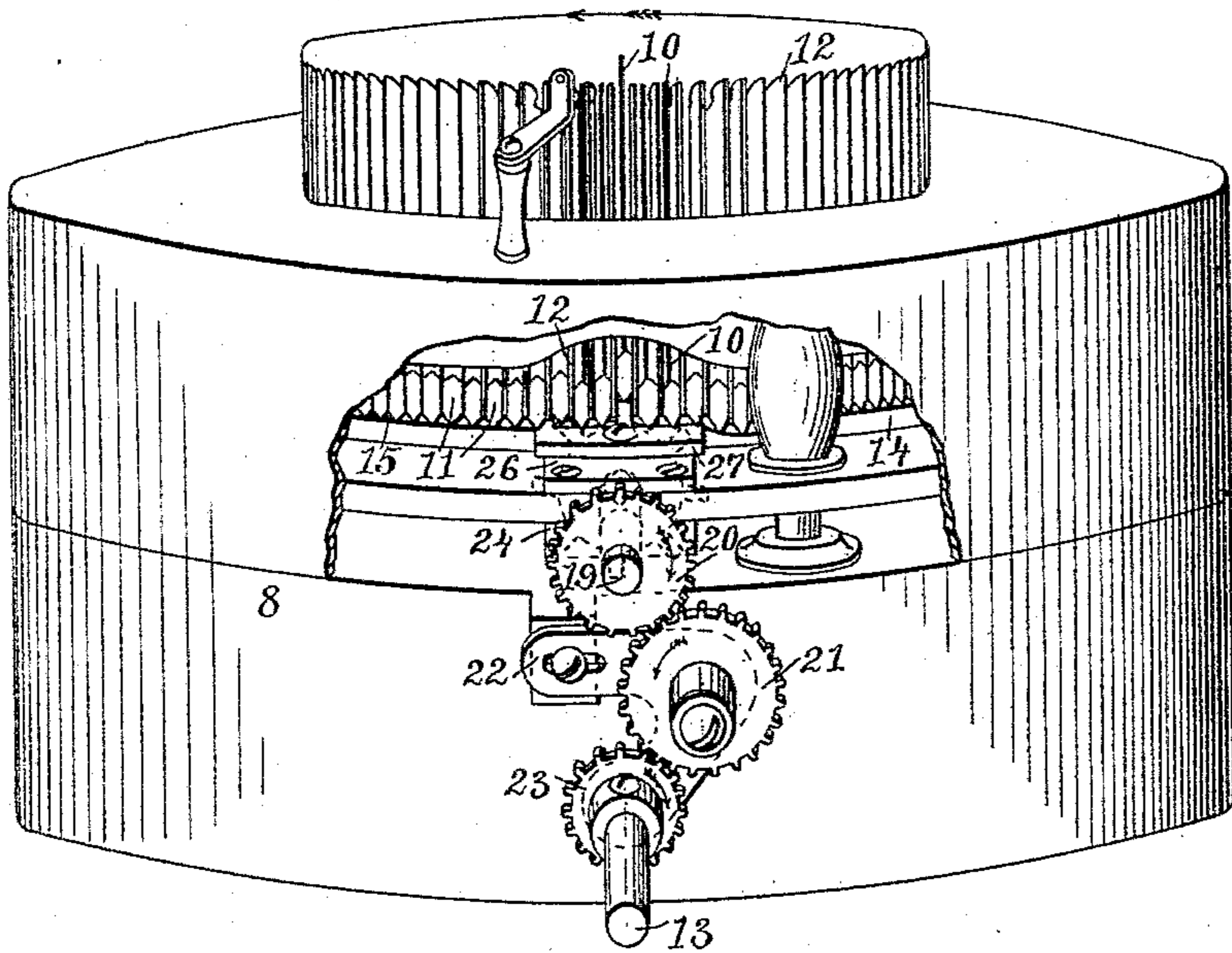


Fig. 3.

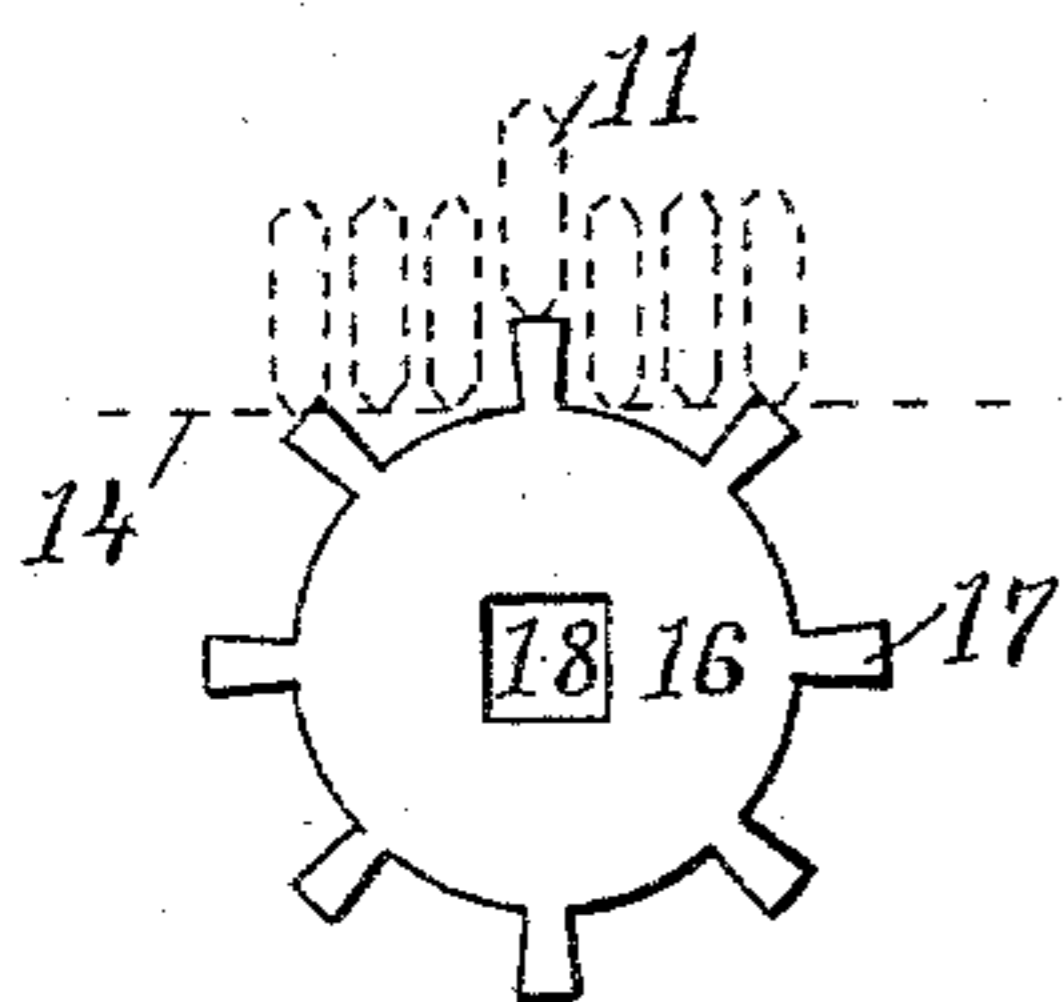


Fig. 4.

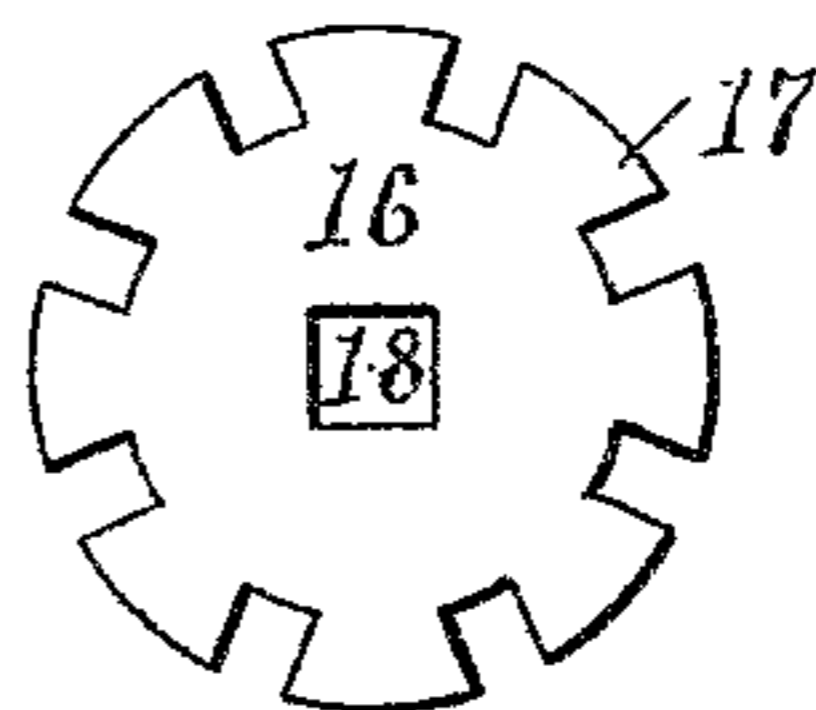


Fig. 2.

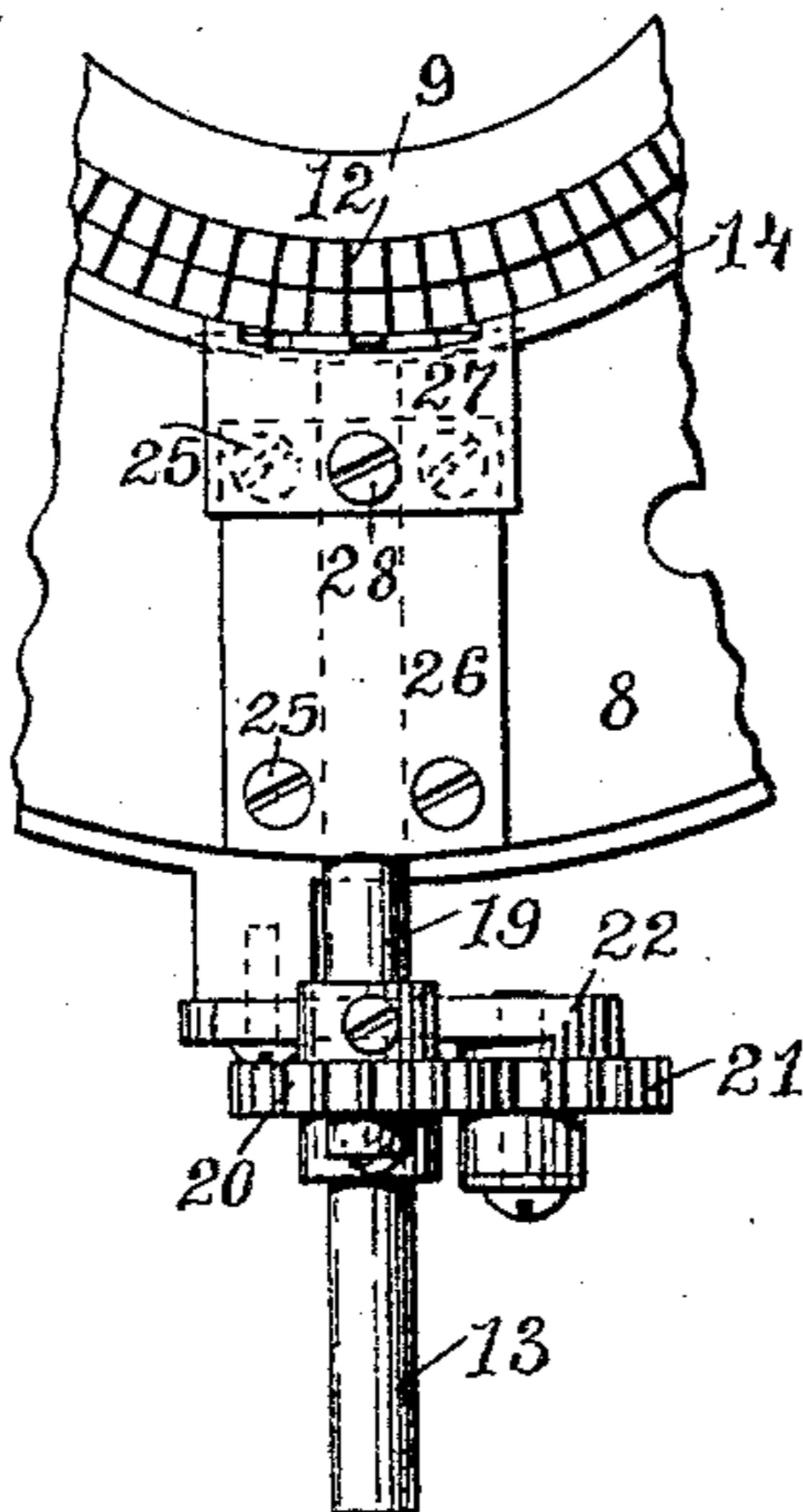


Fig. 5.

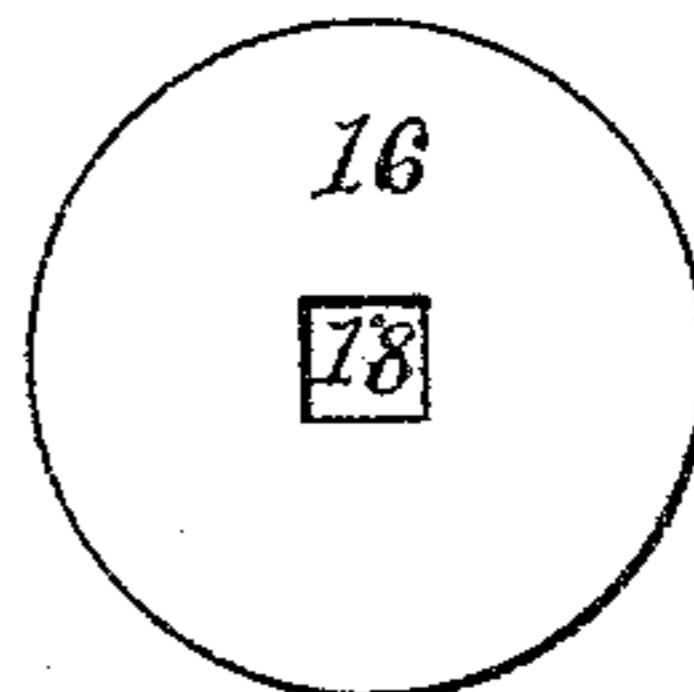
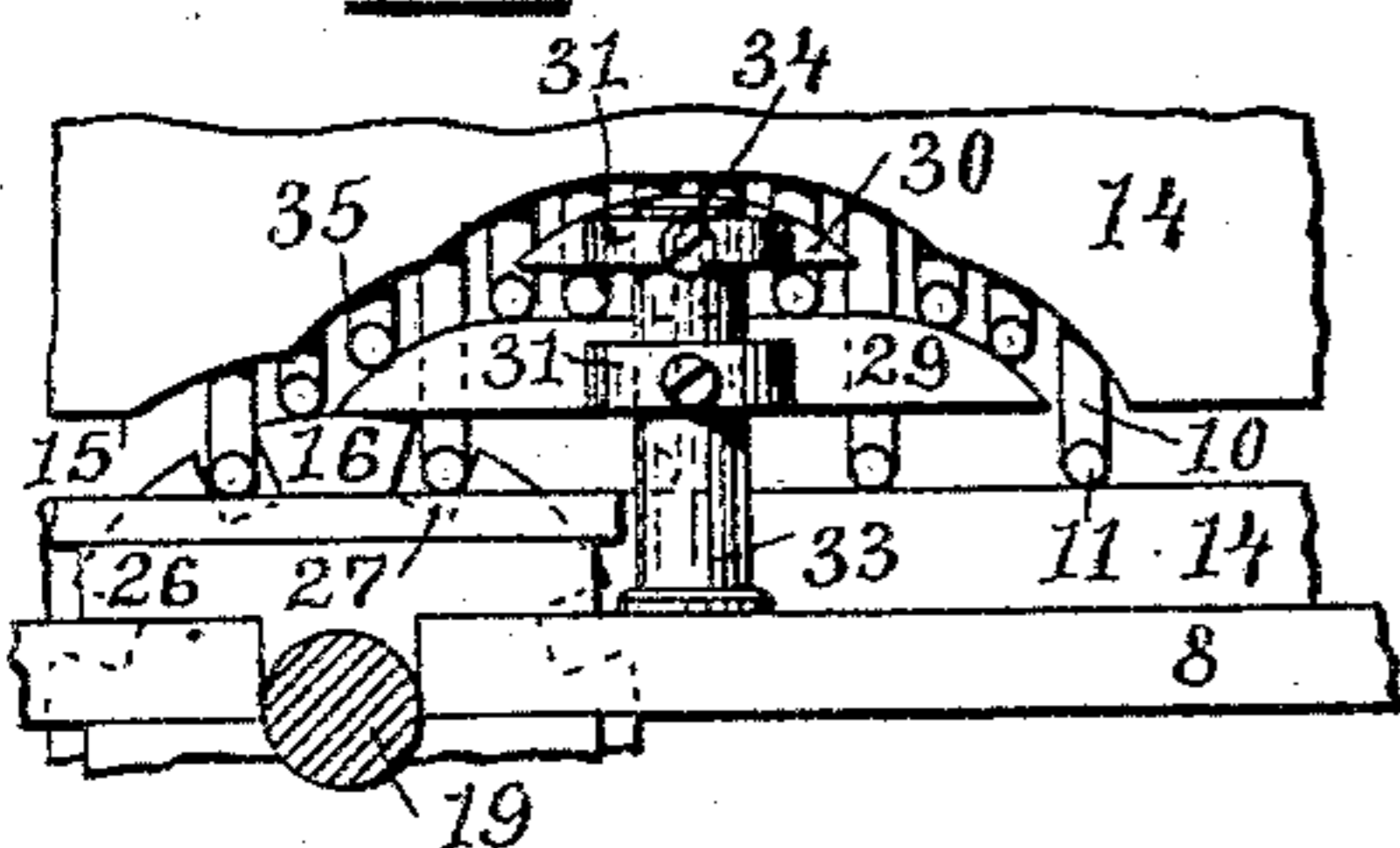


Fig. 6.



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UNITED STATES PATENT OFFICE.

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KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 388,786, dated August 28, 1888.

Application filed February 28, 1887. Serial No. 229,115. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL W. PIERCE, of Pawtucket, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to knitting-machines in which the knitting-needles are reciprocating and adapted to be vertically divided in series, and especially does the invention relate to machines of the circular-knitting system. In these machines a certain pattern of knit fabric is knitted by virtue of having the needles divide vertically in a certain predetermined series—that is, the needles are caused to rise or fall out of their normal horizontal circle in order to perform the knitting.

My invention possesses advantages over the old forms of machines, and I hereby make reference to the Salisbury knitting-loom, Patent No. 212,269 of 1879, which latter may be considered as a typical machine of the class referred to. In the said machine the needles are divided vertically by constructing the needles with different characters of toes, and constructing the cam-cylinder with as many different cam-grooves as there are kinds of toes. This arrangement causes every needle having the same character of toe to undergo the same performance at each revolution of the needle-cylinder. For instance, if the machine be set to vertically divide the needles alternately at certain points of the revolution of the needle-cylinder, there will be only two kinds of toes used in alternate series of one and one. Again, if the needles are to rise and fall at certain points of the revolution in a series of two and one, the needles must of necessity be placed in the predetermined order of two needles having one kind of toes and one of another kind of toe, and so on to arrange the series for the pattern. The great defect in this method of having different characters of toes and correspondingly different cams therefor in order to cause the needles to act in a certain way is that the predetermined series which is started out with must be repeated at each revolution of the needle-cylinder—that is, the needles

having similar toes must perform similar movements throughout—and hence it is impossible to change the order of reciprocating the needles in one revolution of the needle-cylinder—that is to say, where, for instance, two toes of a kind are placed adjacent, the corresponding two needles cannot be operated together and then alternately in one and the same revolution of the needle-cylinder.

One object of my invention is to gain perfect control of the needles, so that in one revolution of the needle-cylinder the needles may be at one point operated in one predetermined way, as in an alternate series of one up and the other down, and at another point of the revolution the said same needles may undergo a varied operation—as, for example, both up or down.

Another object of my invention is to facilitate the ready replacement of the rotary needle-lifters hereinafter described without disturbing the needles.

Another object of my invention is to provide adjustable cam-tracks which are adapted to work in conjunction with the old form of cam-grooves and the rotary needle-lifter.

Another object of my invention is to derive the motion of the rotary needle-lifter from the shaft which drives the needle-cylinder.

To the aforesaid purposes my invention comprises the particular combinations set forth in the claims at the close of this specification, and which consist, principally, in the following mechanical parts, namely: a rotary needle lifter or wheel, means for driving the same by the drive-shaft of the needle-cylinder, the adjustable cam-tracks supported near the cam-cylinder, the removable sections of the cam-cylinder, the needle-cylinder and needles, and the cam-cylinder.

In order that my invention may be fully understood by those skilled in the art, I have illustrated in the accompanying drawings and will proceed to describe the best forms of the invention so far devised by me, but which forms admit of various modifications.

In the said drawings, Figure 1 represents a perspective view of the body of a circular-knitting machine of the latch-needle class and wherein the knit fabric is drawn down through the needle-cylinder as the knitting proceeds.

In this view a portion of the machine-frame is broken away to expose to view my improvements attached to the machine. Fig. 2 represents a top plan view of a portion of the machine shown in Fig. 1. Fig. 3 represents a detached broadside view of the rotary needle-lifter shown in Figs. 1 and 2, and also illustrates the relative positions of the needles acted on by said lifter, the bases of the needles being shown in broken lines. Fig. 4 represents a detached broadside view of another form of the rotary needle-lifter. Fig. 5 represents a detached broadside view of still another form of the rotary lifter. Fig. 6 represents in portion an elevation of the outside of the cam-cylinder and the accompanying needles, the rotary needle-lifter, the machine-frame, and the adjustable cam-tracks mounted on their support, which is placed on the frame.

In the accompanying drawings like numbers of reference designate corresponding parts throughout.

Referring to the drawings, the number 8 designates the machine-frame, in which the needle-cylinder 9 is revolved in a horizontal plane by means of the drive-shaft 13, in a manner well known in this class of machinery.

In the needle-cylinder 9 are loosely mounted the vertically-reciprocating needles 10, which I show as formed with the one kind of toe, 11, and which are adapted to be vertically divided. The hooked sinkers 12 are fixed in the needle-cylinder and alternate in arrangement with the knitting-needles, and these sinkers perform the well-known office of holding down the thread when the needles descend sufficiently to allow their hooked portions to catch the thread.

The cam-cylinder 14 is of a simplified form, the same being constructed with a single cam groove or way, 15, for the needle-toes to run in, and the rotary needle-lifter 16 is placed in a cut-away portion of the lower face of the cam-groove 15 and is disposed in the path of the moving needles 10 and with the plane of the lifter vertical and tangent to the outer face of the needle-cylinder. The needle-lifters are formed each with a central eye, 18, to receive the angularly-formed inner end of the arbor 19 for rotating the attached lifter. The arbor 19 is driven by means of the cog-wheel 20, keyed thereon, and the idle-gear 21, mounted on the bracket 22, secured to the machine-frame, and the idle-gear receives motion from the pinion 23, which is fixed upon the drive-shaft 13 of the needle-cylinder. The arbor 19 turns in the removable plate 24, held by the screws 25, which pass down through the plate 26 and the machine-frame into the said plate 24.

It is obvious that the turning of the drive-shaft 13 will rotate both the needle-cylinder and the lifter. The action of the needle-lifter 16 on the needles is a true lifting motion in contradistinction to the cam action or sliding motion. The needle-lifter 16 is adjusted so as to lift the needles to the required height, and

the lifter rotates in the same direction as the needle-cylinder.

The needles which are not raised by the lifter must have a lower cam-face to run over, and as the cam has to be almost entirely cut away at the points where the needle-lifters are set in, I have provided removable sections, as 27, the use of which will avoid bulging out of the cam-cylinder at the said points, and will especially facilitate the easy replacement of the needle-lifters. The removable section 27 consists of a flat plate, with one edge formed as shown in Fig. 2, so as to fit around the lifter, and the section is held in place by the screw 28, which takes into the plate 26.

The spacing of the lifting arms 17 on the needle-lifters may be gaged so as to lift one needle and leave two undisturbed, as shown in Figs. 1, 2, and 3, or so as to lift two and leave one lowered, as shown in Figs. 4 and 6, or the lifter may be free from arms, as in Fig. 5, in order to lift all the needles. Moreover, if desired, a lifter may be constructed with the arms unequally spaced, instead of uniformly, as illustrated, and thereby will select the needles in a variable manner at each complete revolution of the lifter.

The needle-lifter is placed so as to be cleared by the hooked sinkers and to engage the outwardly-projecting toes of the needles.

It becomes necessary in knitting many patterns to raise certain needles at certain points of the revolution of the needle-cylinder a certain height, which may be the maximum height, or less than the same. In order that the rotary needle-lifters may all be of the same diameter, and in order that certain needles may be raised higher than any one of said lifters are capable of doing, I have constructed the auxiliary cam-tracks 29 and 30, which are adjustable and which coact with the needle-lifters and the cam-groove. The cam-tracks are illustrated in Fig. 6, and are shown as true cam bodies or tracks 29 and 30, respectively, constructed slightly different as to their cam-faces and each formed with a perforated ear, 31. The post 33 is fixed vertically upon the machine-frame, and the perforations of the ears 31 are pierced thereby, so that the cam-tracks 29 and 30 may each be slid up or down on the post 33, to which they are clamped by virtue of the set-screws 34, arranged one for each cam-track. In the case of using these adjustable cam-tracks, I have shown the needles 10 as having longer toes, 11, than in the other instances, so that the toes may project out beyond the outer face of the needle-lifter and reach over to the cam-tracks.

In Fig. 6 the needles are shown as tracking from the needle-lifter 16 over the lower cam-track, 29, and between the same and the track 30, thence down again, in the series of two raised and one not raised. Should it be desired to raise the needles to the maximum height, the upper cam-track should be dropped down upon the upper face of the track 29, so that

the needles may pass over the left-hand end in Fig. 6 of track 29, thence on and over cam-track 30 and off the right-hand end of track 29 down into the cam-groove proper.

5 The employment of the auxiliary cam-tracks makes it necessary to construct the upper face of the cam-groove 15 in the scalloped form 35, so that the needles may rise and fall freely. By virtue of using my auxiliary cam-tracks
10 the needle-lifters can be all of one size, and likewise the removable sections 27 of the cam-cylinder.

There are many advantages to be derived from the use of my improved adjustable cam-
15 tracks combined with the rotary needle-lifters, and these advantages will be obvious to one skilled in knitting and designing, and therefore I think it will be sufficient to state the most important advantage—namely, the vast
20 variety of operations I am enabled to make the needles perform in one revolution of the needle-cylinder, and I can knit a great variety of designs where different colored threads are used.

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

1. The combination, as hereinbefore set forth, with a rotary needle-cylinder provided with a driving-shaft having a pinion, of the
30 needles, a cam-cylinder having a cam-groove for the needles, a rotary needle-lifter adapted to engage the needles, an arbor for turning the

needle-lifter and provided with a cog-wheel, and an idle-gear wheel in mesh with the cog-wheel and pinion respectively, substantially 35 as herein described.

2. The combination, as hereinbefore set forth, with a needle-cylinder and needles, of a cam-cylinder for the needles provided with removable sections 27, the rotary needle-lifter 40 16, supported near the needles and acting to lift the needles, and means for rotating said needle-lifter, substantially as herein described.

3. The combination, as hereinbefore set forth, with a rotary needle-cylinder and needles and the needle-lifter, of the cam-cylinder 45 14, provided with the cam-groove 15, and the auxiliary cam-tracks 29 and 30, having a support and provided with means of adjustment, substantially as described. 50

4. The combination, as hereinbefore set forth, with a needle-cylinder provided with the drive-shaft 13, having the pinion 23, of the needles and the cam-cylinder therefor, the rotary needle-lifter 16, having the arbor 19, provided with the cog-wheel 20, and the idle-
55 pinion 21, gearing with said cog-wheel and pinion, substantially as herein described.

In witness whereof I have hereunto set my hand.

NATHANIEL W. PIERCE.

Witnesses:

M. F. BLIGH,

J. A. MILLER, Jr.