No. 697,616.

Patented Apr. 15, 1902.

E. J. FRANCK.

KNITTING MACHINE.

(Application filed Nov. 21, 1900.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

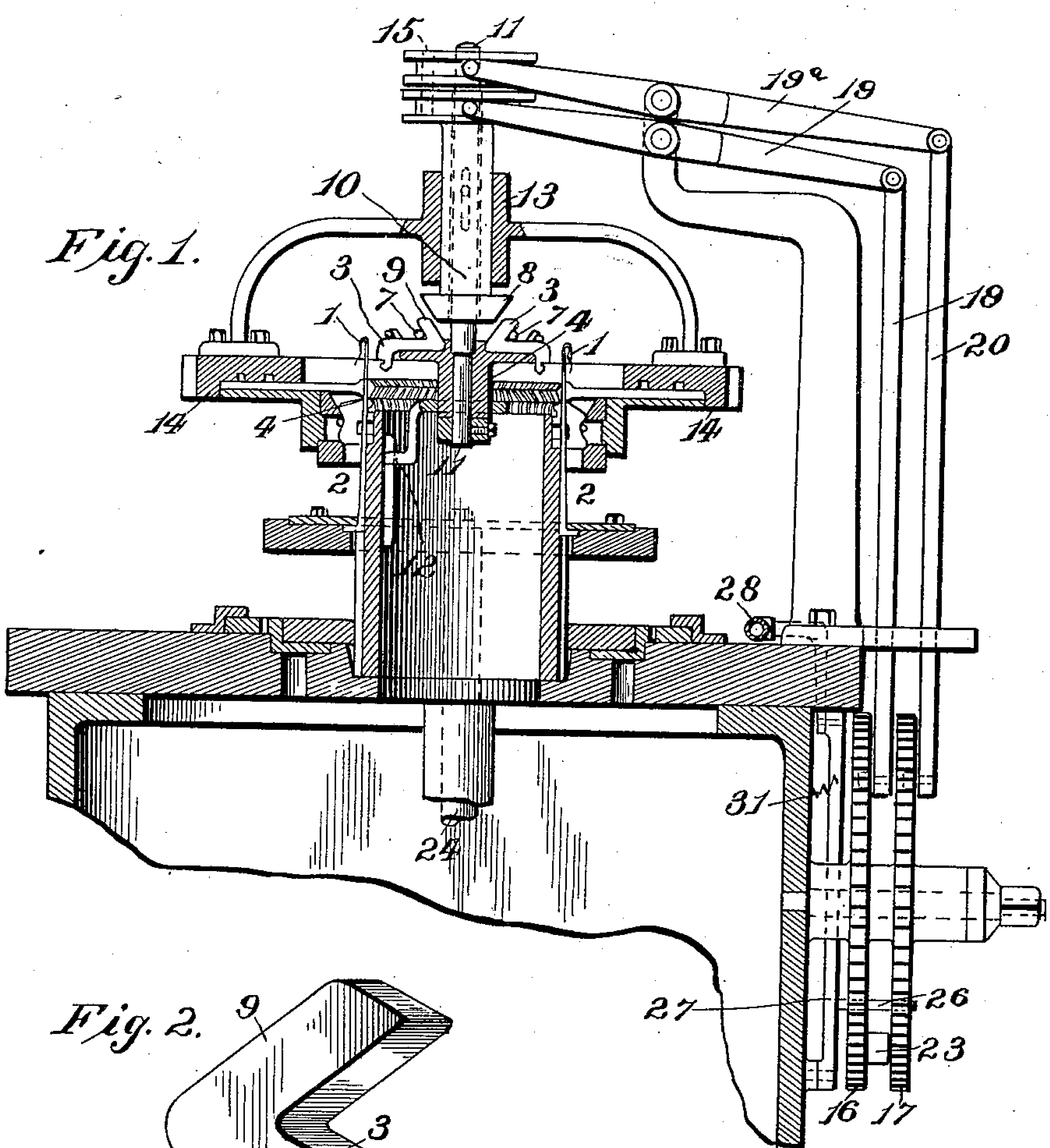
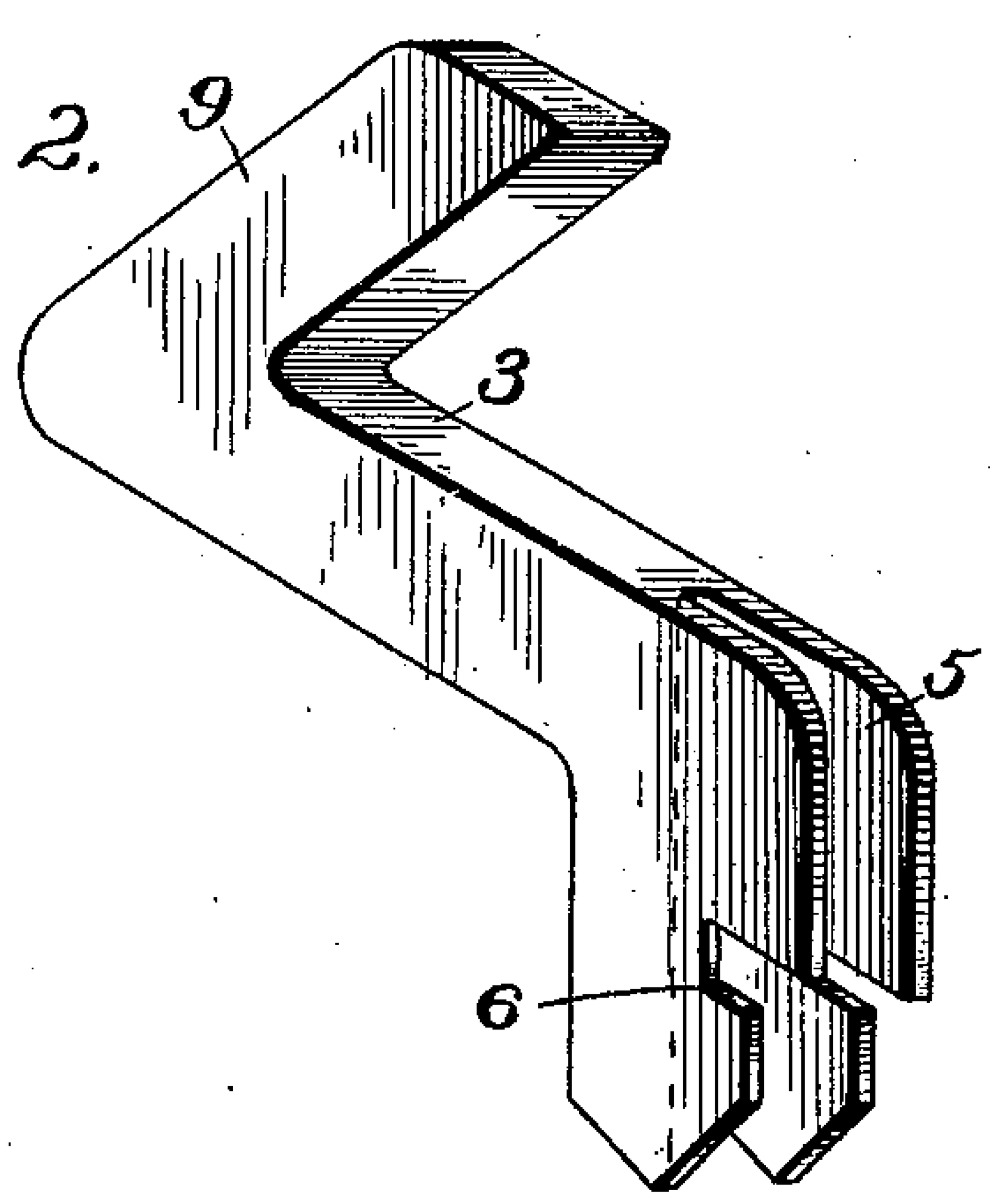


Fig. 2.



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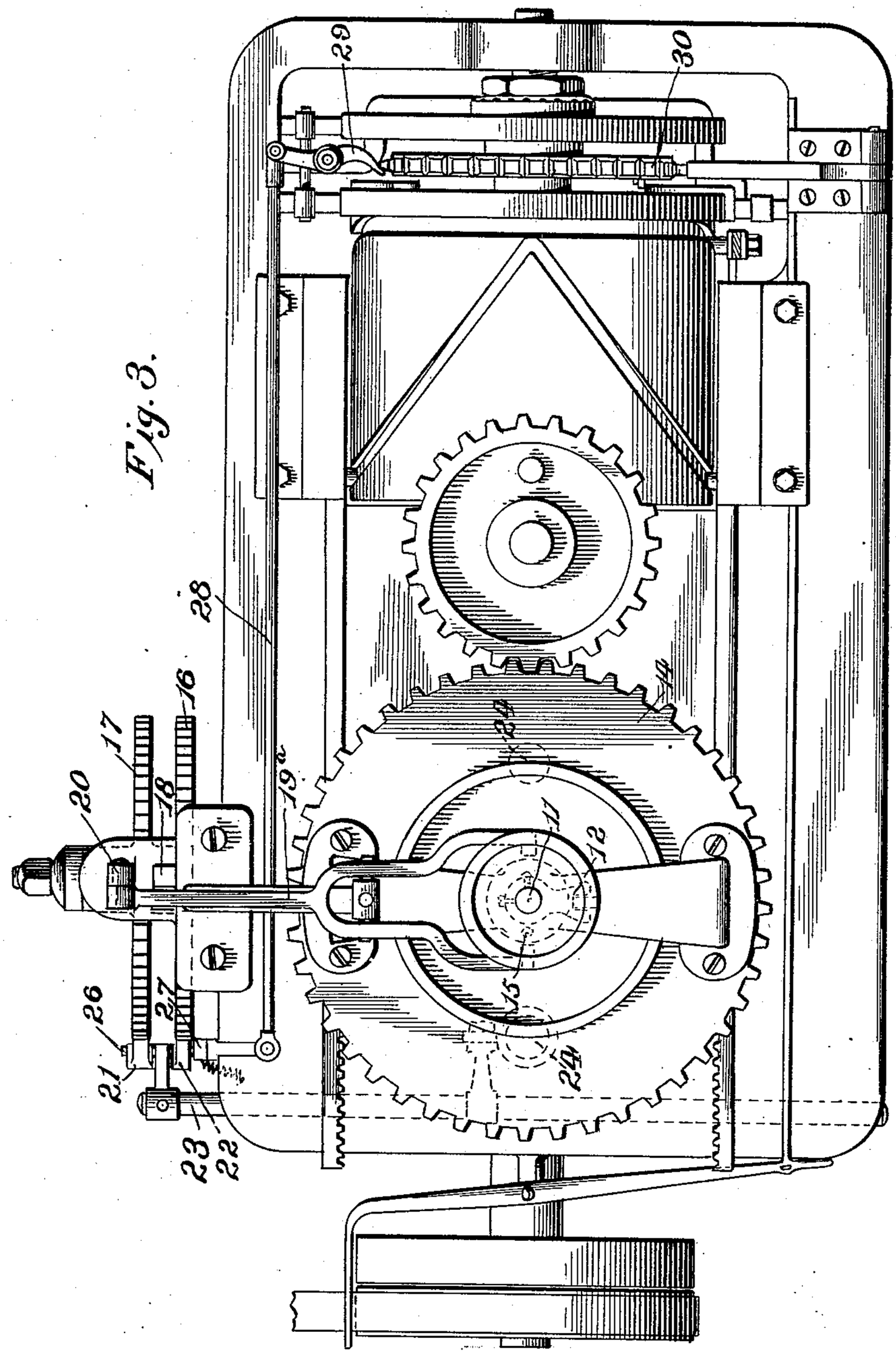

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

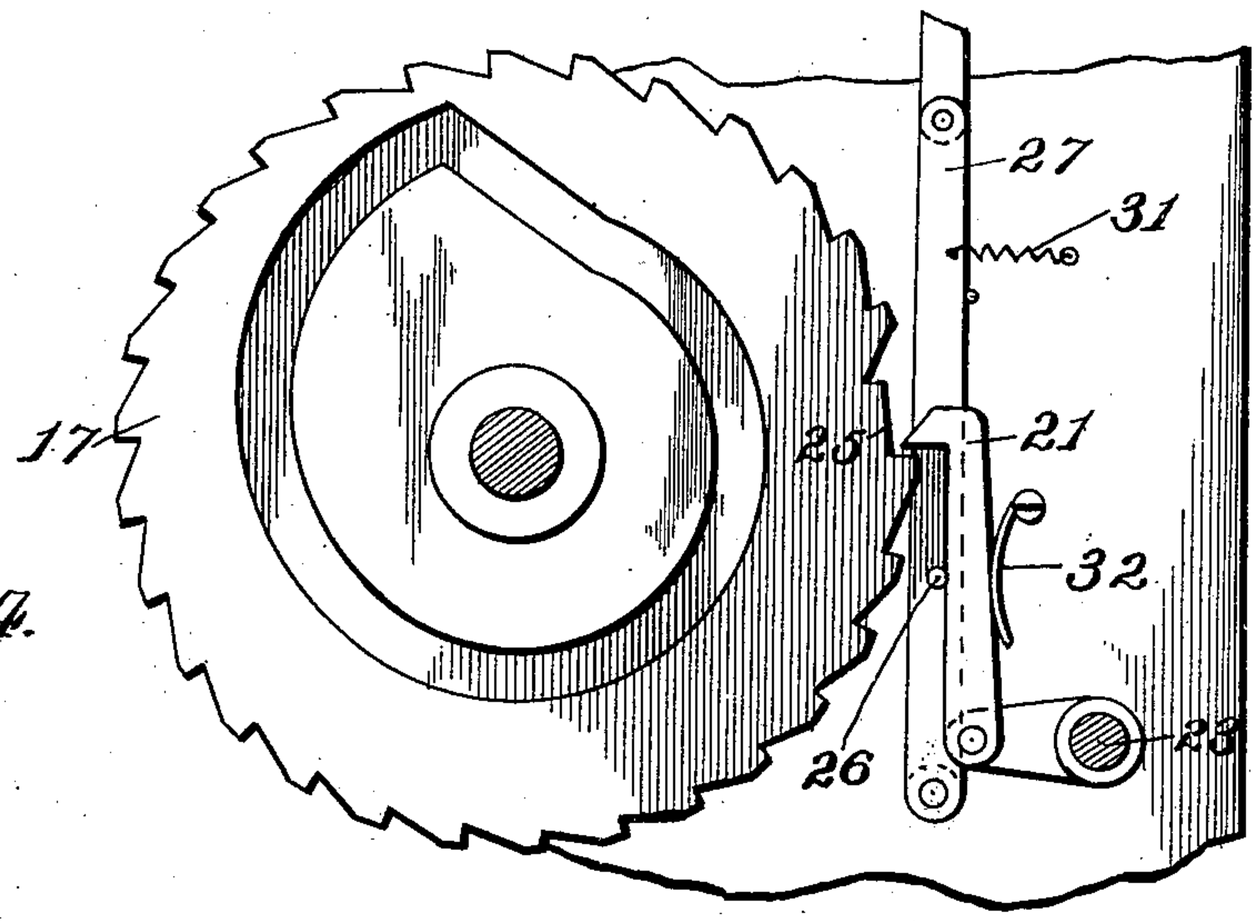

Fig. 4.

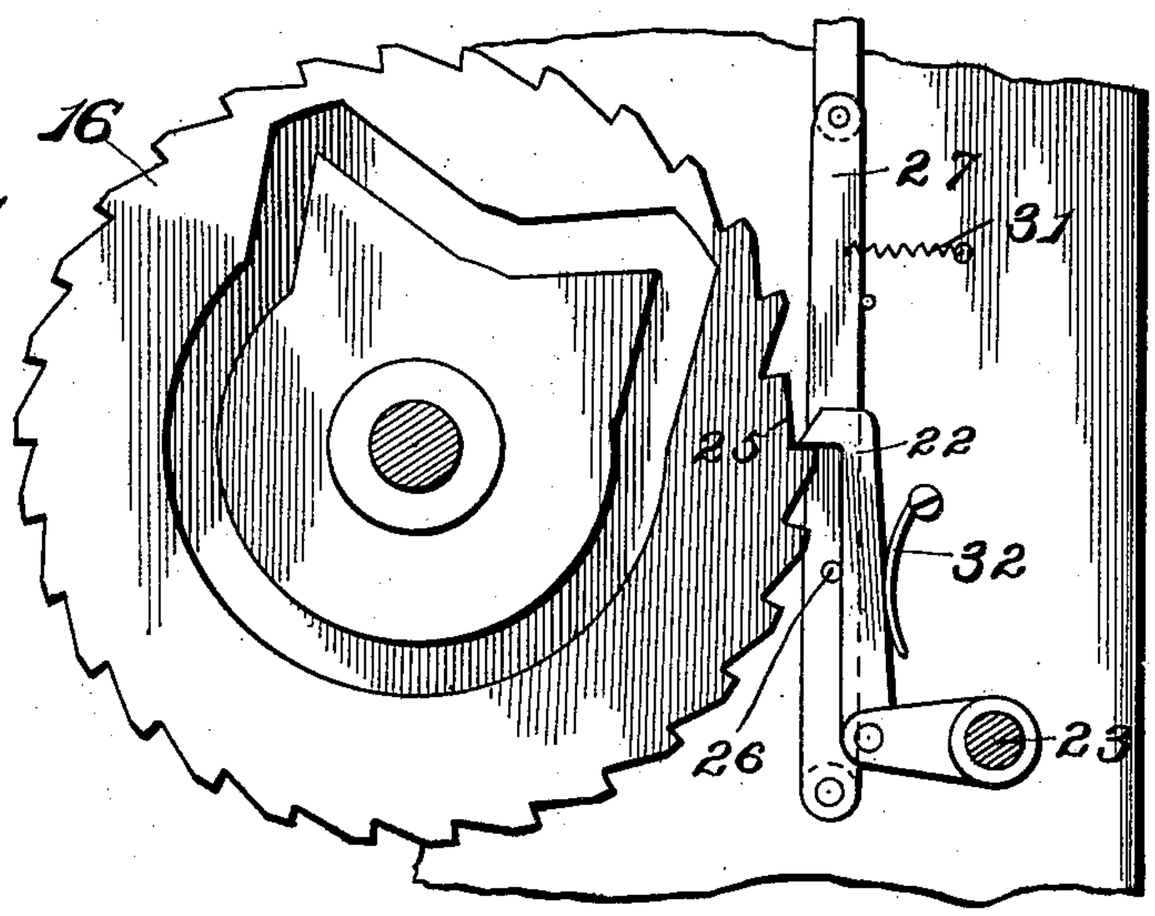

Fig. 5

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UNITED STATES PATENT OFFICE.

EMIL J. FRANCK, OF COLLINGDALE, PENNSYLVANIA.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 697,616, dated April 15, 1902.

Application filed November 21, 1900. Serial No. 37,245. (No model.)

To all whom it may concern:

Be it known that I, EMIL J. FRANCK, a citizen of the United States, residing at Collingdale, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a specification.

The object of the present invention is to provide means for making welts or like finishings—for example, at the top of stockings or on other articles—on circular machines, by which they are fabricated.

To this and other ends hereinafter set forth the invention, stated in general terms, comprises a series of transferrers arranged to move in respect to the needles of the circular head, so as to receive stitches from and deliver them to the needles, and also to move out of the plane of the needles, so as to take up and return slack in the fabric.

The nature, characteristic features, and scope of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1 is a view, principally in central section, illustrating means embodying features of my invention. Fig. 2 is a perspective view illustrating one type of transferrer embodying features of the invention. Fig. 3 is a top or plan view illustrating my invention in application to a well-known type of circular-knitting machine, and Figs. 4 and 5 are views drawn to an enlarged scale in order to illustrate certain cams hereinafter described.

In the drawings, 1 represents the needles, arranged around in a circle, as is customary in so-called "circular-knitting machines," and 2 is the head of the circular-knitting machine.

3 represents transferrers, of which there is one for each needle which is engaged in the fabrication of the tubular fabric. These transferrers are arranged to enter the loops of the stitches and to take up the slack of the web as it is fabricated for a sufficient distance to form the desired length for the welt. They then return these loops to the needles, so that the latter then not only have upon them the loops which would ordinarily be there, but also have these other loops, which were previously taken from them and returned, as described, so that the two sets of loops are subsequently thrown off at the same time, and in that way the hem or welt is formed.

I will now proceed to describe the best means known to me at this time in which to embody my invention.

4 is a carrier arranged concentrically with the head 2, and upon its upper face it is provided with grooves, one for each transferrer and equal in number to the number of needles and arranged opposite to them. The transferrers at their ends are shown as provided with slots or openings 5, into which the needles may penetrate, and also with catches 6, which serve to hold the loops. The transferrers are in the arrangement described movable radially in respect to the needles, and they are solicited toward the center of the carrier by means of a spring 7, which encircles their shanks, as shown.

8 is a cam part which, as shown, is of the shape of a conic frustum, so that when it is pushed downward it operates upon the shanks 9 of the transferrers and pushes the latter outward, so that their slots or grooves 5 embrace the needles. The shank 10 of the part 8 is sleeved onto the spindle 11, which is free to rotate. The spindle 11 supports the carrier 4 by means of a collar at its end, and the claw 12, Fig. 1, has sliding engagement with a feather on the needle-cylinder and prevents rotation of the carrier 4 without interfering with its freedom of up-and-down motion. The work goes down between the claw and feather. The shank 10 and spindle 11, however, have a pin-and-slot connection with the yoke 13, which is shown as mounted on the sinker-cam 14. The result of this is that the sinker-cam 14 rotates the yoke 13, which by reason of the pin-and-slot connection rotates the part 8 and spindle 11, although the spindle 11 and shank 10 are movable vertically in respect to each other and to the yoke.

15 is a hole or guide through which the thread may pass to the machine.

The cams 16 and 17 control the positions of the transferrers. The cam 16 has engagement by way of the link 18 and pivoted lever 19 with the shank 10 of the part 8, provision being made for the rotation of the shank 10 by forking the end of the lever 19 and permitting pins on its forked ends to run in a groove on the

shank. Similarly the spindle 11 is controlled by the cam 17 through the link 20 and pivoted lever 19ª. The cam-grooves are such that, assuming the carrier to be in its lowest position, which is somewhat lower than that shown in Fig. 1, the part 8 descends and causes the transferrer to take up the loops on the needles, as described. Subsequently the part 8 is shifted slightly upward, so as to let the transferrers clear the needles. The carrier 4 and part 8 are then raised without being shifted in respect to each other, so as to take up the tubular web as it is produced. Afterward the part 8 and carrier 4 descend without changing their relative positions until they again occupy the lowest position. Thereupon the part 8 descends in respect to the part 4, so that the transferrers are again pushed out and place their loops upon the needles. Subsequently the part 8 by ascending permits the transferrers to clear the needles. The cams may be provided upon their peripheries with teeth, in which case they can be driven by pawls, as 21 and 22. The pawls in their turn may be driven from any suitable moving part of the machine. As shown, they are carried on a rocker-arm 23, which is connected with one of the reciprocating pieces 24, that serves to elevate and depress the needles, as is well understood. Usually the transferrers will be held for a considerable period of time out of action—for example, during the fabrication of the toe and leg portions of a stocking. To accomplish this, the cams may be provided with shallow teeth, as shown at 25, and the pawls 21 and 22 may be permitted to work up and down over these shallow teeth without imparting motion to the cams. To bring the pawls into this position, use may be made of a rod or lifter, as 26, carried by a rocker-arm 27, of which the upper end is connected, for example, by means of links and levers, as 28, to a part, as 29, which responds to a pattern-chain 30. The spring 31 serves to solicit the arm 27 in one direction, while the pattern-chain serves to move it in the other direction. The springs 32 serve to solicit the pawls up to their work.

It will be obvious to those skilled in the art to which the invention pertains that modifications may be made in details without departing from the spirit thereof. Hence I do not limit myself to the precise construction and arrangement of parts hereinabove set forth, and illustrated in the drawings; but,

Having thus described the nature and objects of the invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An attachment for circular-knitting machines comprising a series of transferrers arranged in a circle and movable radially, and means for shifting them radially as a whole to take loops off of the fabric and return them to the needles and thereby form a seamless welt, substantially as described.

2. A circular-knitting machine provided with a series of transferrers and means for shifting the same radially in respect to the needles and vertically in respect to the same, substantially as described.

3. The combination of a carrier, transferrers mounted to move radially of the carrier, means for shifting the carrier and transferrers, and means for shifting the transferrers in respect to the carrier, substantially as described.

4. A transferrer having a bifurcated end forming tines with an open slot between them through which a needle can enter laterally, and said tines having catches for engaging a loop, substantially as described.

5. The combination of a carrier, transferrers carried by and movable radially of the carrier, cams, a part for shifting the transferrers, and linkwork interposed between the last-mentioned part and one of the cams and between the carrier and the other of the cams, substantially as described.

6. The combination of a carrier, transferrers carried by and movable radially of the carrier, cams, a part for shifting the transferrers, linkwork interposed between the last-mentioned part and one of the cams and between the carrier and the other of the cams, and mechanism for automatically driving and arresting said cams, substantially as described.

7. The combination of a circular carrier provided with radial grooves, transferrers movable in said grooves, a conic frustum adapted to shift the transferrers in one direction, means for soliciting the transferrers in the other direction, and mechanism for operating said parts, substantially as described.

In testimony whereof I have hereunto signed my name.

EMIL J. FRANCK.

In presence of—
W. J. JACKSON,
FRANK T. KALAS.