

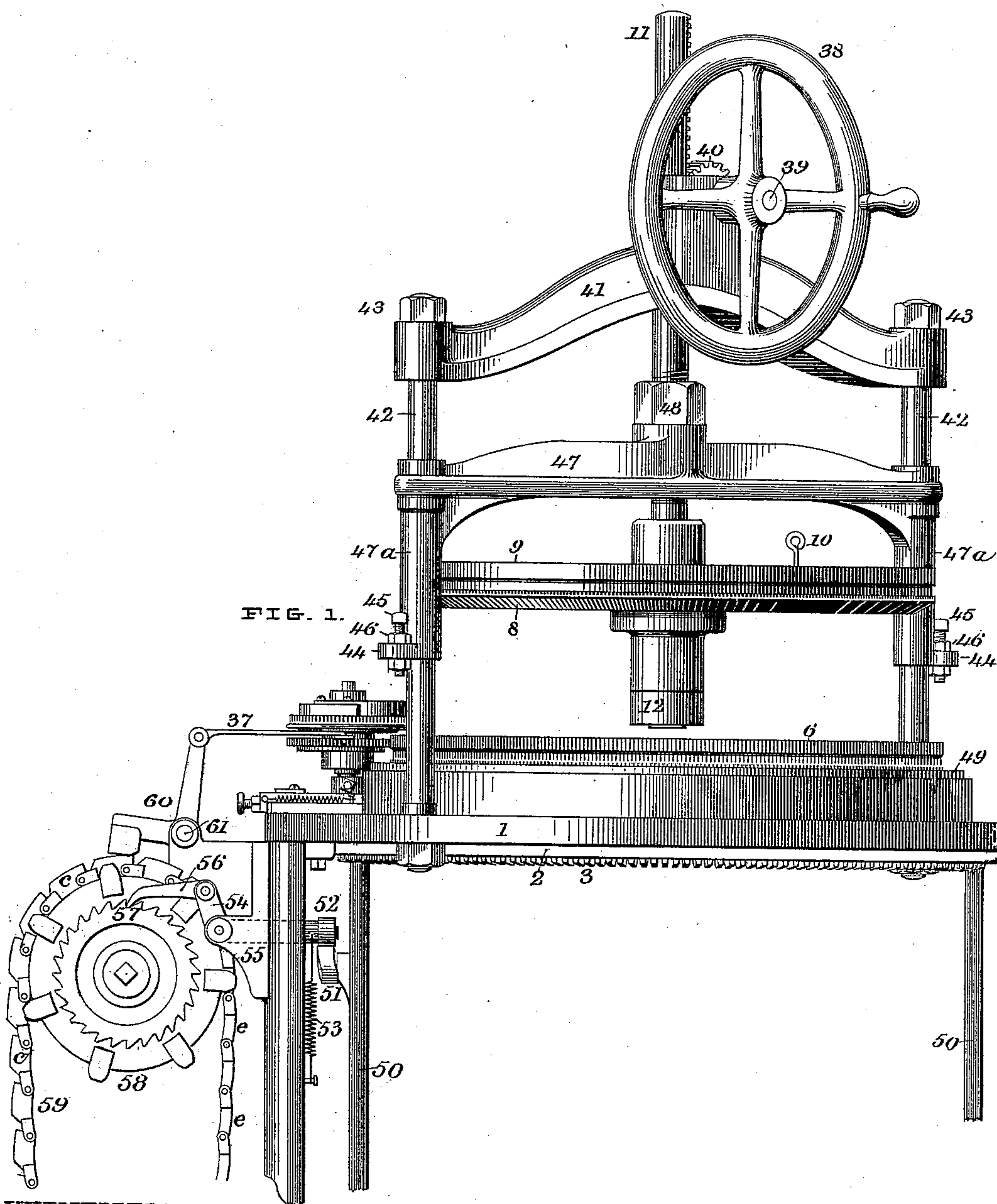
(No Model.)

3 Sheets—Sheet 1.

E. TIFFANY.
CIRCULAR RIB KNITTING MACHINE.

No. 536,744.

Patented Apr. 2, 1895.



WITNESSES:

B. S. Hathaway
W. R. Worthington

INVENTOR:

ELI TIFFANY,
By *Franklin Scott* Attorney.

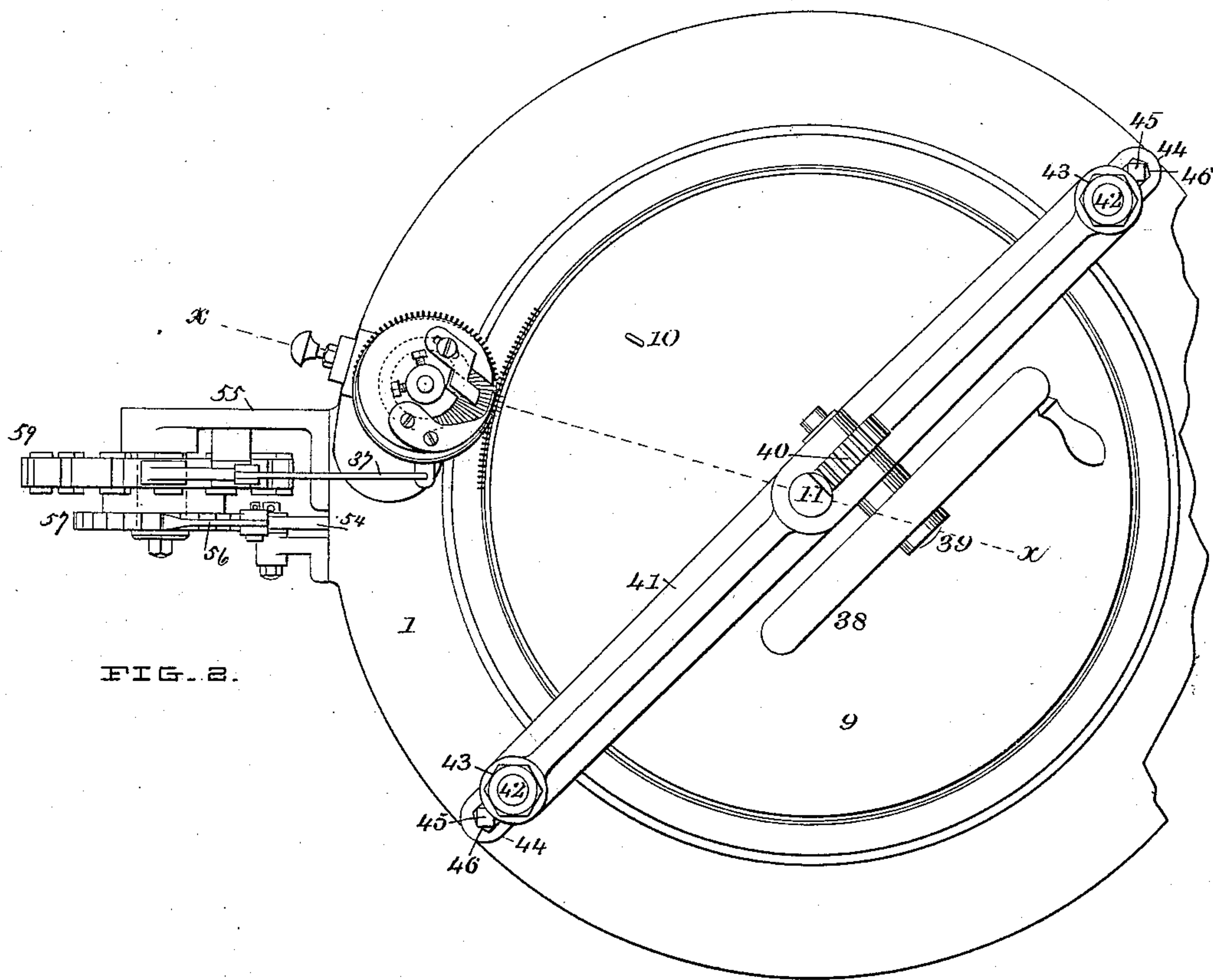
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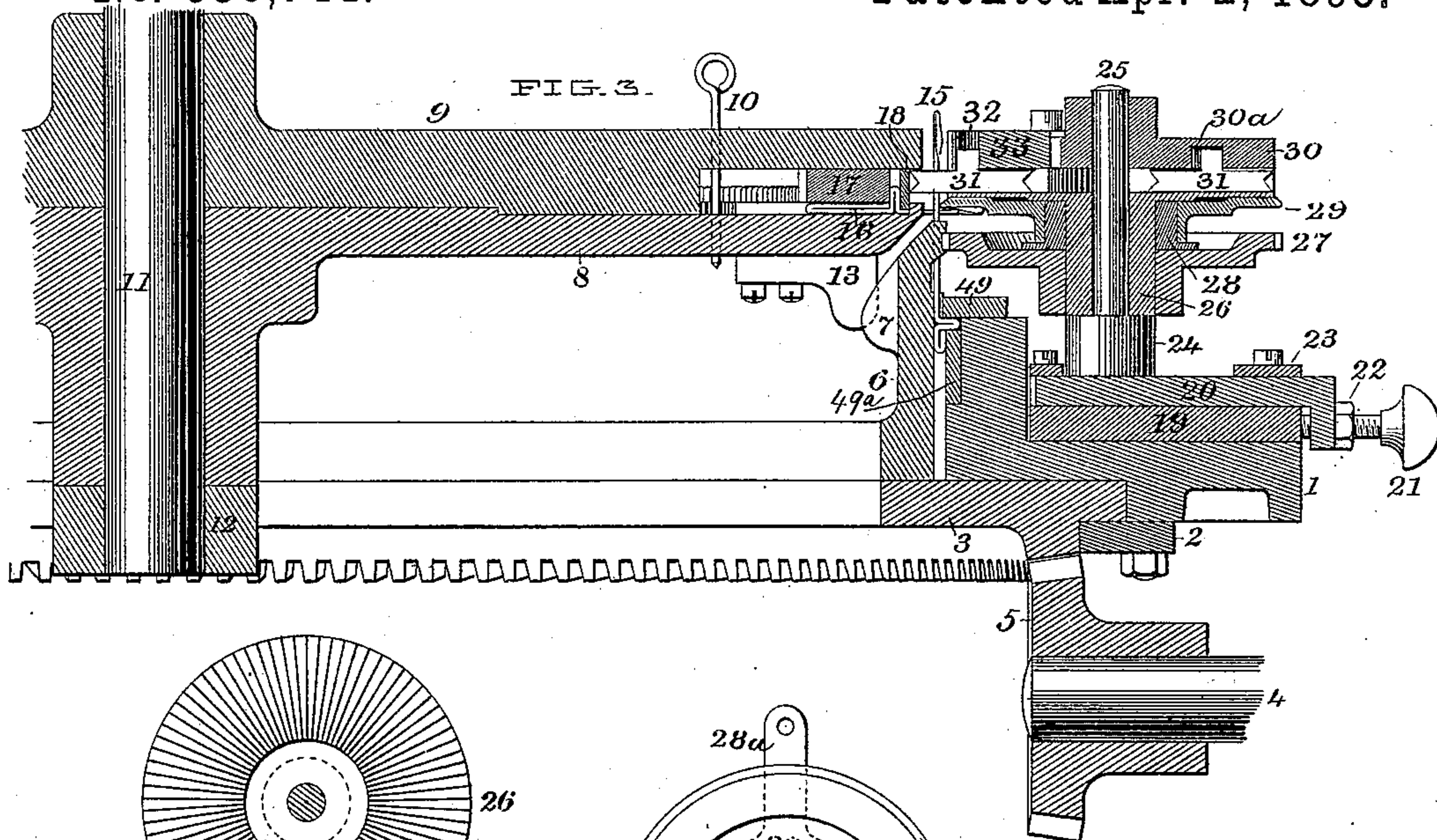


FIG. 5.

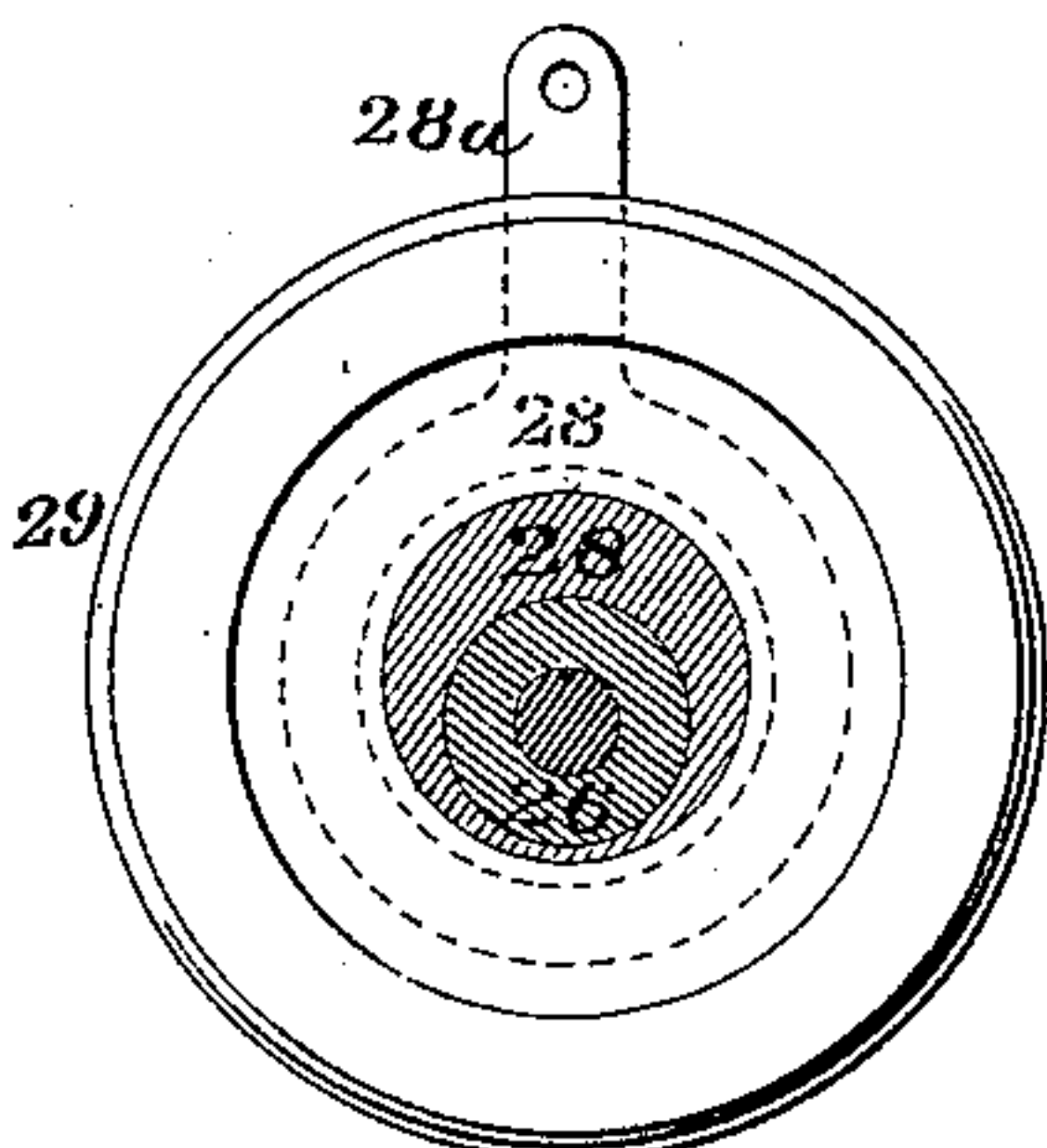
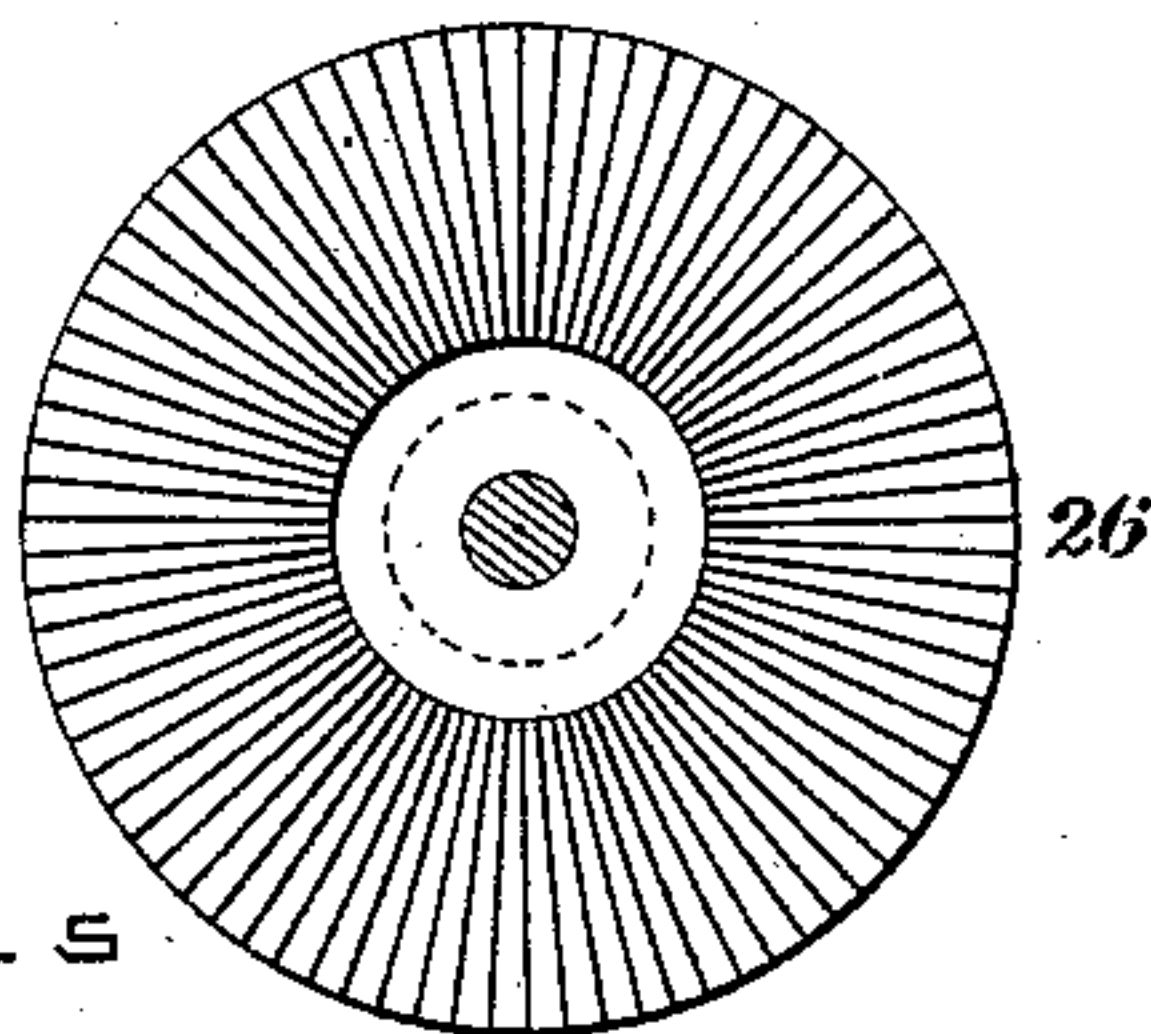


FIG. 7.

FIG. 6.

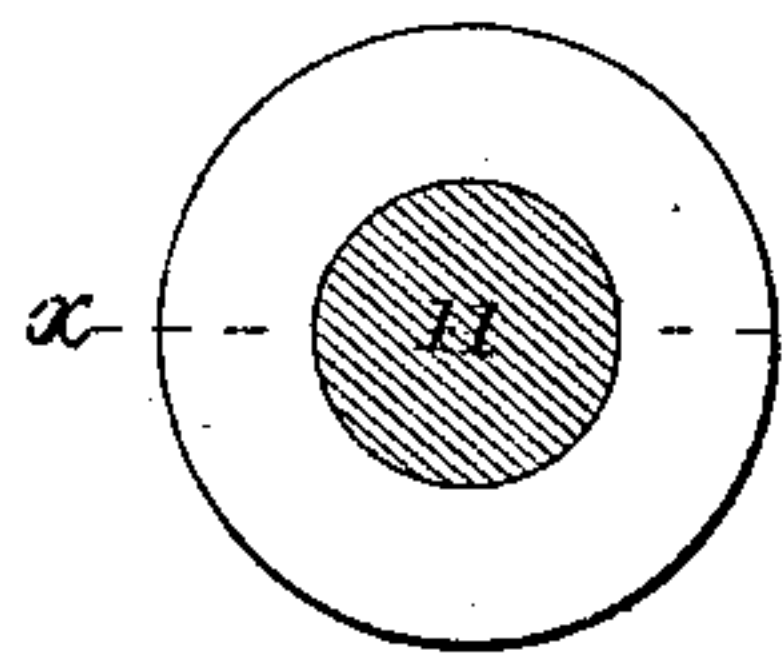
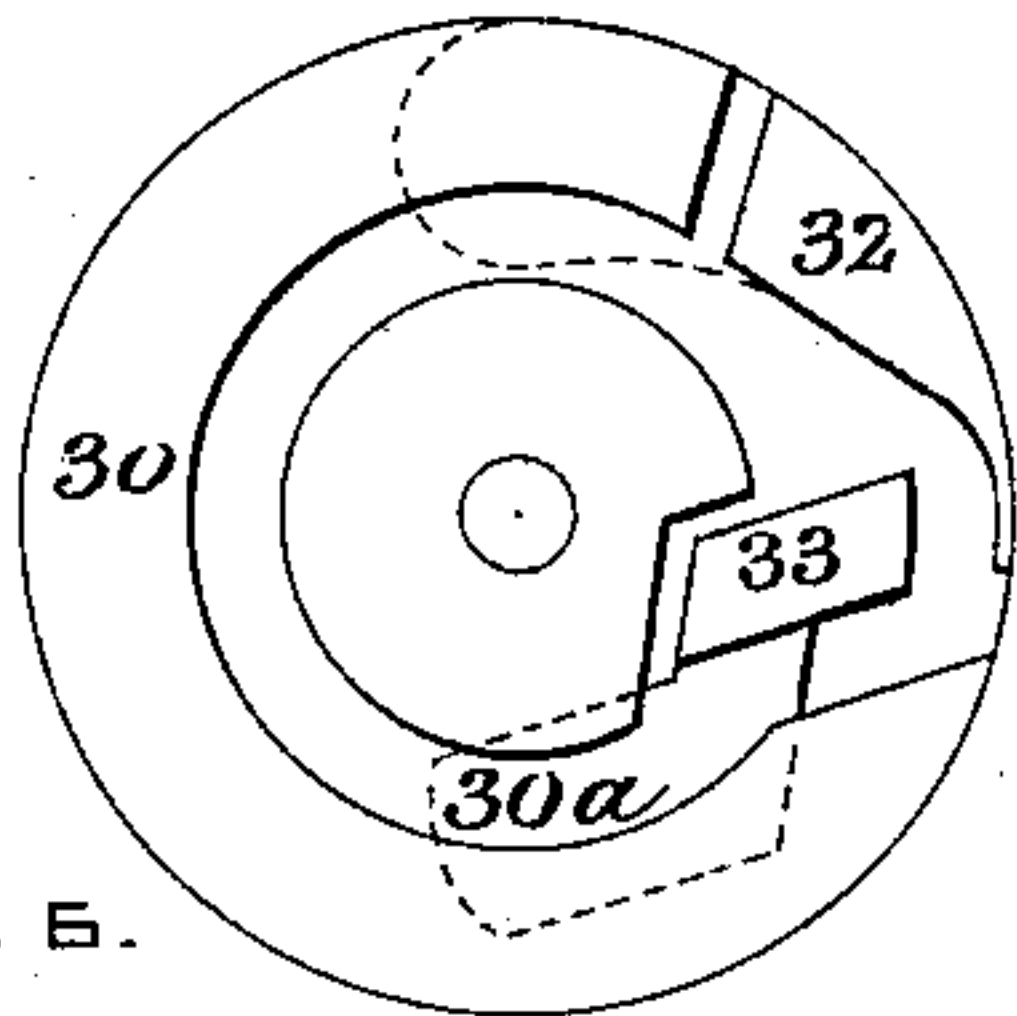
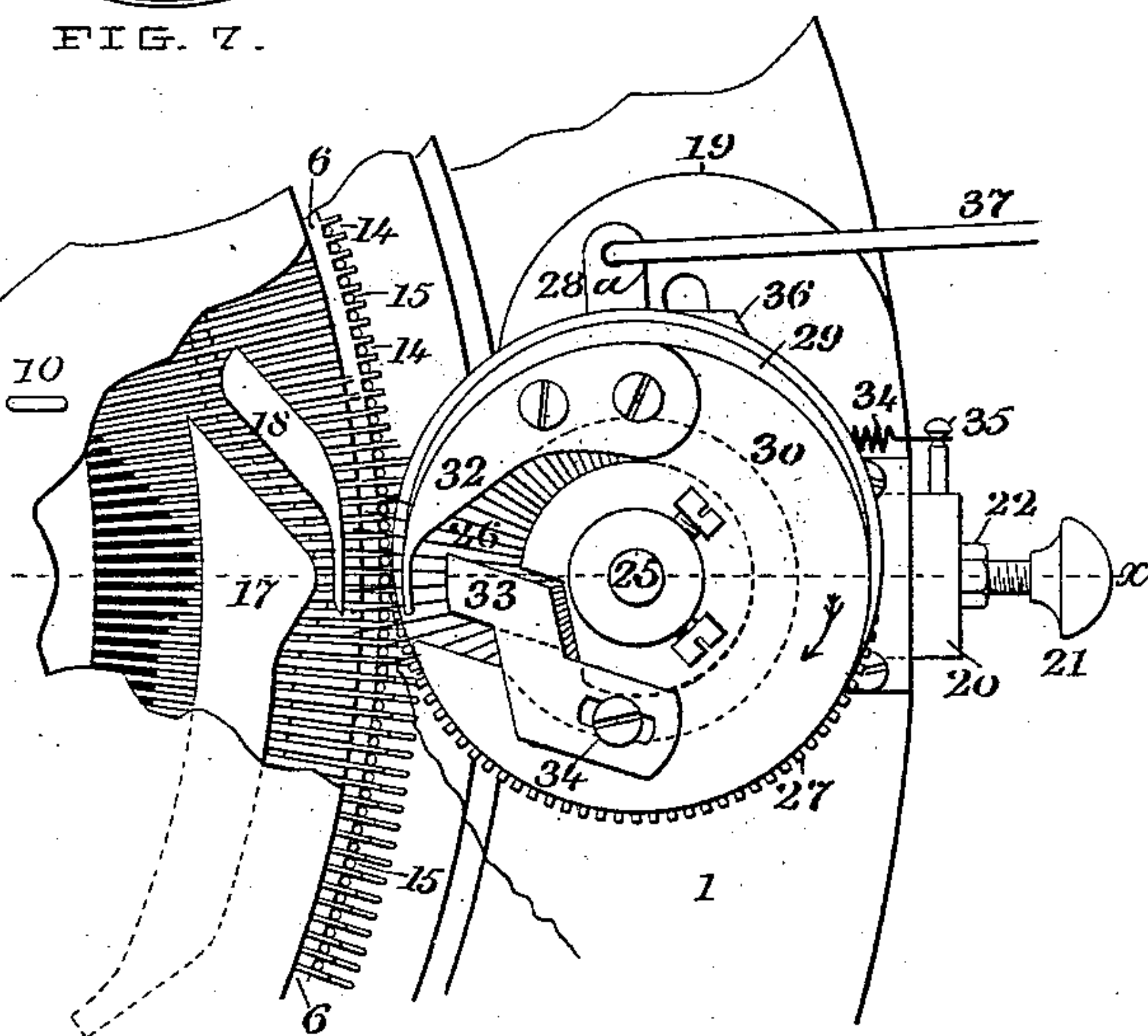


FIG. 4.



FIG. 8.



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UNITED STATES PATENT OFFICE.

ELI TIFFANY, OF BENNINGTON, VERMONT.

CIRCULAR-RIB-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 536,744, dated April 2, 1895.

Application filed April 9, 1892. Serial No. 428,451. (No model.)

To all whom it may concern:

Be it known that I, ELI TIFFANY, of the town of Bennington, in the county of Bennington and State of Vermont, have invented certain Improvements in Circular-Rib-Knitting Machines, of which the following description, in connection with the accompanying three sheets of drawings, constitutes a specification.

10 This invention relates to provisions for supplying the yarn to the needles of circular rib knitting and other cylinder machines for knitting tubular fabrics and for regulating the depth of the stitch; to provisions for separating the horizontal needle dial from the vertical needle cylinder for purposes of running on a rib or of making repairs; and to mechanism for controlling the action of the presser wheel in making "royal rib" finish so called.

20 In this machine one set of spring needles and one set of latch needles are employed, although the yarn feeding devices are equally well adapted to use on ordinary machines where only one set of needles is employed.

25 With the machines in common use it has not been practicable to use weak, rotten or tender yarn, or yarn which was not of uniform strength, for the reason that as it was carried or forced in between the needles by the wings of the burr wheels breakage would occur at the weak points of the yarn due to the excessive strain or tension put upon it. To obviate this objection I have dispensed with the burr wheels and have substituted therefor a small rotary apparatus which in its entirety I call a "feed wheel." The construction and details of this part of my invention are mainly found in Figures 3, 4, 5, 6, 7, and 8.

30 Another objectionable feature in existing machines consists in the fact that adequate provision for the separation of the dial plate from the cylinder so as to permit free access to the interior for any purpose, is not provided for. To meet this difficulty I have devised special apparatus for lifting the horizontal cam and dial plates high enough above the needle cylinder to allow free access to the interior of the machine. This is especially advantageous in making repairs, adjustments or in running on a web preparatory to starting a new rib.

The invention is fully shown in the drawings wherein—

Fig. 1 shows an elevation of a circular rib knitting machine with the dial plate elevated as when about to run on a starting piece. Fig. 2 is a plan view of the same. Fig. 3 is a radial section taken on the line $x x$, of Fig. 2. Fig. 4 is a plan view on an enlarged scale of the feed wheel and of the cams and radial needles of the dial plate. Fig. 5 is a face view of the sinker bed of the feed wheel. Fig. 6 is an inverted view of the cam race plate. Fig. 7 is a detail of the presser wheel and of its eccentric pivotal adjustment on the hub of the sinker bed. Fig. 8 is a detail view of one of the sinkers.

These improvements are applicable to that class of machines employed in knitting tubular ribbed work which uses two sets of needles worked at right angles with each other—one set working in vertical grooves in a rotating cylinder while the other works in radial grooves in a horizontal rotating bed. In this machine the radial are latch needles while the vertical are spring needles.

I have shown my apparatus mounted on the table 1 of a circular rib knitting machine with the dial plate which carries the radial needles elevated so that the arm can be easily passed between the edge of said plate and the upper edge of the vertical needle cylinder as shown in Fig. 1. For the purpose of effecting this open separation of these two parts I have erected on the table 1 two cylindrical guide posts 42 42 which are united at the top by the cross-tree 41. Upon these guide posts a vertically sliding cross-head 47 is fitted to be moved up and down. For this purpose it is provided with the two sleeve bearings 47^a and to the bottom of each of these a set screw 45 is fitted to work through the ear 44 and be confined by the jam-nut 46. These set screws bottom on the surface of the table 1 when the dial plate 8 is lowered into working position as in Fig. 3 and regulate the degree of separation or space between the upper edge of the needle cylinder 6 and the under edge of the dial plate 8. The lifting spindle 11 passes through the cross-head 47 and is rigidly confined therein. A collar 12 is attached to its bottom end above which the dial plate 8 is fitted to turn. The dial and cam plates

are held in proper adjustment and relation to each other by a pin 10 which passes through them as in Fig. 3 whenever it is found necessary to elevate or raise the dial plate out of its working position. The upper end of the lifting spindle 11 is provided with a rack with which the pinion 40 on shaft 39 engages. This pinion is rotated by the hand wheel 38 by the revolution of which the dial plate is raised and lowered at will. This feature of mounting the dial and cam plates on a spindle connected with a vertically movable cross-head provided with long sleeve bearings is new and prevents any rocking or wobbling of either the spindle or of the rotary knitting apparatus.

In using the above described apparatus when it is desired to lift the dial plate for any purpose, the pin 10 is inserted in the holes provided for it in order to prevent the relative displacement of the dial and the cam plates. Then the two are elevated by the rotation of the hand wheel 38. However the pin 10 may be withdrawn if necessary and the dial plate rotated when elevated, but care should be exercised that the two plates should be brought into proper apposition and the pin inserted before the plates are lowered into their working position.

The feed wheel mechanism shown in Figs. 3 and 4 is all mounted on a small horizontal sliding stand 20, Fig. 3, which moves in ways or between guides 23 on a base plate 19 which is bolted to the table of the machine by a bolt the head of which is seen at 36 Fig. 4. The stand slide 20 has a retractile spring 34 attached to it at pin 35 the other end of which is connected with a pin on the stationary base as seen in Fig. 1. This spring acts to throw the slide toward the needles, and the limit of such throw is determined by the adjustment of the set screw 21, the end of which strikes against the outer edge of the base plate 19. This sliding feature is used whenever it is necessary to withdraw the whole apparatus out of its normal working position in reference to the needle cylinder.

The journal stud 25 is erected on the slide plate and on this stud the rotating sinker bed 26 is fitted to run. Around the hub of the sinker bed the gear wheel 27 is fitted and fastened so as to run therewith. The teeth of the gear mesh between the tricks of the needle cylinder as shown in Fig. 4 by which it together with the sinker bed is driven when the cylinder is rotated. Above the gear and below the sinker bed an eccentric ring 28 is fitted which has a handle or lever 28^a projecting from one side as seen in Figs. 1, 4, and 7 by means of which said ring may be slightly turned about the hub of the sinker bed. Outside of this eccentric ring the presser wheel 29 is fitted to revolve freely as it may be propelled by the vertical needles with which it comes in contact in the process of knitting. The swing of handle 28^a carries this eccentrically pivoted presser wheel toward and from the needle barbs and is utilized for the pur-

pose of mispressing any predetermined needle or number of needles according to the design set up in the pattern chain shown in Fig. 1 as will appear farther on. The sinker bed is radially grooved as seen in Fig. 5 for the reception of the sinkers 31 of which a detail appears in Fig. 8. These sinkers have both ends of symmetrical shape so that they are reversible, a feature which materially enhances their value as when one end is worn out or broken their position in the groove may be reversed. Each one has a shank which is designed to run in the cam race 30^a shown in Fig. 6. The cam plate in which this race appears is attached to the top of the journal stud 25. A portion of the plate next to the needle cylinder is cut away to make room for the slur-cock 33 and the retracting cam 32. The slur-cock is screwed to the upper side of the cam-plate 30 and is capable of adjustment toward and from the needles by means of a screw and slot in its tail piece as seen in Fig. 4. This adjustment of the slur-cock is for the purpose of determining the throw of the sinkers between the needles and by its means the depth of the stitch is regulated. The sinker wheel runs in the direction of the arrow as shown in Fig. 4, and as the shanks of the sinkers in passing around strike the face of the slur cock 33 they are thrown out between the vertical needles 15 of the needle cylinder, and taking the yarn as it is delivered to them sink it between the needles to such a depth as the adjustment of the slide 20 and of the slur cock calls for. The guard cam 32 is so constructed that as the shanks of the sinkers pass off the incline of the slur cock they fall within the reach of the guard cam 32, the front end of which is made to be substantially concentric with the wheel for the space of two or three needles before the retracting cam face is reached. From this point the cam face retracts the sinkers until they reach the concentric part of the shank race.

The needles in the dial plate 8 are operated by the action of the cams 17 and 18 as they pass them in the rotation of the dial plate 8, and as there is nothing in their action different from that of many existing and well known machines which are well understood, no specific description thereof is here given.

The vertical needles are actuated by means of the cam plates 49 and 49^a shown in section in Fig. 3. The interval between the under edge of plate 49 and the top of plate 49^a constitutes a race through which the shanks of the needles travel. As this is a common construction well understood it is not here particularly described.

When ordinary ribbed goods are being produced the presser wheel is set to the desired position and the lever 28^a fastened so as to secure its positive action; but when an intermittent action of this wheel is called for the pattern mechanism shown in Figs. 1 and 2 is

brought into action. This consists of an endless chain or jacquard made up of thick and thin links *c c* and *e e*, and carried by the sprocket wheel 58. This sprocket revolves on a journal stud projecting from a bracket 55 attached to the side of the main frame of the machine. It is propelled by a ratchet 57 and pawl 56 attached to the bell crank 54 which is actuated by a cam lug 51 on the suspender arm 50 which depends from the under side of the needle cylinder and revolves therewith. At each revolution of the needle cylinder this lug lifts the roll 52 on the inner end of one of the arms of the bell crank 54 thereby propelling the ratchet one notch and the chain one link. Above the chain another bell crank 60 is pivoted to the same bracket, the lower arm of which has a tappet which rides on the top of the chain 59 while at the end of the other arm the link 37 connects the same with the handle 28^a of the presser wheel. Accordingly as the vertical arm of the bell crank 60 is thrown in and out under the influence of the pattern chain the handle 28^a will be swung and the presser wheel 29 will be correspondingly thrown into and out of contact with the vertical needle barbs. This mechanism is brought into action in producing figured fabrics or in making "royal ribs." When the needle cylinder is equipped with latch needles only in using the feed wheel the presser wheel and its connections are dispensed with, the system of sinkers being adapted to work with latch needles equally as well as with spring needles. By the use of this feed wheel either with spring or latch needles a much more elastic fabric can be produced than by the old style devices and a much more even and uniform surface can be produced.

The above described "feed-wheel" may be mounted on a suitable stand and adapted to run in connection with the horizontal set of needles without in any way departing from its principle of operation. Therefore I claim the invention in combination with any set of rotating needles whether arranged to radiate from the axis of rotation of a cylinder or in parallelism therewith. As many of these feed wheels may be arranged around a cylinder as can be operated advantageously, and connections may be made from one to another in any of the well known ways so that the action of pattern chain can be communicated to as many as may be desired.

The special advantage accruing from the use of this device in working uneven, weak, or tender yarn results from the fact that after the thread is seized by a sinker blade the cam face of the slur-cock 33 is such, taken in connection with the intermeshing of the needles 15 15 with the sinkers, that practically the stitch is sunk to the limit of its depth between the first two needles between which the sinker enters, so that in the further rotation of the wheel the yarn is not drawn from one needle to another through the notches at the ends

of the sinkers whereby it is stretched, drawn or weakened in any way. Therefore a much finer, weaker and tenderer yarn can be worked than where the ordinary burr wheel is used.

Therefore I claim as my invention—

1. The combination with the described rotary feed wheel and the series of barbed needles of a rotary knitting machine, of the eccentrically mounted presser wheel and means substantially as shown, connected therewith, for putting said presser wheel in and out of action substantially as described and for the purposes set forth.

2. The combination of a grooved rotating needle cylinder equipped with vertically movable barbed needles, cams for imparting to said needles their appropriate vertical movements, a horizontal toothed wheel geared to mesh with the tricks of the needle cylinder and to be rotated thereby and in unison therewith, a concentric sinker dial connected with said wheel and revolving therewith, a series of shanked sinkers and a cam race for imparting to said sinkers their appropriate movements, with a presser wheel and an adjustable eccentric bearing on which said presser wheel is fitted to run, substantially as described and for the purpose specified.

3. The combination of the needle cylinder, needles, feed wheel comprising the gear, sinker dial, sinkers and cam race, a presser eccentrically mounted as shown, and the described sliding stand on which the feed wheel is mounted, substantially as and for the purposes described and set forth.

4. The combination with the needle cylinder and needles of the feed wheel fitted with the eccentric presser, the pattern device and provisions substantially as shown, connecting it with the presser for the purpose of alternately knitting pressed or mispressed work substantially as specified.

5. The stationary cam plate and rotating dial plate mounted on the lifting spindle, a sliding crosshead to which said spindle is attached, the vertical standards upon which said crosshead slides, and means substantially as shown, connected with said standards for elevating and lowering said spindle in the manner substantially as described and for the purpose set forth.

6. The presser-shifting-lever carrying the presser wheel, eccentrically pivoted on or about the axis of the feed wheel and connected by means substantially as shown with the pattern mechanism, and the feed wheel, in combination with said pattern mechanism, as a provision for mispressing at predetermined intervals, substantially as specified.

In witness whereof I have hereto subscribed my name, at Bennington, Vermont, this 15th day of March, A. D. 1892.

ELI TIFFANY.

In presence of—

FRANKLIN SCOTT,
A. H. WINSLOW.