

2 Sheets—Sheet 1

No. 411,685.

Patented Sept. 24, 1889.

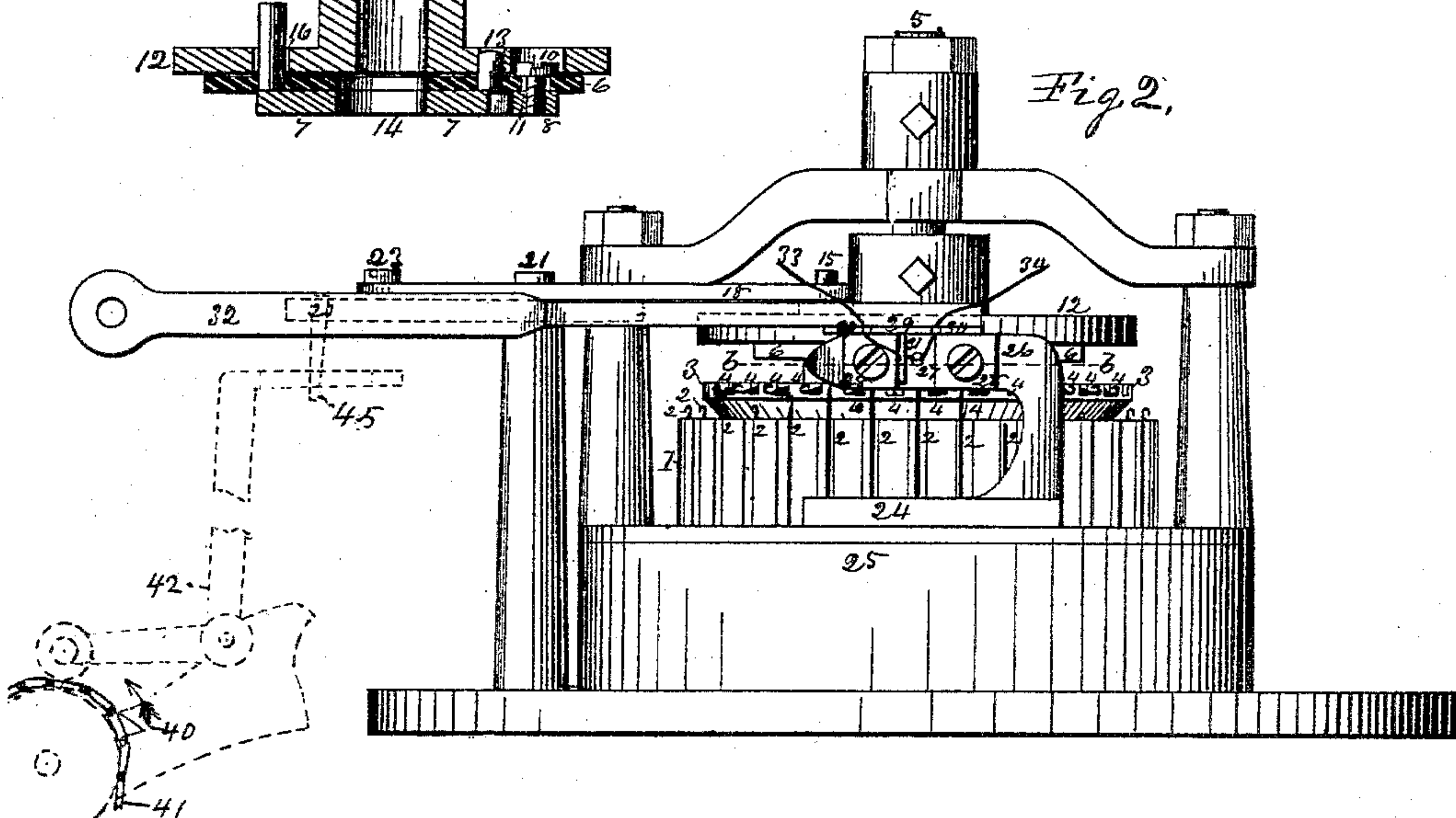
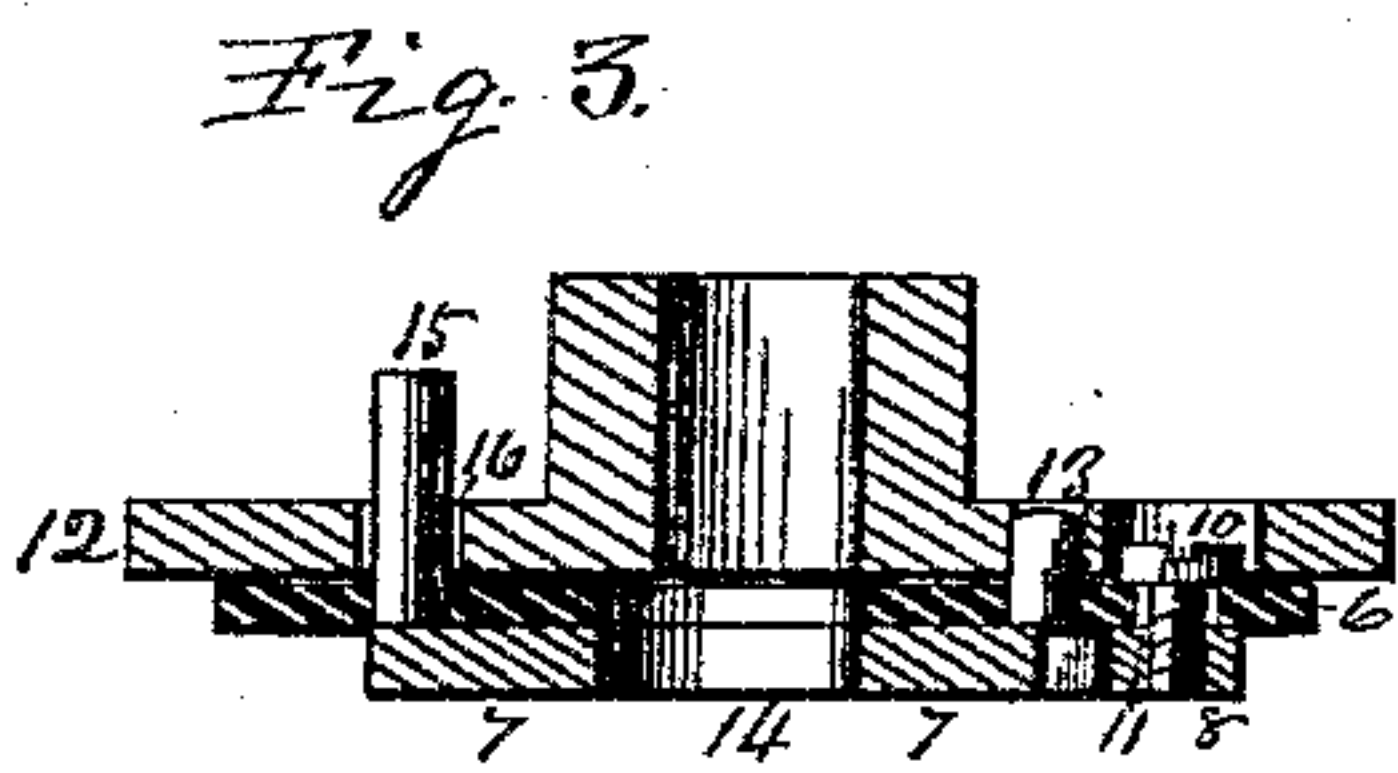


Fig. 2.

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(No Model.)

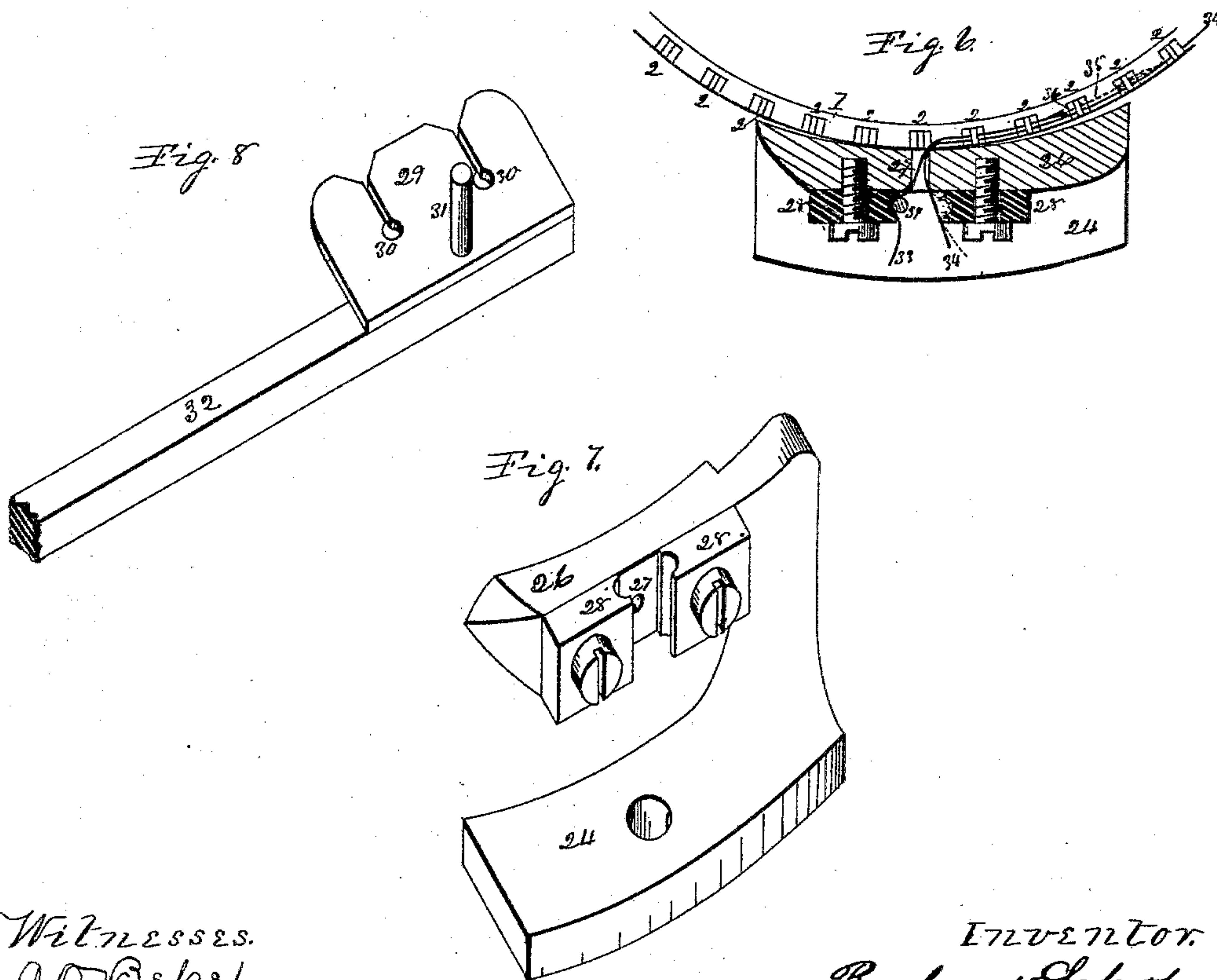
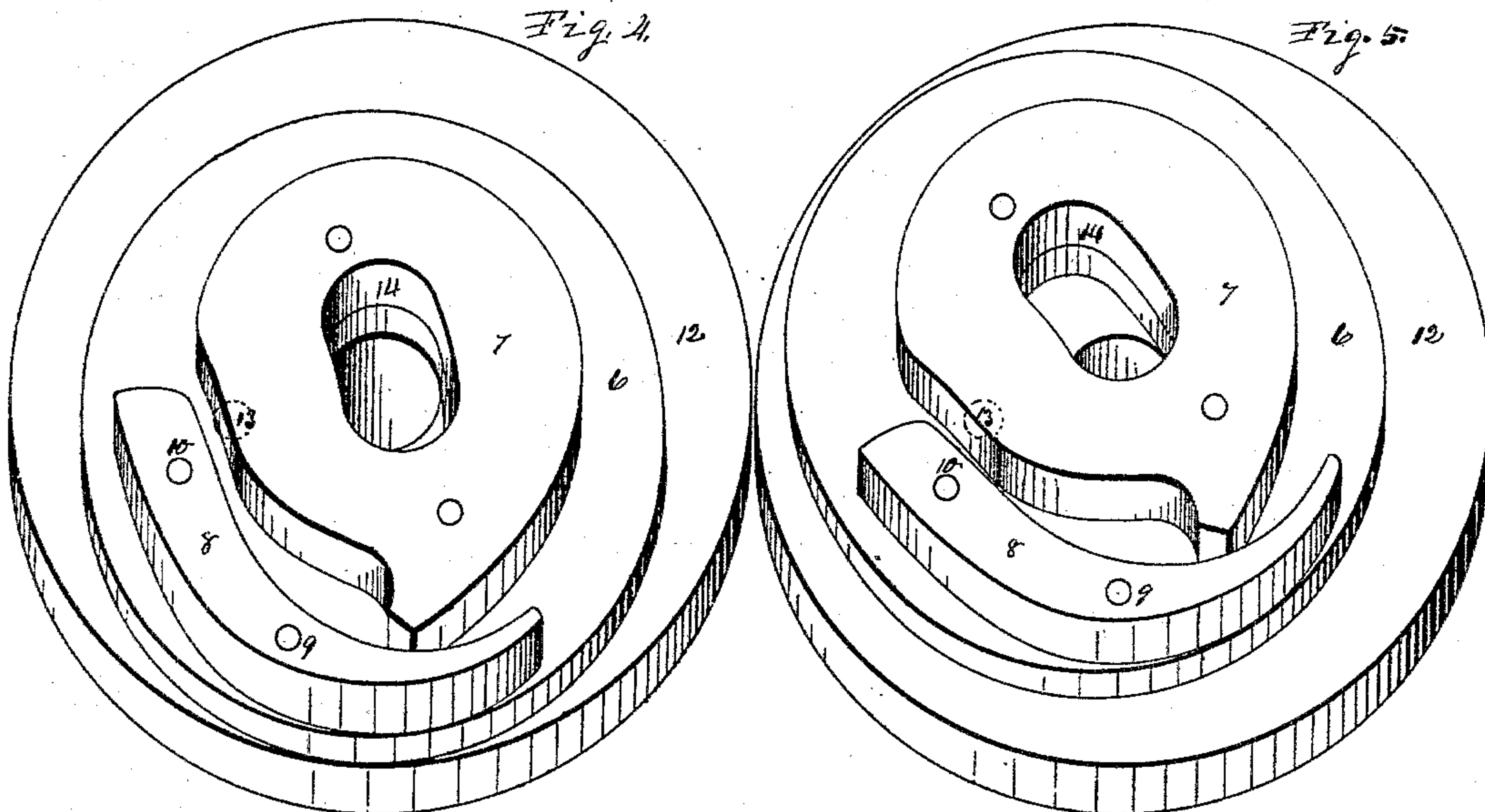
2 Sheets—Sheet 2.

R. SCHOFIELD.

CIRCULAR RIB KNITTING MACHINE.

No. 411,685.

Patented Sept. 24. 1889.



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UNITED STATES PATENT OFFICE.

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CIRCULAR-RIB-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 411,685, dated September 24, 1889.

Application filed March 12, 1887. Serial No. 230,663. (No model.)

To all whom it may concern:

Be it known that I, RICHARD SCHOFIELD, a subject of the Queen of Great Britain, residing at Paris, county of Brant, Province of Ontario, Canada, have invented new and useful Improvements in Circular-Rib-Knitting Machines, of which the following is a specification.

This invention relates to a class of knitting-machines known as the "ribbing-machine." Its objects are to improve this class of machines, to simplify their construction, to render them more efficient, to automatically produce at suitable intervals in the fabric in the process of knitting a portion known as the "welt," and to provide for the alternate employment automatically of various varieties or variously-colored yarns in the same or continuously-knit fabric.

To accomplish the above objects, I have employed my improvements in connection with a known form of a machine represented in the accompanying drawings, in which—

Figure 1 is a plan view of a machine embodying my invention, of which Fig. 2 is an elevation. Fig. 3 is a vertical section of the cam to operate the dial-needles and its disk support on dotted line *a* of Fig. 1. Fig. 4 is an isometrical under face representation of the cam to operate the dial-needles in position on its disk-support to operate the needles. Fig. 5 is an isometrical under face representation of the cam to operate the dial-needles in position on its disk-support to withdraw the needles from action. Fig. 6 is a horizontal section of the yarn-guide and yarn-changing device on dotted line *b* of Fig. 2. Fig. 7 is an isometrical representation of the fixed portion of the yarn-guide and yarn-changing device, and Fig. 8 is an isometrical under face representation of the movable portion of the yarn guide and changing device.

The knitting-machine in connection with which I have in this instance employed my improvements is of the well-known circular variety, in which a rotating cylinder 1, carrying a series of vertically-moving needles 2, and a dial 3, of disk form, carrying a series of radially-moving needles 4 and rotating with the cylinder about the same axial center on a fixed shaft 5, are employed.

In a class of ribbed work produced on like machines to that represented in the accompanying drawings to be cut in sections it is desirable at the point in the fabric at which the separation is to be made to produce what is well known as a "welt," the same being produced by throwing out of action for one or more rounds one of the sets of needles employed, retaining thereon the stitches held thereby, and then resuming the knitting with all the needles.

For the purpose of operating the needles 4 in the process of knitting, and to withdraw them from action to produce the welt-course, I employ an oscillating cam, preferably composed of a base 6 of disk form. A cam 7, fixed centrally to the base portion, is employed to engage the right-angled arms formed on the shanks of the needles at or near the ends to impart to them their outward endwise movement, and the cam 8, to engage the right-angled arms of the needles to impart to them their return movement, is pivoted to the base at 9, and its rear end is fixed in place on the base, and is made adjustable on its base by means of a screw 10, passed through an enlarged opening 11 in its base and screwed into its rear end portion. This cam and its fixed head-plate support 12 have an eccentric pivotal connection at 13, and the center of the cam is provided with an elongated central opening 14 concentric with its pivotal connection to receive the fixed shaft-support of the disk-head and permit a limited oscillating movement of the cam on its pivotal connection therewith. A stud-pin 15, rising from the upper face of the cam, preferably on the side thereof opposite to its point of pivotal connection with the disk-head, rises through a segmental slot-opening 16, formed in the disk-head concentric with the pivotal point of the cam in its connection therewith. The end of the stud-pin 15 projecting above the upper face of the disk-head receives a link 17, which, in connection with a lever 18, to which it is pivoted, provides the means to make a suitable connection with some of the moving parts of the machine, (not shown, but such, for example, as shown and described in Letters Patent No. 284,591, granted to H. P. Ballou, September 11, 1883, or of any other

well-known or approved form,) to enable it to be operated at proper intervals to oscillate the cam to carry it to the position relatively with the disk-head, as shown in Fig. 4, to operate the dial-needles 4 in connection with the cylinder-needles 2 to produce a ribbed fabric alike on both sides.

When the cam is in the position (shown in Fig. 4) to operate the dial-needles, the lever 18 and the link 17, in its connection with the stud-pin 15, will be in their solid-line position, as shown in Fig. 1.

When in the process of knitting the point in the fabric at which to produce the welt-course is reached, the cam by means of its link-and-lever connection with any suitable moving part of the machine—such, for example, as shown in the Ballou patent hereinbefore referred to—is carried from its position shown in Fig. 4 to its position shown in Fig. 5 relatively with its disk-head support, and will withdraw the dial-needles from action, and the knitting to form the welt-course will be produced on the cylinder-needles 2 only. In this movement of the cam the lever 18 and link 17, connected with the cam, will be carried from their solid-line position shown in Fig. 1 to their dotted-line position therein shown, and their return movement will return the dial-needles to their working position. The rear end of the curved portion 8 of the cam is made adjustable in its connection relatively with its base-support by the means and in the manner hereinbefore described for the purpose of regulating the inward movement of the radial needle to properly cast or shed the loops, and an elongated opening 19, formed in the disk-head, permits access to the adjusting-screw for the purposes of adjustment without removing the parts.

The lever employed to oscillate the cam is composed of two parts 18 and 20, having the same pivotal support at 21, and the free end of the portion 18 is provided with a curved slot 22 concentric to its pivotal support, and a screw 23, passed through the slot and screwed into the portion 20, provides the means of adjustment to vary the position of the cam in its oscillatory movements relatively with its disk-head support to operate the needles to receive the yarn and cast or shed the stitches in the best manner within the capacity of the machine. One of several devices which might be employed to oscillate the lever 20 is shown in dotted lines, Figs. 1 and 2, in which an angle-lever 42 is provided with a plate 43 at its upper end, having an oblique slot 44, adapted to receive a pin 45, depending from the end of lever 20, the angle-lever being actuated in one direction by cams 40 on an endless chain 41 and in the opposite direction by a spring of any well-known form, (not shown,) or by gravity alone.

The fixed portion of the yarn-guide is of crane form, having its base portion 24 fixed to the base 25, in which the needle-carrying cylinder 1 revolves. The overhanging arm

portion 26 of the fixed yarn-guide is pierced, forming a guide-eye 27, through which the yarn is passed to the needles. This overhanging arm rises in position relatively with the needles to deliver the yarn passed through its eye to the needles in a manner to be surely taken by the needles in the process of knitting. The overhanging arm portion 26 of the fixed yarn-guide is provided with like grasping-jaws 28, fixed on its outer face on opposite sides of the guide-eye therein, and their inner opposite faces are made in semicircular concave grooved form.

The movable portion of the yarn-guide, which, in connection with the grasping-jaws 28, forms the yarn transferring or changing mechanism, consists, essentially, of a plate 29, with yarn-guide eyes 30 formed therein at proper intervals, and in this instance are slotted laterally to readily admit the yarn to the guide-eyes. A grasping-jaw 31, depending centrally from its under face to enter between the like fixed jaws 28, is of a conformation to enter the grooved face of the fixed jaws, and in this instance is of stud-pin form. This movable portion of the yarn-guide is suitably connected to any suitable moving part of the machine—such, for example, as one of the knee-levers K shown in the Ballou patent referred to above—to impart to it an alternate back-and-forth reciprocating movement to cause the depending stud-pin-formed jaw to engage the opposite fixed jaws alternately. In this instance I have employed a bar 32, fixed to the movable yarn-guide, extending substantially in the plane of the movement of the guide, as part of the means necessary to connect the guide to some of the moving parts of the machine to impart to it the required movement automatically.

In the employment of my improved yarn-guide and yarn-changing mechanism in the process of knitting the yarns 33 and 34 employed are placed in the movable guide in their respective eyes, and are passed on opposite sides of the jaw depending from its under face, and are both passed through the eye in the fixed guide in position to be delivered to the needles in the process of knitting. It is now supposed that one of the yarns 34 has been employed in the knitting process up to the point therein at which a change to the yarn 33 is required. Up to this point the yarn 34 has been free to be taken in by the needles and the yarn 33 has been grasped and held within the jaws, as shown in Fig. 6, and the movable guide has been in the position shown in solid lines in Fig. 1. At the point requiring the change the movable yarn-guide is automatically or otherwise shifted to its dotted-line position, (shown in Figs. 1 and 6,) in which movement the yarn 33 will be released to be employed in the fabric in the process of knitting, as shown at 35 in Fig. 6, and the yarn 34 will be grasped and firmly held between the opposite jaws, as therein shown in dotted lines, and the onward movement of

the knitting mechanism will break the yarn 34 on or over the corner of one of the needle-grooves or needles, as shown at 36 in Fig. 6. In the changing of the movable yarn-guide to free the yarn 33 and confine the yarn 34 sufficient time is given for the yarn 33 to be carried by frictional contact with the yarn 34 into the fabric and form an overlap connection therewith before it is separated at 36, as shown in Fig. 6. In the return movement of the movable yarn-guide from its dotted-line position to its solid-line position, as shown in Fig. 1, the action upon the yarns last above described will be reversed and the respective yarns will be confined and freed, as shown in solid lines in Fig. 6.

The foregoing changes of yarn in the process of knitting will occur automatically at predetermined intervals provided for in the connection of the movable yarn-guide with any suitable moving, counting, or registering part of the machine.

In the foregoing I have represented my improved yarn-changing mechanism in connection with a circular-ribbing knitting-machine, but do not wish to confine its use to this particular class of machines, as with suitable mechanical changes to adapt it to the particular class or style of machine it is capable of use in connection with perhaps most or all of the varieties of machines now in use requiring a yarn-changing device.

I claim as my invention—

1. In combination, a fixed head-plate, a dial-plate provided with suitable needles, a disk-formed base centrally mounted on the dial-plate shaft and eccentrically pivoted to the fixed head-plate, means for oscillating the disk-formed base, a needle-projecting cam fixed centrally to the disk-formed base, a needle-retracting cam pivoted to the said base, and means for locking the pivoted cam to the base, the needle-projecting cam and the disk-formed base being provided with an elongated opening at the point where the dial-plate shaft passes through, whereby the said cam and disk-formed base are permitted an oscillating movement on their eccentric connection with the fixed head-plate, substantially as set forth.

2. In combination, the fixed head-plate, the dial-plate provided with needles, the disk-formed base, the needle-projecting cam fixed to the disk-base, the disk-formed base being pivoted eccentrically to the fixed head-plate and permitted an oscillating movement, the needle-retracting cam pivoted to the disk-formed base, means for oscillating the disk-formed base, and means for locking the heel end of the retracting-cam to the base in different positions to determine the inward movement of the needles, substantially as set forth.

3. In combination, the fixed head-plate provided with an opening, the dial-plate provided

with needles, the disk-formed base pivoted to the fixed head-plate, means for oscillating the disk-formed base, the needle-projecting cam fixed to the disk-formed base, the needle-retracting cam pivoted to the disk-formed base, and means for adjusting one end of the needle-retracting cam relatively to the disk-formed base, the said adjusting mechanism being located opposite the opening in the fixed head, whereby the adjustments may be made without separating the parts, substantially as set forth.

4. In combination, the fixed head-plate, the oscillating disk-formed base pivoted to the head, the projecting and retracting cams thereon to operate the dial-needles, a lever to operate the oscillating disk-formed base, means for vibrating the lever, the said lever being connected at one end to the oscillating disk-formed base and at the other end to its actuating mechanism, and the said operating-lever being formed in two sections having the same pivotal support, and means for locking one of the sections in different adjustments transversely to the other section, substantially as set forth.

5. In combination, the knitting-needles and their rotary support, a pair of fixed jaws between which the yarns pass to the needles, and a reciprocating slide provided with yarn-guides and with an arm or jaw adapted to alternately engage the faces of the fixed jaws to break the yarn, substantially as set forth.

6. The herein-described yarn-changing device, consisting, essentially, of the fixed jaws between which the yarns are directed and the reciprocating slide provided with a clamping-jaw adapted to move back and forth between the fixed jaws, and further provided with yarn-guides to direct the yarns between the jaws, substantially as set forth.

7. The herein-described yarn-changing device, consisting, essentially, of fixed jaws between which the yarn is directed and the reciprocating slide having a movement transverse to the line in which the yarn is fed to the needles, and provided with a depending clamping-jaw adapted to move back and forth between the fixed jaws, and further provided with yarn-guides secured thereto to move simultaneously therewith, substantially as and for the purpose set forth.

8. The herein-described yarn-changing device, consisting, essentially, of fixed jaws having concave faces and the reciprocating slide provided with a clamping-jaw convex on its sides toward the concave-faced jaws, the said reciprocating slide being provided with yarn-guides, substantially as set forth.

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Witnesses:

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