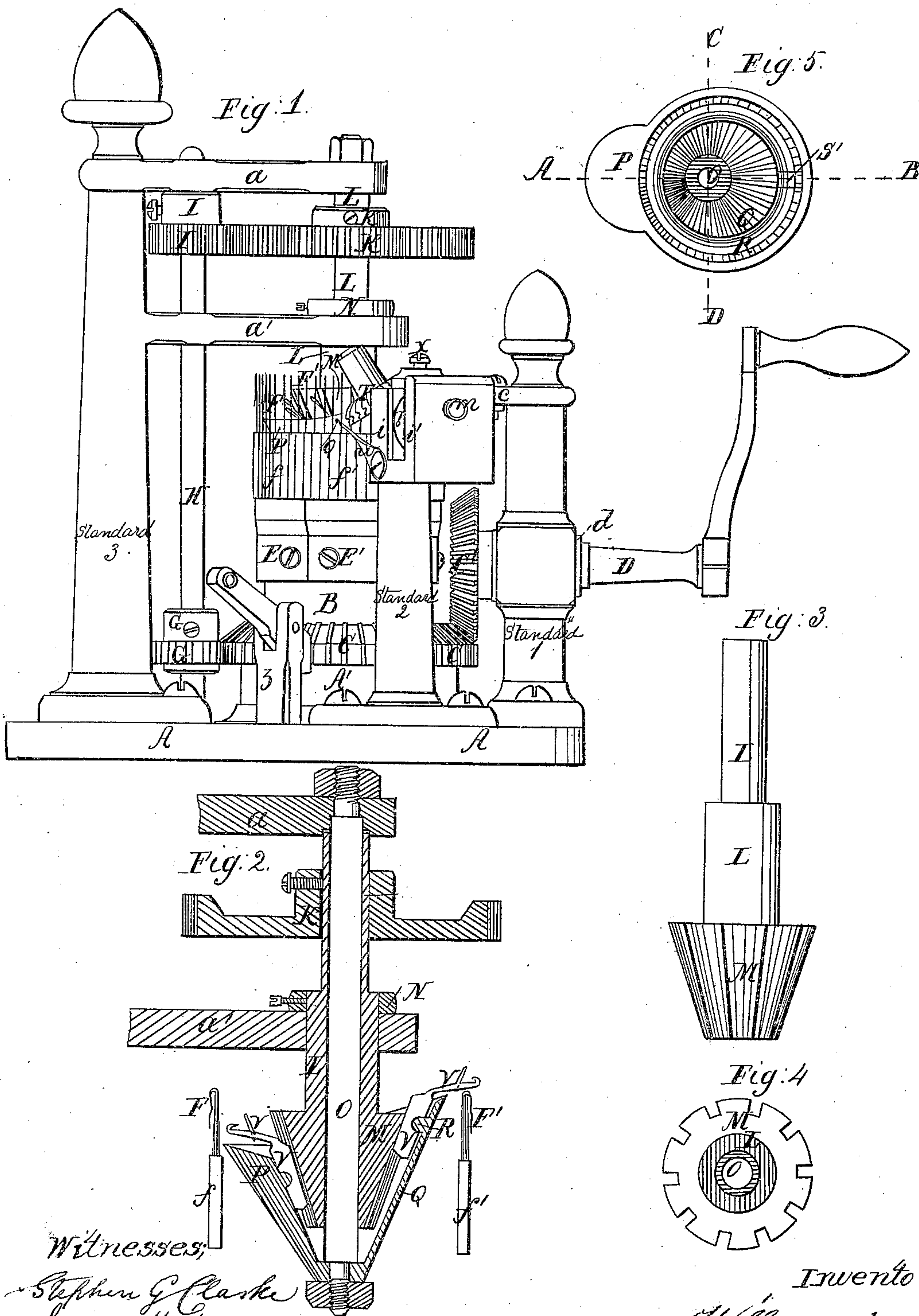


W. Binkley.
Knitting Mach.

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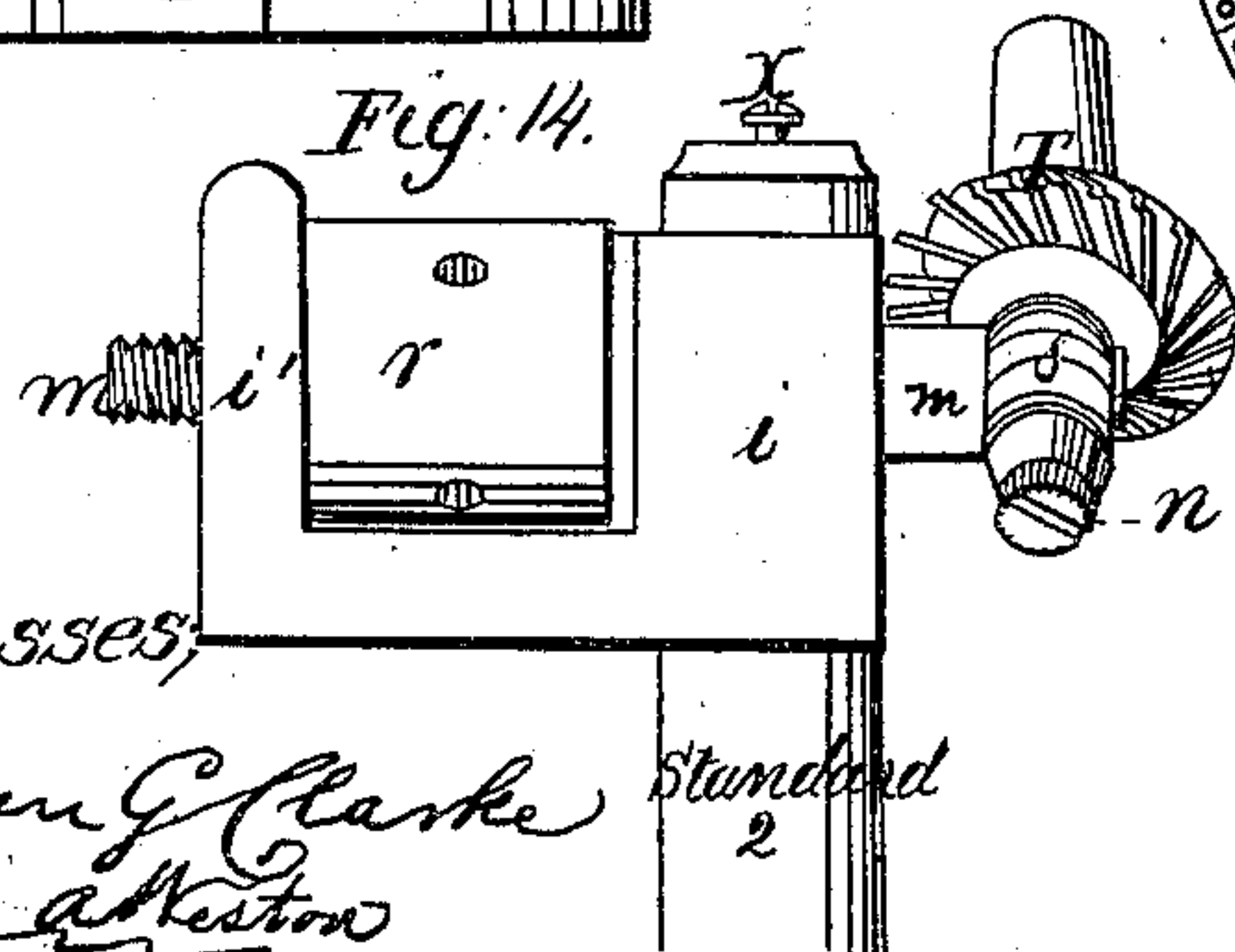
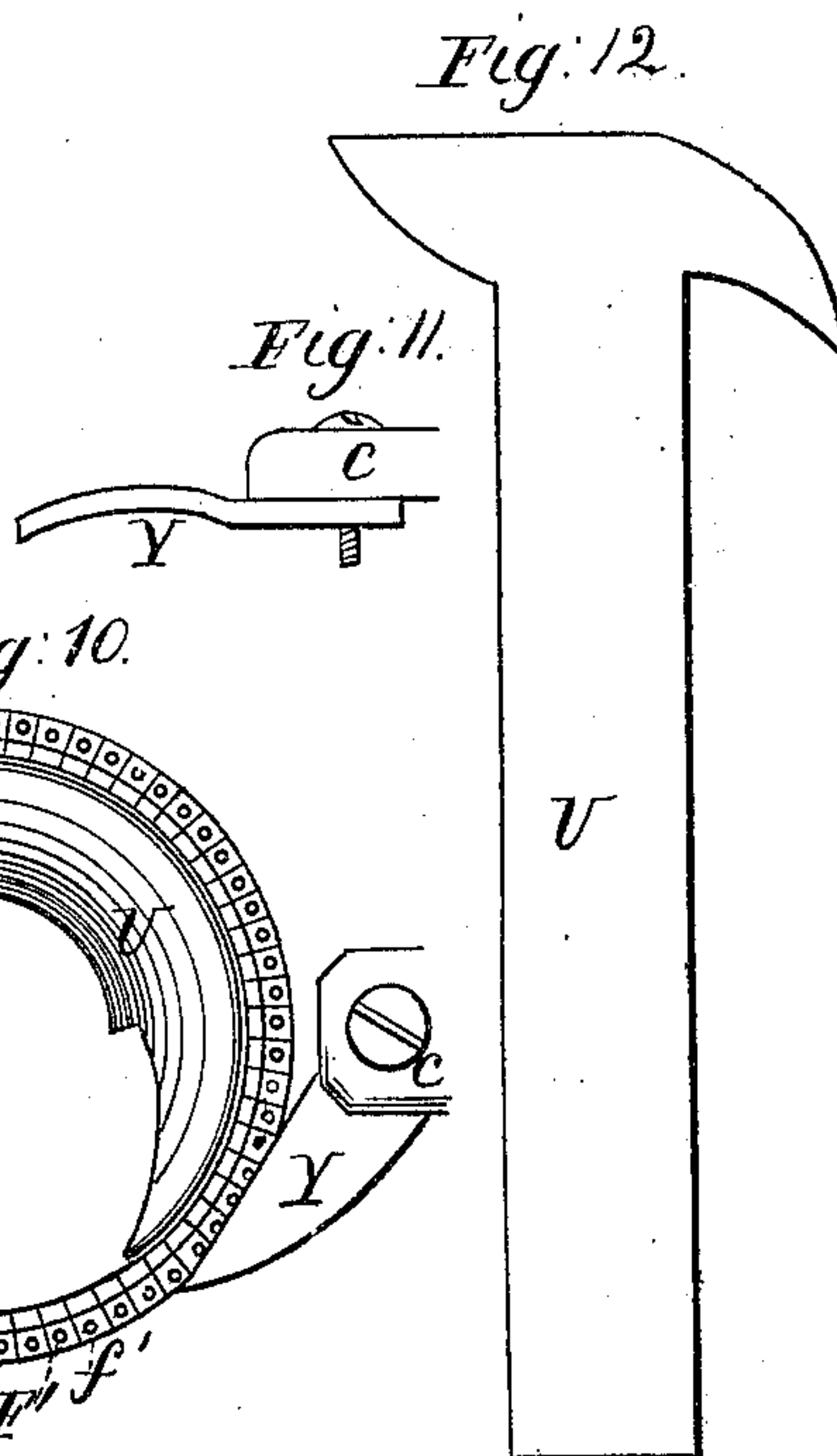
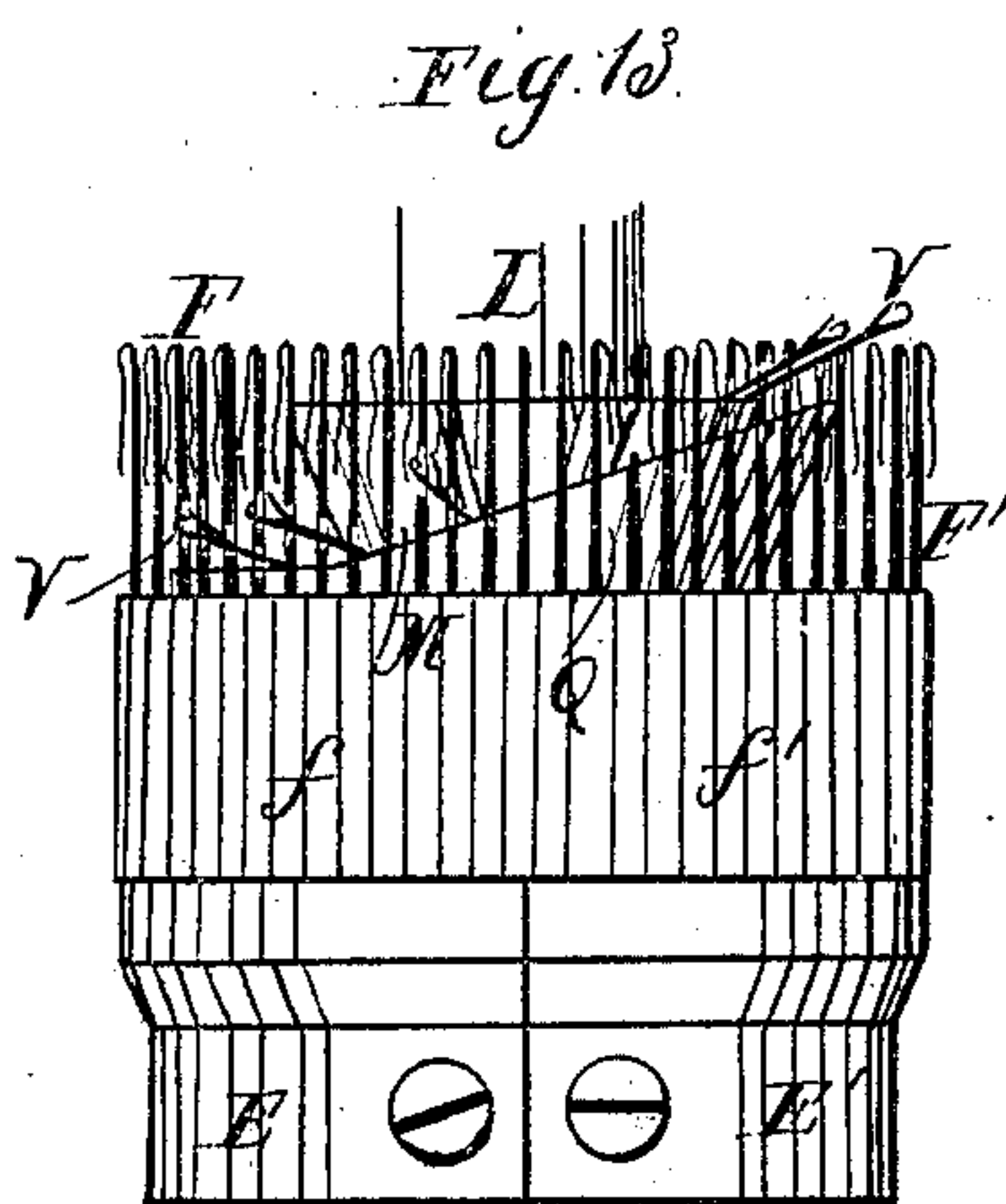
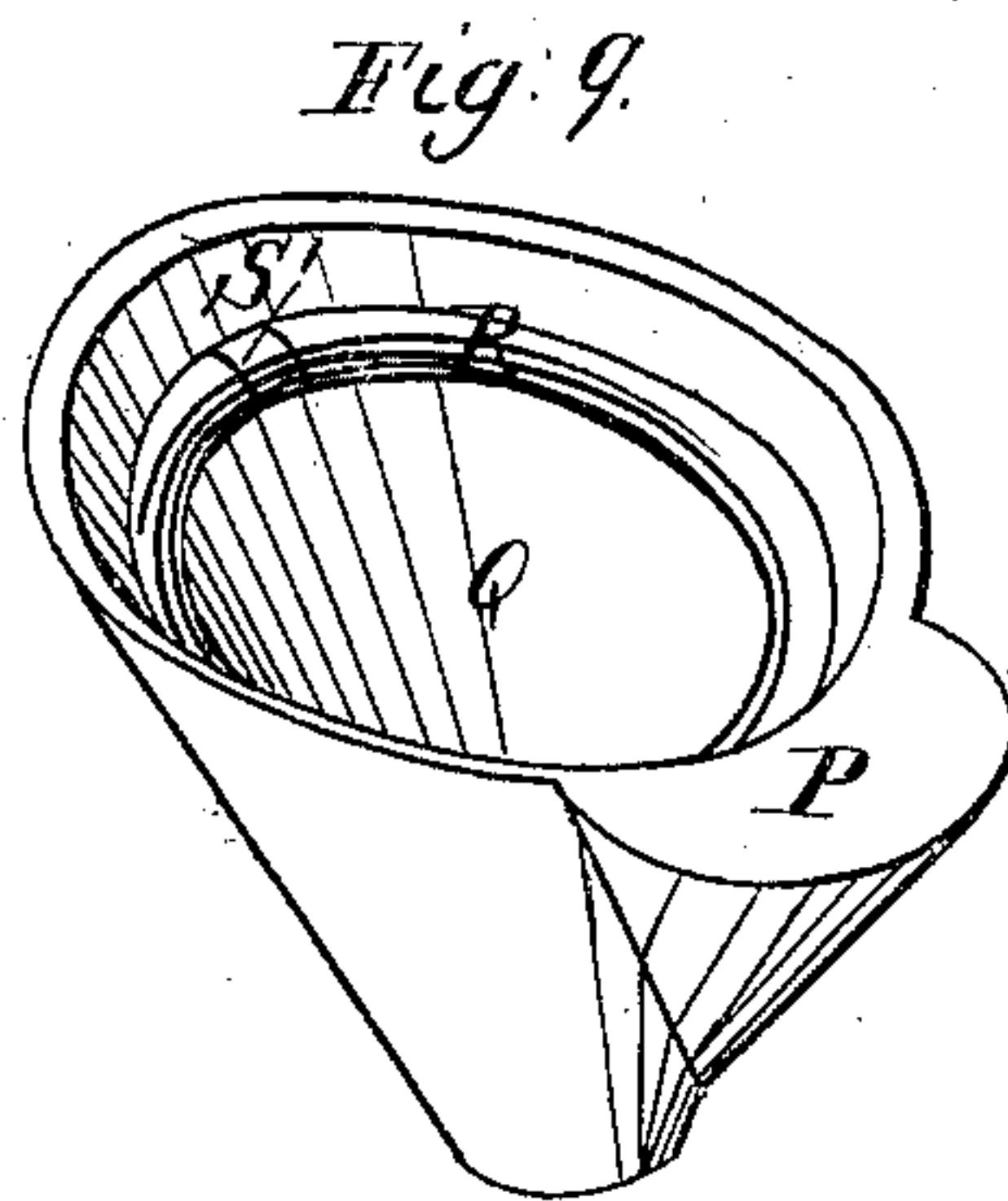
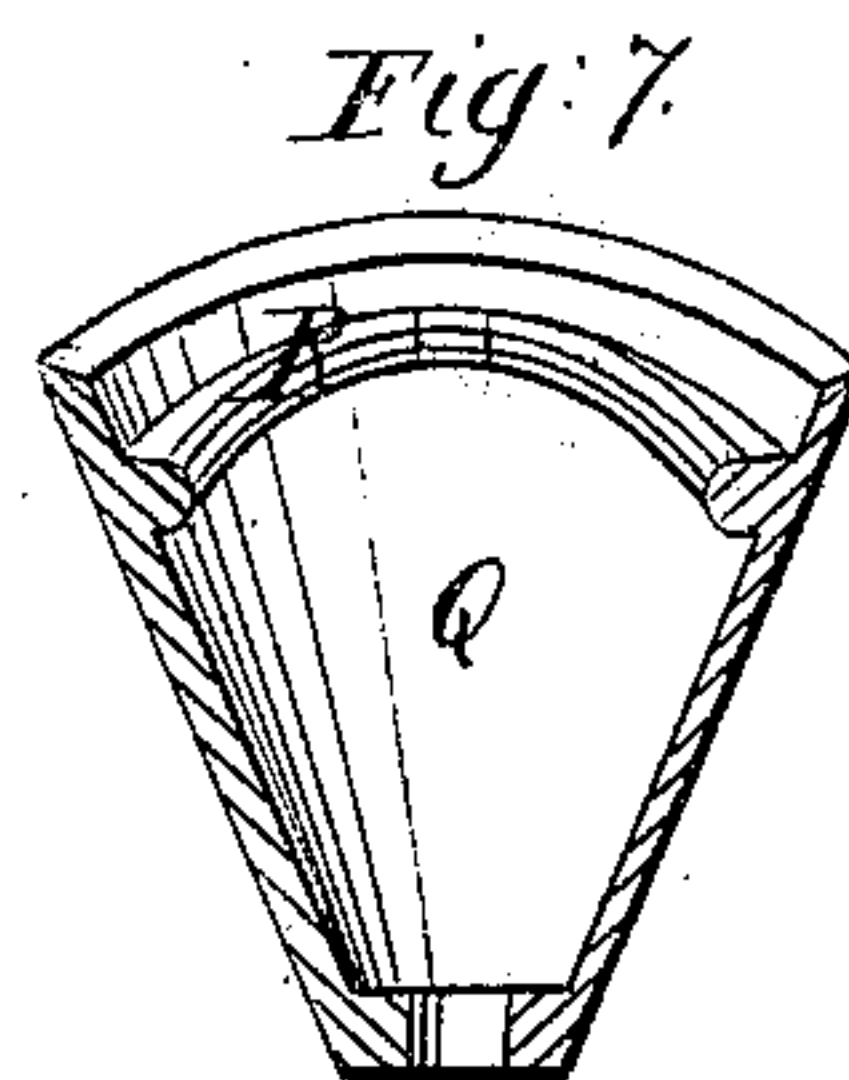
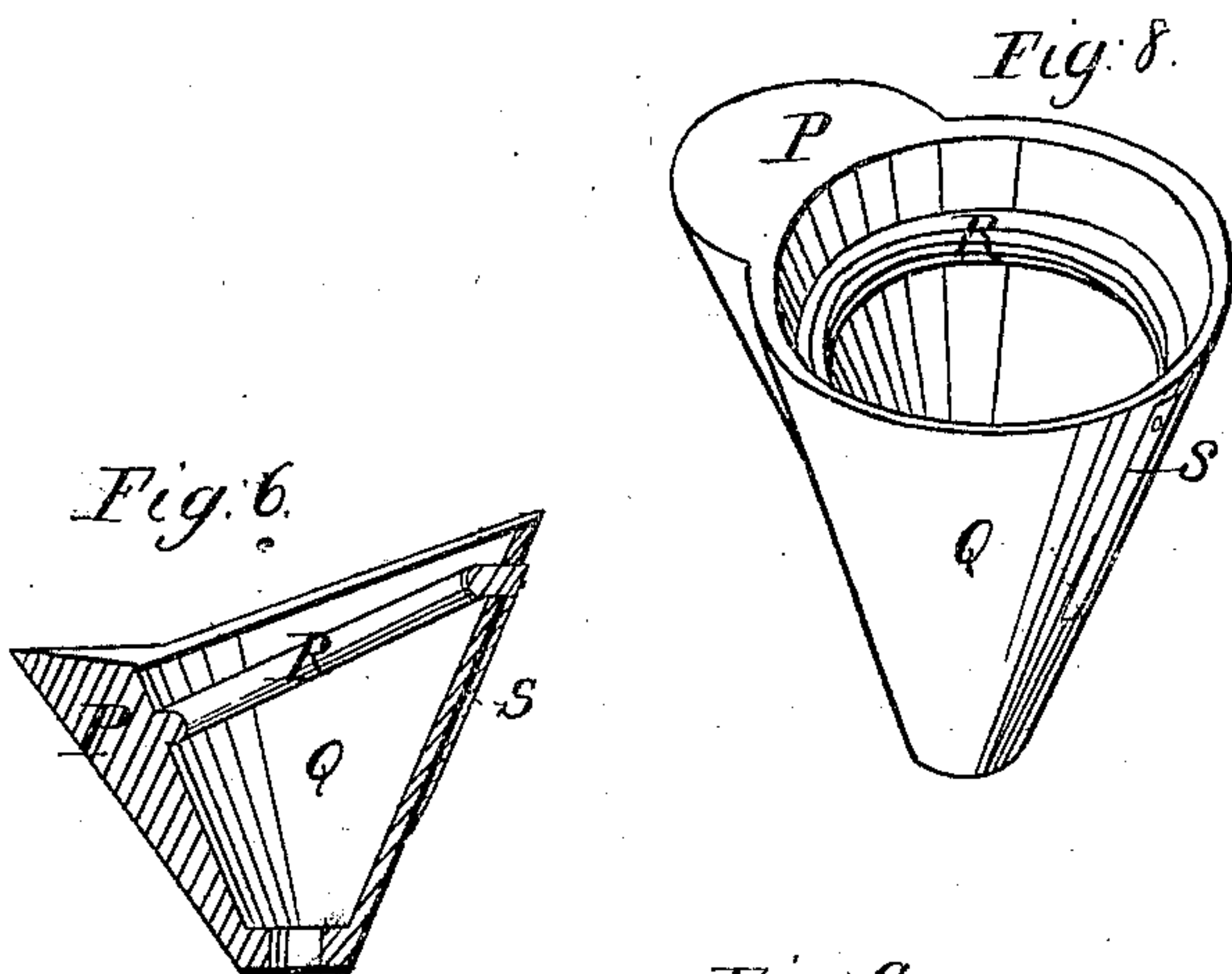
Patented Oct. 4, 1859



W. Binkley
Knitting Mach.

Nº 25,698.

Patented Oct. 4, 1859.



Witnesses;

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UNITED STATES PATENT OFFICE.

WILLIAM BINKLEY, OF MANCHESTER, NEW HAMPSHIRE, ASSIGNOR TO
SAMUEL N. BELL, OF SAME PLACE.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. 25,698, dated October 4, 1859.

To all whom it may concern:

Be it known that I, WILLIAM BINKLEY, of the city of Manchester, in the county of Hillsborough and State of New Hampshire, have invented certain new and useful Improvements in Rotary Knitting-Machines for Knitting Ribbed Fabrics; and I do hereby declare that the following is a full and exact description of the construction and operation thereof, reference being had to the accompanying drawings, and to the letters marked thereon, making part of this specification.

Figure 1 is a perspective view of a rotary knitting-machine and the improvements thereto for making ribbed fabrics. Fig. 2 is a longitudinal section showing the grooved cone in which the rib-needles move, the elliptical section of a hollow cone concentric to the cone in which the rib-needles move, the gearing and hollow shaft by which the grooved needle-cone is revolved and the shaft by which the stationary concentric hollow cone is supported, and the elliptical cam by which the rib-needles are operated. Fig. 3 is a longitudinal elevation of the grooved cone and hollow shafts by which the cone is supported and revolved. Fig. 4 is a transverse section of the same cone and shaft. Fig. 5 is a transverse section of the hollow concentric cone. Fig. 6 is a longitudinal section of the concentric or outside cone in a plane represented by the line A B in Fig. 5, and also showing the projection or slide for tightening the stitches. Fig. 7 is a longitudinal section of the concentric or outside cone in a plane represented by the line C D in Fig. 5, in both Figs. 6 and 7 showing the position of the cam which operates the rib-needles on its inner surface. Figs. 8 and 9 are perspective views of the concentric cone and showing the elliptical form in which the upper end of the cone is made and the corresponding elliptical form of the cam on its inner surface, and also the slide or projection on its lower side for tightening the rib-stitches. Fig. 10 is a transverse section showing the position of the upright needles and the slide connected therewith, over which the work passes, and also the presser for holding down the barbs of the needles. Fig. 11 is a side view of the presser. Fig. 12 is an

elevation of the slide. Fig. 13 is a longitudinal elevation of the needle-holder, showing the relative positions of the two sets of needles, portions of the upright needles being cut away to show the position and operation of the two cones and of the inner or rib needles by means of the grooved cone and elliptical cam on the inside of the stationary concentric cone. Fig. 14 is a longitudinal elevation of the standard which supports the sinker-wheel and the devices by which it is moved forward or back and retained firmly in any position desired.

The same letters refer to like parts of the machine in all the drawings.

A is the frame or base of the machine, upon the cylindrical part of which A' is placed the needle-holder B.

B is a cylindrical needle-holder revolving within the cylindrical part of the frame A' and extending within it nearly to the bottom of the frame A, and supported on the top of the cylinder A'. On the outside or periphery of B is the bevel-gear C.

C is a bevel-gear on the periphery of the needle-holder B, attached to and forming part of B, the upper or bevel teeth of which mesh into the bevel-wheel C', which is attached to the extremity of the driving-shaft D.

D is the driving-shaft, to which power is applied, and is supported in bearings in the standard 1, and having on its extremity the bevel-wheel C', which communicates motion to the bevel-gear C, and thereby to the needle-holder B.

E E' are clamps fastened to the needle-holder B by set-screws, and which bear firmly on the leads or metal sockets *f f'*, in which the needles F F' are placed, thereby holding the needles firmly in their places.

F F' are the series of upright needles set in leads or metal sockets *f f'*, as in the ordinary plain rotary knitting-machines, and are firmly bound to the needle-holder B by the clamps E E'.

G is a gear on the shaft H, and meshing into the bevel-gear C and receiving motion therefrom.

H is a shaft turning in bearings in the arms *a* and *a'* and in the base or foot of the standard 3. This shaft has near its lower end the

gear G, and near the other end and between the bearings of the shaft in the arms *a* and *a'* the gear I, which meshes into the gear K on the hollow shaft L, to which is attached the cone M, both of said gears G and I being fastened by set-screws or their equivalents and turning with the shaft H.

I is a gear near the upper end of the shaft H and between the bearings of the shaft H in the arms *a* and *a'*, turning with the shaft H and communicating motion to the gear K.

K is a gear on the hollow shaft L of the cone M, and receives its motion from the gear I, and thereby causes the cone M to revolve.

L is a hollow shaft fitting loosely over the shaft O, which shaft O supports the stationary concentric cone Q, which cone Q has on its inner surface the elliptical cam R, and the cam R, fitting in the notches of the leads or metal sockets of the rib-needles V, moves them in the grooves of the cone M. On said hollow shaft L is the gear K, which is fastened to the shaft and receives motion from the gear I. The shaft or sleeve L turns in bearings in the arms *a* and *a'*, and is supported on the arm *a'* by the collar N, which forms the bearing on which the shaft revolves. To the shaft or sleeve L is attached the grooved cone M.

M is a cone provided on its outer surface with longitudinal grooves, in which the rib-needles V move, the number of ribs being regulated by the number of grooves.

N is a collar on the shaft L, which rests on the arm *a'* and forms the bearing or support on which the cone M and shaft L revolve. The collar N may be adjusted by a set-screw to any position required.

O is a fixed shaft supported by means of a nut and screw on its upper end to the arm *a* and which supports at its other end the stationary hollow concentric cone Q at such distance from the cone M as to allow the rib-needles V to move freely in the grooves of the cone M when they are revolving with the cone M and with the notches of the leads or metal sockets of the rib-needles bearing on the cam R.

P is a projection on the side of the cone Q, on the lower or shorter side, of sufficient size to extend a little beyond the point to which the rib-needles, when at their lowest position, extend for the purpose of drawing the loops off from the rib-needles to form the rib-stitch and also to draw the rib-stitches to the required degree of tightness, and is made of such a width and height above the lower part of the elliptical top of the cone as may be necessary to draw the stitches properly, varying with the size of the machine and the kind of material used. It may be either solid, as in the model, or fastened by screws, as convenient.

Q is a hollow cone on the end of the shaft O and is concentric with the cone M, and is at its upper and larger end cutoff diagonally to its longitudinal axis, giving the top of the

cone an elliptical form, the amount so cut off on one side being equal to the difference of the elevation and depression desired to be given to the rib-needles in their motion in the grooves in the cone M. The cone Q has on its inner surface an elliptical cam R, placed parallel to the plane of the top of the fixed cone Q and which fits into the notches in the leads of the rib-needles V, and when the needles are revolved by the cone M the cam R gives to them at the same time an upward and outward motion during one half of their revolution and during the other half an inward and downward motion.

S is a spring on the outside of the cone Q, as shown in Figs. 6 and 8 of the drawings, to which a portion of the cam R is attached, so that when the spring is pressed back that portion of the cam R attached to the spring also moves back through an opening *s'*, as shown in Figs. 5 and 9 of the drawings, in the cone Q and leaves a space when the cam R is cut off, whereby the rib-needles may be inserted in the grooves of the cone M without removing the other parts, and on releasing the spring the cam is again whole and offers no obstruction to the operation of the rib-needles.

T is a sinker-wheel or looping-wheel of the ordinary form supported on a shaft *s*, attached to the end of the shaft *m*, which shaft *s* is capable of revolution thereon and is fixed in any desired position thereon by the set-screw *n*.

m is a rectangular shaft passing through the arm *i* of the standard 2, and having at one end the shaft *s* and at the other a screw-thread which passes through the arm *i'*. The shaft *m* is moved forward and back for the purpose of bringing the shaft *s* and the sinker-wheel T nearer or more remote from the needles F F' by means of the nut *r*, which turns freely on the thread on *m* and at the same time fills the space between the arms *i* and *i'*, thereby preventing the shaft *m* and sinker-wheel T from being moved from its place by accident or the jar of the machine. The shaft *m* is further secured against motion by the set-screw *x* on the top of *i*.

U is a slide placed inside the upright row of needles for the purpose of raising up the work and casting off the stitches, as in ordinary plain looms, and is fastened by screws to the frame A.

V are the needles for forming the ribs, and which move in the grooves of the cone M, and are operated by the action of the cam R in the notches of the leads or metal sockets of the needles, whereby an upward and outward motion is given them on one part of the revolution and an inward and downward motion on the other.

W is a yarn-guide attached to the side of the standard 2, having an eye near the end through which the yarn passes to the sinker-wheel T for the purpose of bringing the yarn to the wheel at the proper place to

catch in the hooks of the teeth of the wheel and to prevent its slipping off from the wheel if the yarn becomes too slack.

Z is a stop consisting of a standard supporting a lever through an eye in the end of which the yarn passes, the tension of the yarn keeping the lever up, and when it breaks or becomes too slack the long arm of the lever falls and brings the other into the teeth of the bevel-gear B and stops the machine.

The numbers 1, 2, and 3 are standards supporting various parts of the machine.

1 is a standard supporting the driving-shaft D, which turns in a bearing, as *d*, and also supporting the presser Y, which is attached by a screw to an arm *c* near the top of the standard.

Y is a presser attached to the arm *e* by a screw, the object of which is to close the barbs of the needles F F', so that the stitches formed on the needles may slide over the barb and be cast off by the slide U, and with the loop formed on the barb by the sinker-wheel forms a new stitch.

2 is a standard supporting the sinker-wheel T and the shafts *s* and *m*, as before described.

3 is a standard having two arms *a* and *a'*, extending over the needle-holder B. These arms make the bearings of the shafts H and L. The arm *a* supports the shaft O, which is firmly attached to it by a screw on the upper end of O, which passing through a hole in *a* the shoulder on O catches against the lower side of *a* and is secured by a nut on the top of the arm, the parts above named being made of any suitable material and operated by the devices set forth or their equivalents, substantially as described.

The operation of the machine is as follows: The power is applied to the driving-shaft D, and thereby to the wheel C', which communicates motion to the bevel-gear C on the needle-holder B and causes the needle-holder B, with its series of upright needles, to revolve on the cylindrical part A' of the frame A, within which the needle-holder B revolves, and the revolution of the needles F F', between which the teeth of the sinker-wheel T pass, causes the revolution of that wheel, the wheel T being placed at the proper distance to give the requisite length of stitch required, the wheel T making a continuous series of loops in the barbs of the needles F F', the operation of the wheel T being to pass the thread or yarn as it is held by the notch in the teeth of T under the barb of the needle, and the further revolution of T brings the loop formed under the barb of the needle up to the top of the needle. After one or more series of loops are formed on the needles F F' the weight or other take-up motion, or its equivalent, draws the loop down on the needles after passing the end of the slide U to the lead or socket in which the needle is placed. The loops then, as they are revolved with the needles, pass up on the slide U, the

barbs on the needles being held down by the presser Y until the loops have passed the barb, then passing along the slide U, so that at its highest part the work is raised up, so that the loops which were at the bottom of the needles are drawn up, and a stitch is formed by the loop at the bottom being cast off over the top of the needles and over the loop at the top, the loop thus formed being retained by the barb and allowed to slide to the bottom of the needles after passing the slide U, and as the same needles again pass the sinker-wheel new loops are formed, over which the loop or stitch already on the needle is cast off, thus forming a new stitch to be again cast off, and so on. This makes plain knit fabric, and the machine so far described is substantially the ordinary plain rotary knitting-machine, which is well known.

Upon the side of the frame A opposite to the driving power is placed the standard 3, securely fastened to the frame A and placed on its upper side. This standard has at and near its upper end two parallel arms *a* and *a'*, extending over the needle-holder B and through which the shaft H passes, and which, with another bearing in the foot of the standard, forms the bearing of the shaft H and in which it turns. The arm *a'* also supports the hollow shaft L, which is held up by the collar N, adjustable by set-screws to the position desired, and which rests on the upper side of the arm *a'* and forms its support. The shaft L also turns in bearings in *a* and *a'*. The shaft L is made larger when it passes through *a'* to give greater steadiness of motion. The end of the shaft L goes into the upper arm *a* sufficiently far to give it a firm bearing, but not entirely through it, thereby acting as a stop and preventing the shaft and cone attached thereto from rising out of its position. The arm *a* also supports the shaft O, turning loosely in the hollow shaft L, and to the shaft O is attached the fixed elliptical concentric cone Q. By means of a nut or screw on the end of O the shaft O is made smaller at either end and has a screw-thread cut thereon, and fits closely in the hole in the arm and in the bottom of Q, respectively. It forms a shoulder or stop, and the nut being screwed thereon holds the shaft firmly to *a* and the cone Q firmly to O. On the shaft H are the gears G and I, fastened to it by set-screws, deriving their motion from C. The gear I also communicates motion to the gear K, and thereby to the shaft L and cone M.

The gears B and G and gears I and K are cut with different numbers of teeth, but proportioned to one another, so that the gears B and K revolve through equal space in equal time, the gears I and K having finer teeth than the others to insure steadiness of motion. The motion communicated by the gears causes the cone M, in which the rib-needles traverse, to move correspondent to and concentric with the needle-holder B, so that the rib-needles rise and fall always in the same spaces between the upright needles F F'. The ellipti-

cal hollow cone Q has on its inner surface the elliptical cam R, which fits into the notch made in the leads or metal sockets of the rib-needles. The cone M has these rib-needles placed in the grooves, and they fitting over the cam R. The cone Q being stationary, the revolution of the cone M carries with it the needles, which are elevated and depressed, and at the same time moved inward and outward by the cam as the revolution of M brings each needle to the higher or lower part of the cam. The operation of the two cones is such that by the revolution of M around and within Q the rib-needles are alternately raised and depressed, and at the same time moved outward and inward as they follow the direction given them by the cam R. The rib-needles are also cast in leads and are bent at an angle so as to make them, when moved out and in, draw the stitches transversely to the position of of the upright needles. The cone Q is set and held in such a position that the highest part of the cone and of the cam R shall be next to and correspond with the highest part of the slide U. The rib-needles, as they pass the striker-wheel and rise by the action of the cam R, are projected outward above the presser Y and between the stitch already formed on the upright needles and the last loop formed by the sinker-wheel. As they arrive at their highest point of elevation, when the plain stitch is cast off over the top of the needles, the loop between the upright needles is drawn down to the rib-needles, which at this point project beyond the upright series of needles, and the loop is retained on the rib-needle by the hook of the needle at its point. As the rib-needles pass the projection or slide P the loop of yarn caught in the hook of the rib-needle is drawn tight by being drawn over the edge of P, the rib-needles not extending to the edge of P, and as the rib-needles are raised upward and outward by the cam the tightened loop on the needles slips back over the latch or over the barb of the rib-needle, and as it again reaches the point of highest elevation a second loop is drawn down onto the rib-needle, when the stitches are cast off from the upright needles by the slide U, so that the rib-needles have then one loop of yarn on each side of the latch

or barb. Then as the needles revolve the projection P again draws the loop in the hook of the needle tight and at the same time draws the loop which was back of the latch or barb forward, and it is cast off over the point of the hook and over the loop retained therein, making with the loop retained by the hook of the needle the rib-stitch. This process is repeated with each revolution of the needles.

The sinker-wheel T is set on a shaft *s* at right angles to the shaft *m*, and *s* is capable of motion around the shaft *m* and is fastened in any desired position by the set-screw *n*. The shaft *m* passes through the arms *i* and *i'* of the standard 2, and is made square or of other angular form when it passes through the arm *i* to give it greater firmness, and has a screw-thread cut on the end, passing through *i'*, on which thread the nut *r*, which fills the whole space between *i* and *i'*, turns. The nut being turned in either direction moves the shaft *m* and the wheel T in one direction or the other, and the shaft *m* is held in its position by the nut *r*, so that it cannot be moved by accident or the jar of the machine. The shaft *m* is also further secured by the set-screw *x* on the top of the arm *i*. The rib-needles are removed and replaced at pleasure by means of the spring S, which, with S', on being drawn back, leaves an opening in the cam R wherein the needles may be inserted or removed, the grooves being successively turned opposite to the opening at S'. The releasing the spring closes the opening and the cam is perfect.

What I claim as my invention, and desire to secure by Letters Patent, is—

The hollow cone Q, cut off elliptically and with the parallel elliptical cam K on its inner surface, together with the projection P on the lower side, supported by the shaft O, passing through the hollow shaft L and attached to the arm *a* of the standard 3 or their equivalents, substantially as described, for the purposes set forth.

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Witnesses:

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