

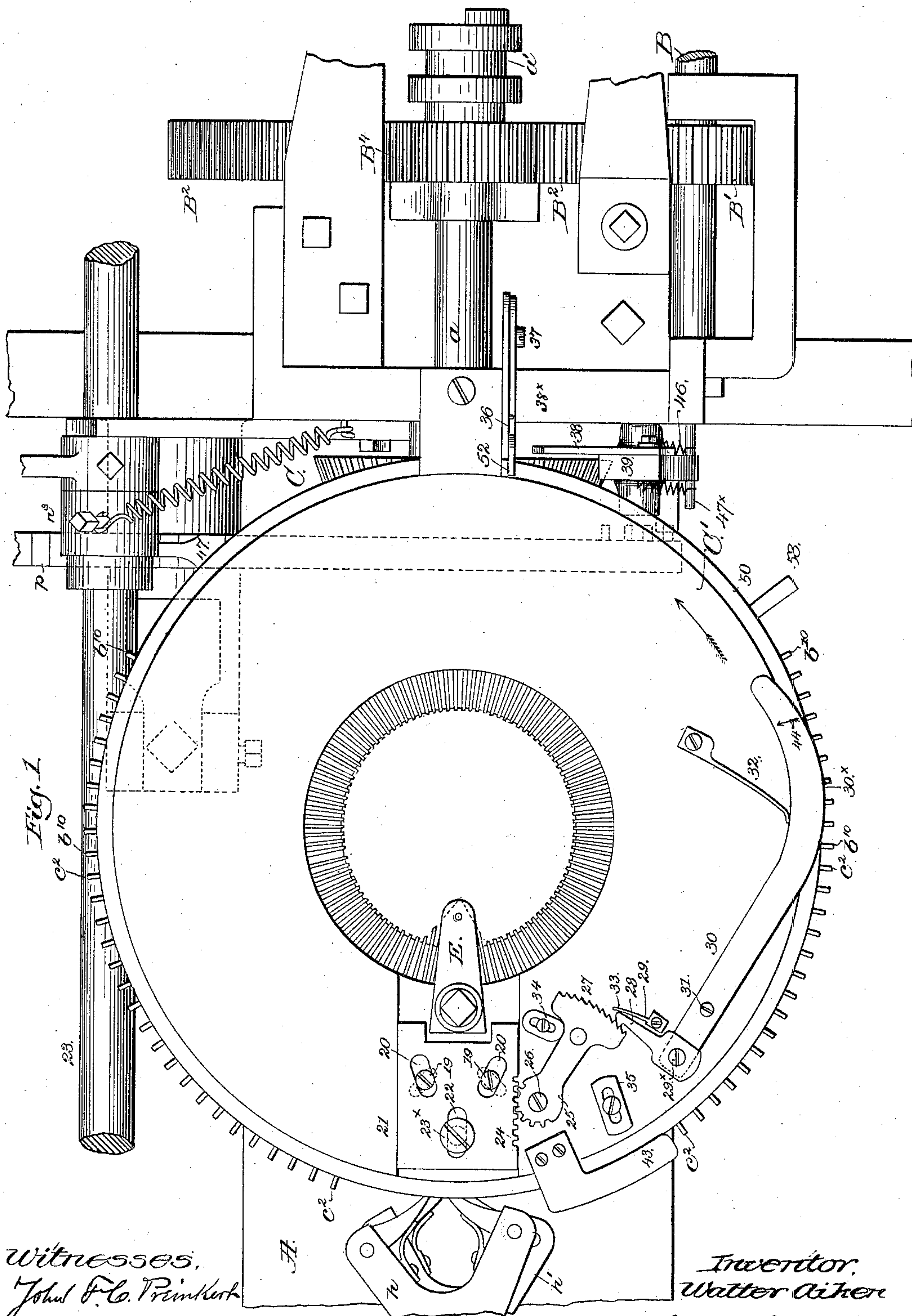
(No Model.)

3 Sheets—Sheet 1.

W. AIKEN.
KNITTING MACHINE.

No. 324,796.

Patented Aug. 25, 1885.



Witnesses,
John F. C. Prentiss
Henry Marsh

Inventor,
Walter Aiken
by Crosby & Gregory
attys.

(No Model.)

3 Sheets—Sheet 2.

W. AIKEN.
KNITTING MACHINE.

No. 324,796.

Patented Aug. 25, 1885.

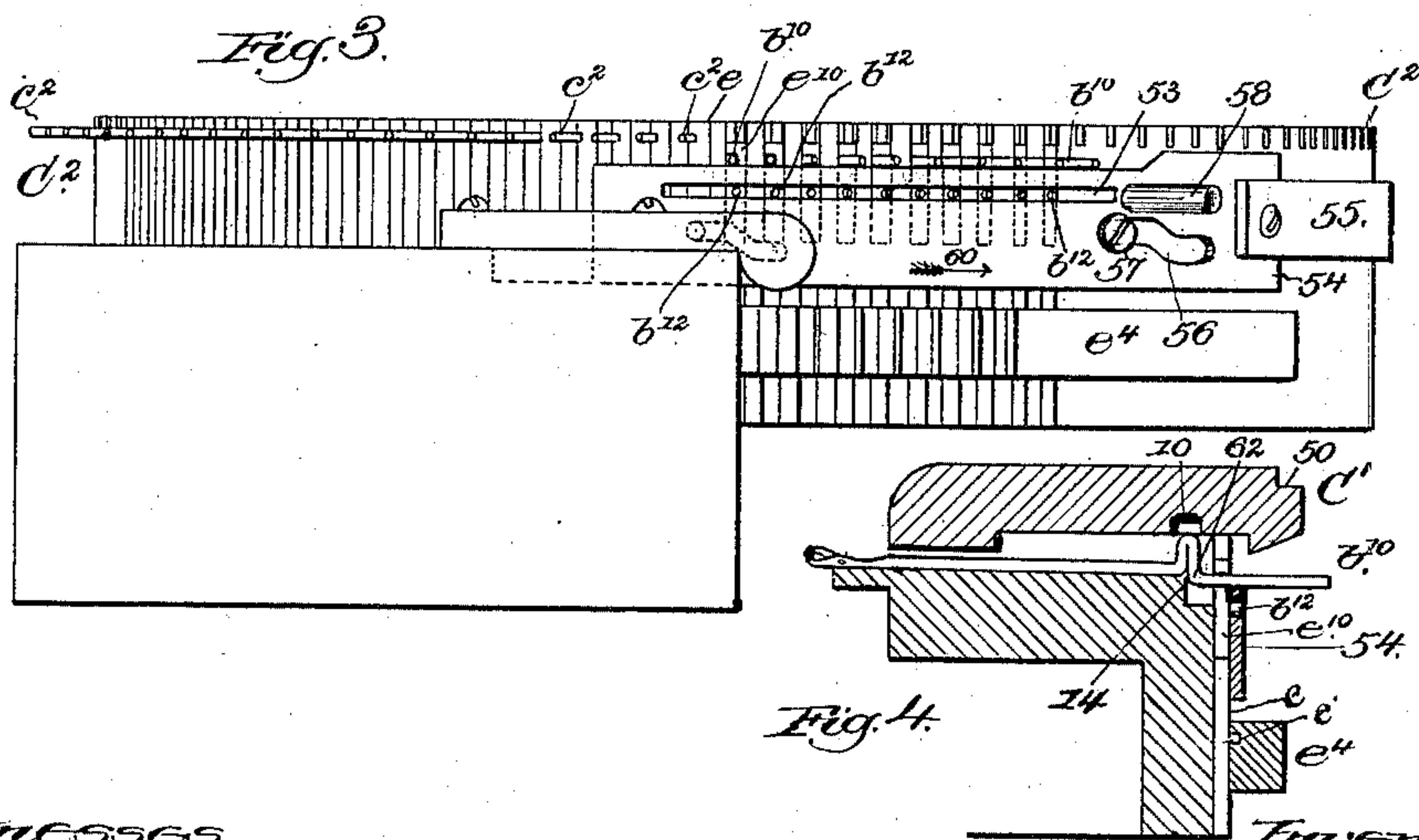
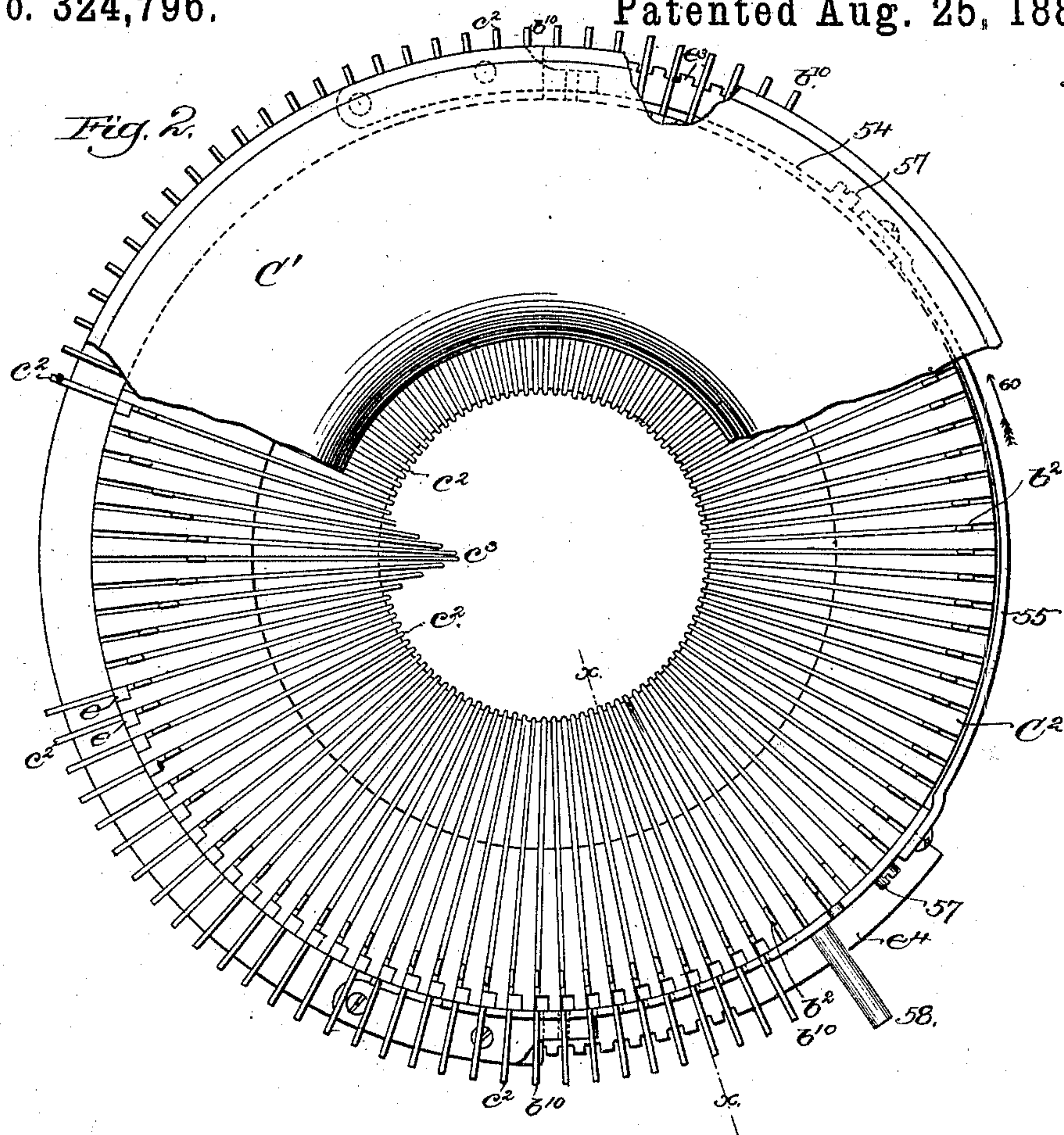
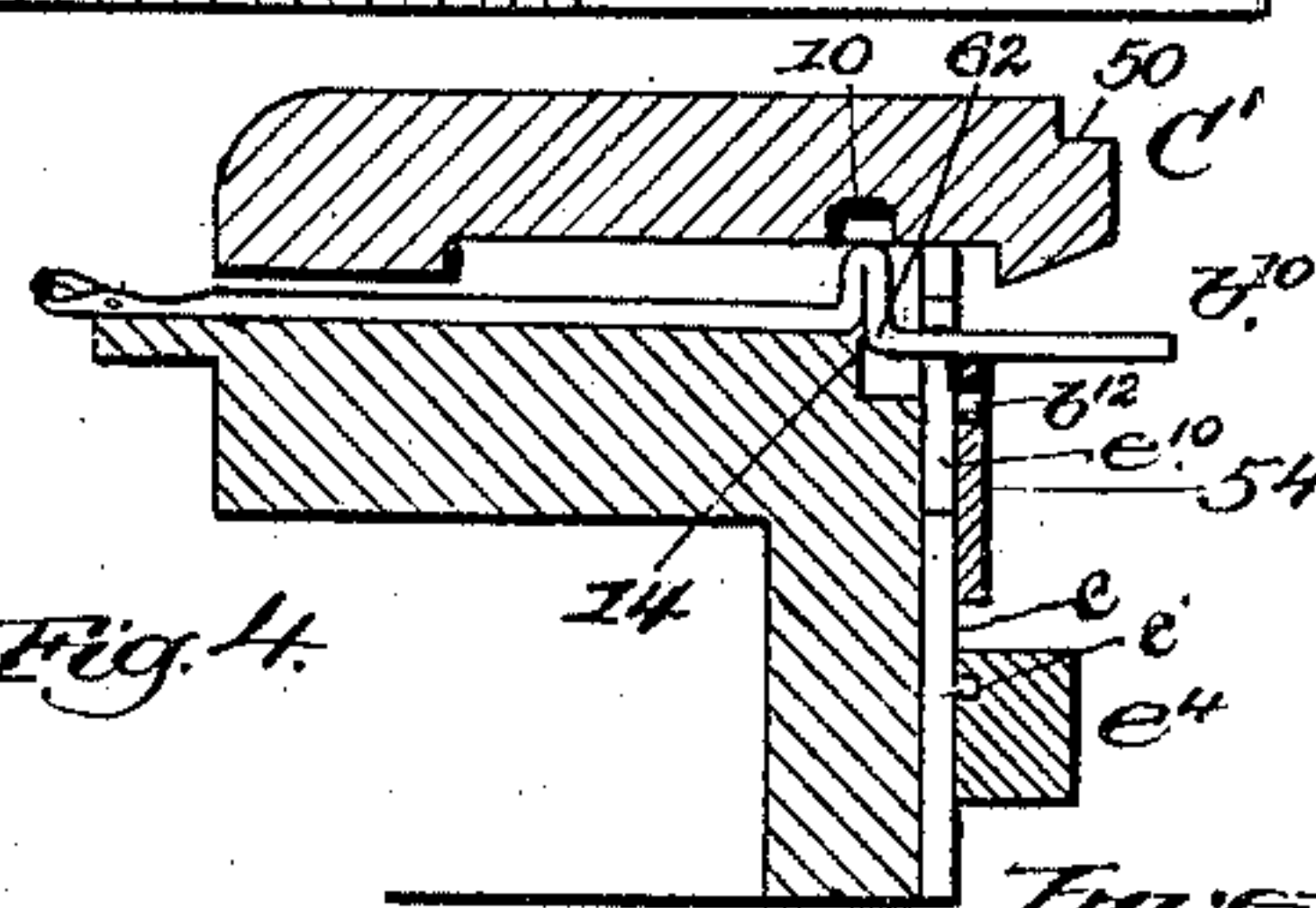


Fig. 4.



Witnesses,
John F. C. Printkert
Henry Marsh.

Inventor,
Walter Aiken.
by Crosby & Gregory attys

(No Model.)

3 Sheets—Sheet 3.

W. AIKEN.
KNITTING MACHINE.

No. 324,796.

Patented Aug. 25, 1885.

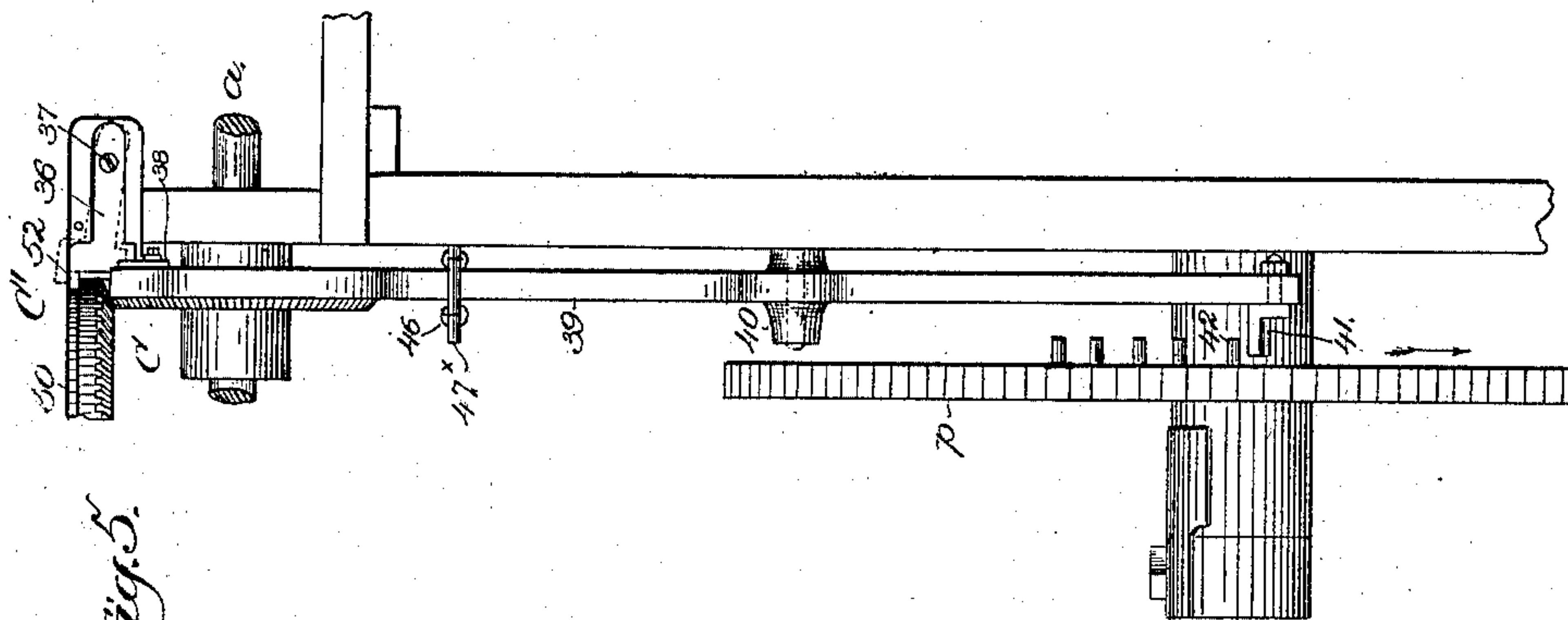


Fig. 5.

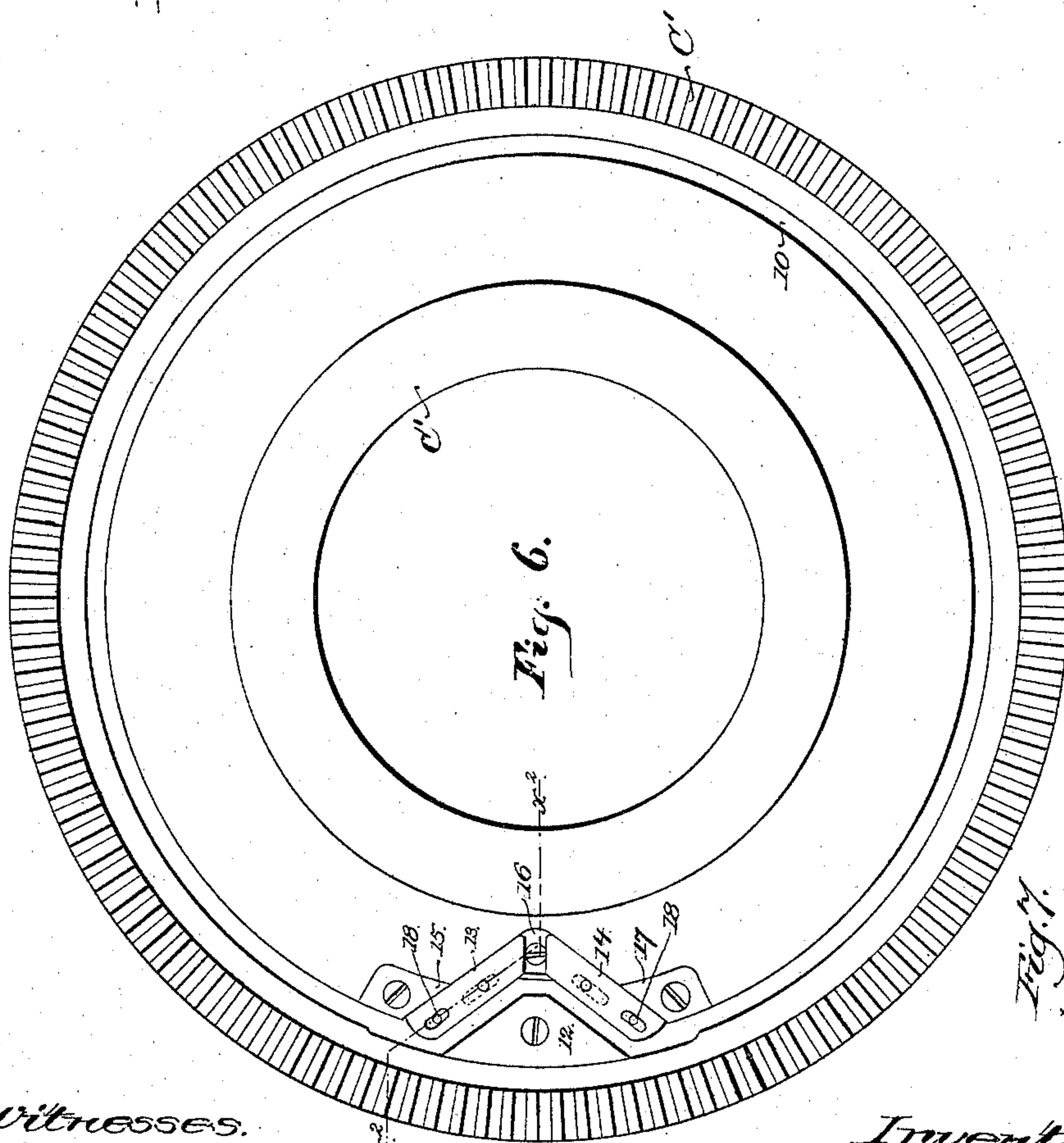
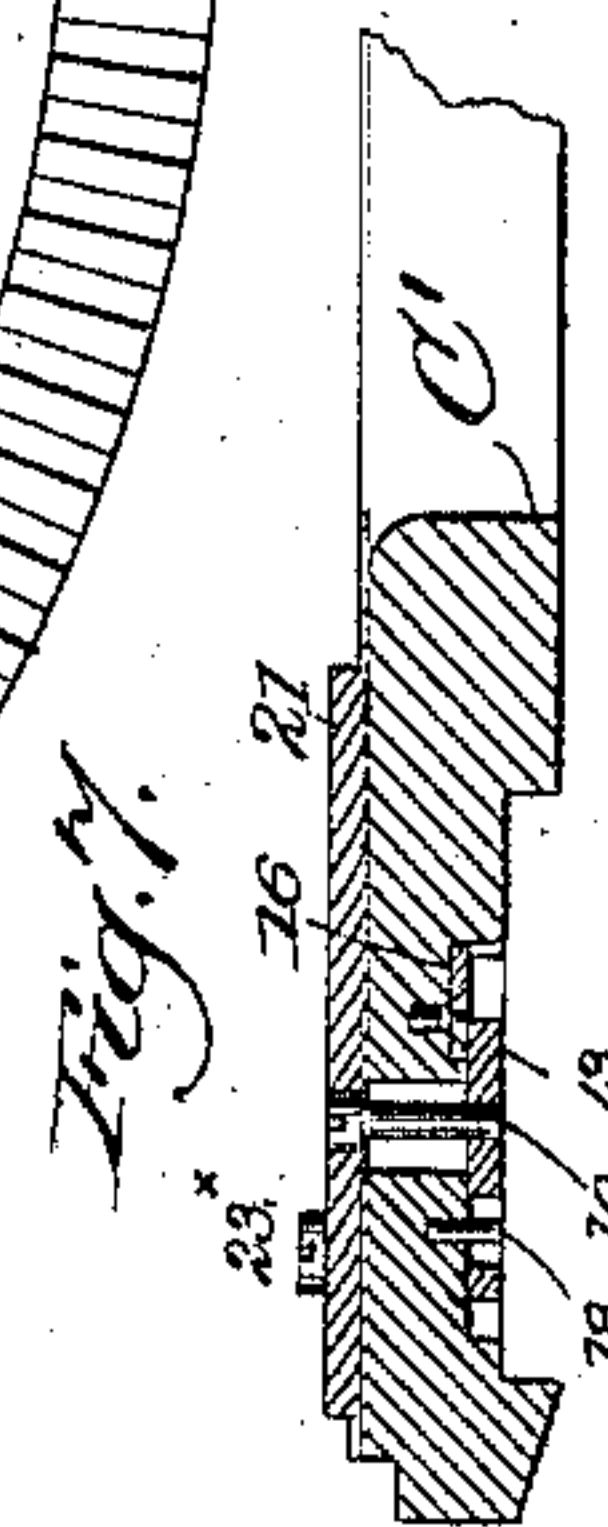


Fig. 6.



1027

Witnesses.
John F. C. Prentiss
Henry Marsh.

Inventor:
Walter Clien
By Crosby & Gregory attys

UNITED STATES PATENT OFFICE.

WALTER AIKEN, OF FRANKLIN FALLS, NEW HAMPSHIRE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 324,796, dated August 25, 1885.

Application filed December 26, 1883. (No model.)

To all whom it may concern:

Be it known that I, WALTER AIKEN, of Franklin Falls, county of Merrimac, State of New Hampshire, have invented an Improvement in Knitting-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

10 In another machine, represented in United States application No. 105,911, I have shown a cam-plate provided with two cam-grooves and two independent cams to operate a series of needles of two different lengths from their hooks to their butts, some of the said needles being operated by one and some by the other of the said cams. In this my present invention all the needles are of the same length from their hooks to their butts; but some of the said needles, especially those which receive thread when narrowing and widening, and as many needles at each side of them as are traversed over by the knitting-cam when narrowing and widening, have tail-pieces to enter needle-shifters, and also have shouldered butts, as in my said application. Herein the cam-plate, adapted at times to be rotated and at other times to be reciprocated, as in the machine described in the said application, has but one cam-groove and one knitting-cam. The tails of those needles at the sides of the series of needles used in knitting heels or toes or when narrowing or widening are all lowered at once by means of an auxiliary cam-slide operated by hand, it acting to draw the butts of such needles from the cam-groove, so that the cam-plate cannot reciprocate them, and thereafter as the cam-plate is reciprocated one needle at a time of the series of needles used when heel and toe work is to be done is lowered by the needle-shifters actuated by toothed segmental slides, as in my said application. The stocking is commenced at the top of the leg, and at such time the knitting-cam will be held back, as in the drawings, far enough to give the longest loop for that stocking; but as the cam-plate is rotated the curved end of the stitch-changing lever carried by the cam-plate is at times struck by a finger or tappet under the control, preferably, of a pattern wheel or surface, so that the said stitch-changing lever is made effective in moving

the knitting-cam to shorten the loops, thus gradually decreasing the diameter of the tubular leg of the stocking and partially fashioning the same.

The specific features constituting the invention herein to be protected are set forth in the claims at the end of this specification.

Figure 1 represents a sufficient portion of a knitting-machine in top view (in connection with the machine described in my application No. 105,911, filed September 8, 1883) to enable one conversant with knitting-machines to understand my present invention; Fig. 2, a detail in top view showing part of the cam-plate, the needle-bed, needles therein, needle-shifters, auxiliary cam slide to simultaneously withdraw the butts of several needles from the groove of the cam-plate, and one of the segmental cam-slides for moving the needle-shifters which hold the tails of those needles which in narrowing and widening are used to knit; Fig. 3, a side elevation of Fig. 2, the cam-plate being, however, omitted; Fig. 4, a section on the line $x x$, Fig. 2, including the cam-plate; Fig. 5, a detail, but on a smaller scale, showing part of the cam-plate, shaft and gear to move it, part of the frame-work, pattern wheel or surface, lever moved by it, and the finger or tappet actuated by the said lever to determine automatically when the length of loop shall be changed to alter the diameter of the tubular web being knitted. Fig. 6 is an under side view of the cam-plate to show its single groove and the adjustable knitting-cam, and Fig. 7 a section of Fig. 6 on the dotted line $x^2 x^2$.

The shaft B, pinion B', toothed wheel B², shaft a, loose pinion B⁴ thereon, clutch part a', bevel-gear C, cam-plate C', thread-guide E, needle-bed C², having shoulder 1-1, needle-shifters e, segmental toothed slides e³ e⁴, pawls h h' to move them, needles c² c³, pattern wheel or surface p, rock-shaft 23, arm n³, and pawl 47, to move the said pattern wheel or surface intermittingly, are all substantially as in the application referred to, where they are designated by like letters, and in this present invention the parts hereinbefore mentioned will be actuated as described in the said application, and the said cam-plate C' and segmental slides for moving the needle-shifters will be actuated as therein described for the produc-

tion of the leg, heel, foot, and toe part of a stocking.

The cam-plate C' herein described, instead of having two cam-grooves, as in the said application, has a single cam-groove, 10, having a co-operating throwing-out cam, 12, and a drawing-in or knitting cam composed of two sliding blocks, 13 14, let into spaces formed at the under side of the said cam-plate, where their edges act against guide-blocks 15 16 17. Each slide 13 14 has a slot to receive a pin, 18, (see Fig. 7,) attached to the cam-plate near the blocks 15 17. Headed screws 19, one for each slide, are passed down through a diagonal slot made in the cam-plate and are screwed into the said slides, the heads of the said screws having a diameter exceeding the width of the said slots and resting upon the cam-plate, preventing the said slides from dropping, yet permitting them to be moved longitudinally, the shanks of the said screws then moving in the diagonal slots in the cam-plate. One of these slots is clearly shown in Fig. 7, but in Figs. 1 and 6 said slots are shown only in dotted lines. The heads of the screws 19, projected above the cam-plate, enter diagonal slots 20 20 in the cam-adjusting block 21, having a slot, 22, which receives through it the shank of a screw, 23^x, which is screwed into the cam-plate C'. The cam-adjusting block 21 has teeth 24 at one edge, (see Fig. 1,) which are engaged by the toothed circular end of a lever, 25, pivoted at 26, and having at its outer end, as herein shown, a segmental rack, 27, which is acted upon by a pawl, 28, attached to a lever, 30, called "the stitch-changing-lever" pivoted at 31, and having a cam shaped or curved edge, 30^x. The pawl 28 is acted upon by a spring, 29, which normally keeps the former, pivoted at 29^x on the lever 30, in contact with the teeth 27 of the toothed lever 25, and moves the latter and the slide 21 and the slides 13 14 to alter their position on the cam-plate, and consequently the length of the loops formed by the needles drawn back or in by the said slides, the said loops varying from course to course according as it may be desired to make the tubular web for the stocking of greater or less diameter, thus adapting it to fit the leg substantially as does a stocking which is fashioned as usual by narrowing. The lever 30 is normally kept pressed outward beyond the periphery of the cam-plate C' by the spring 32, so that the said lever may be struck and turned in the direction of the arrow 44 thereon to actuate the lever 25 and effect the movement of the slides 13 14, to shorten the loops drawn by the needles, whenever the said lever 30 comes in contact with the finger 36, pivoted at 37 on a fixed part of the frame and under the control of the pins 42 of the pattern wheel or surface *p*. The pins 42 are placed at a greater or less distance apart and in such number and with such regard to the speed of the wheel *p* as to effect the lifting of the finger 36 into the range of the lever 30 carried by the cam-plate, after any

desired number of rotations thereof. In practice the finger 36 is lifted to strike and turn the lever and cause the pawl 28 to move the lever 25 the distance of one tooth and shorten the stitch at about every five rotations of the cam-plate, or at each fifth or other desired knitted course. The number of teeth in the segmental part 27 will be more or less, according to the number of variations to be made on the length of the loops. The pins 42 strike against the foot 41, forming part of the lever 39, pivoted at 40, and moves the said lever in the direction to cause its attached arm or projection 38, beveled at its forward end, as at 38^x, to be moved forward under the finger 36, thus lifting the latter, as in dotted lines, Fig. 5, in which position the said finger acts to turn the lever 30 as the cam-plate in its rotation brings the said lever against the said finger. The lever 39, after it has been moved forward by a pin, 42, is moved backward by a spring, 46, bent about the said lever, both ends of the said spring being fastened to a pin, 47^x, attached to the frame-work of the machine. The finger 36 bears against the frame-work with sufficient friction to remain in its elevated position until positively depressed, which happens immediately after the lever 30 is moved by the finger through the intervention of a presser, 43, (see Fig. 1,) attached to the cam-plate, and the said finger will remain down until again lifted by the projection 38 and lever 39. The cam-plate C', near its edge, is cut away, as shown at 50, to form a rest for the end 52 of the finger 36. The series of needles *c*³, in number equal, substantially, to the number of stitches in the narrowest course to be knitted for heel and toe work, have at each side of them a series of needles, *c*², the tails of which are held in needle-shifters *e*, and the said needle-shifters, provided with projections *e*¹, extended into toothed segmental slides *e*³ *e*⁴, as in my said application, will be lowered, as therein described, to remove the butts of the needles *c*² from the cam-groove 10 and the range of the knitting-cam and to lock the projecting shoulders 62 of the needle-butts on the shoulder 14 of the needle-bed when narrowing is being done, and will be raised, as therein described, to again place the butts of the needles in position to be acted upon by the knitting-cam for widening.

In this my present invention, instead of using needles of two lengths from their hooks to their butts and using two grooves, as in the application referred to, a series of needles (marked *b*¹⁰) located at the outer sides of the series of needles *c*² and equal in number to the number of needles passed over by the knitting-cam, which latter has a uniform stroke beyond the butts of the outermost of the series of needles *c*², as the cam-plate is reciprocated for heel and toe work, have tails extended into grooves in an auxiliary series of needle-shifters (marked *e*¹⁰) but the projections *b*¹² of said shifters, located near the needle holding and guiding grooves, are extended into a

long slot, 53, in an auxiliary cam-slide, 54, having one or more cam-slots, 56, which receive through them suitable fixed pins, 57, such as shown in dotted and full lines, Fig. 3.

5 There are two slides, 54, at different parts of the needle-bed to operate the two series of auxiliary shifters e^{10} , which control the raising of the two series of needles marked b^{10} , and the said slides are attached together by a connecting plate or rod, 55, so that all the said needles b^{10} of both series (shown as ten in number) may be simultaneously lowered and raised by hand by engaging the handle 58, as will be understood from the drawings. Movements
15 of the cam-slides 54 in the direction of the arrow 60, Figs. 2 and 3, will lower all the needles b^{10} , so that their butts will be withdrawn from the groove 10 and from the range of the knitting-cam, causing the shoulder 62 of the
20 needles to engage with the shoulder 14, and hence the needles b^{10} will remain at rest and hold back their loops, and the needles b^2 (best shown in Fig. 2, and without tails beyond their butts) will rest with their butts in the concentric part of the groove 10, and, drawn fully
25 back and remaining in the concentric part of the said groove during the reciprocations of the cam-plate, the needles b^2 will not be reciprocated.

30 I do not broadly claim a cam to raise and lower needles, so that their butts will be removed from a groove, to be left at rest, or to be placed in a groove to be acted upon by a cam to knit.

35 I claim—

1. The plate C', means to move it, the needle-bed and needles therein, and the knitting-cam composed of three parts and carried by the said plate, combined with the cam-adjusting block 21, the segmental rack, and
40 the lever 30 and its pawl, and with means to operate the said lever, substantially as described.

2. The cam-plate, means to rotate it, the
45 needle-bed, needles therein, the knitting-cam, the cam-adjusting block provided with teeth, the lever 25, toothed at one end to engage the toothed cam-adjusting block and provided with a segmental rack at its other end, the
50 stitch-regulating lever, and its pawl to engage the segmental rack to move the lever step by

step in the same direction, combined with the finger 36, the lever and its projection to operate the finger in one direction, and with the pattern-wheel to actuate the said lever intermittingly, substantially as described. 55

3. The plate C', the knitting cam composed of the throwing-out cam 12 and two slides, 13 14, their attached headed screws 19, the toothed cam-adjusting block 21, provided with
60 diagonal slots to receive the said screws, the toothed lever having a segmental toothed end, and the stitch-regulating lever and pawl carried by it, combined with a finger to strike or move the said stitch-regulating lever, and
65 with means to rotate the said plate, substantially as described.

4. The cam-plate, the stitch-regulating lever thereon, and means to rotate the said cam-plate, the finger, the lever provided with the
70 projection 38 to lift the said finger, and the presser 43 to depress said finger, combined with the pattern-wheel, to operate substantially as described.

5. The cam-plate, means to move it, the
75 needle-bed, the series of needles used in narrowing and widening, and the series of needles b^{10} each side of the said needles, combined with means, substantially as described, to automatically lower the needles b^{10} and
80 withdraw their butts from the groove in the said cam-plate preparatory to narrowing the web for the production of heels and toes, substantially as set forth.

6. The cam-plate, means to move it, the
85 needle-bed, the series of needles c^2 , c^3 , and b^{10} , the needle-shifters e , segmental cam-slides to move the said shifters, and the auxiliary cam-slides, combined with the needle-shifter e^{10} to hold the tails of the needles b^{10} , the said cam-
90 slides being adapted to simultaneously operate all the shifters e^{10} and the needles held by them preparatory to narrowing, substantially as set forth.

In testimony whereof I have signed my name
95 to this specification in the presence of two subscribing witnesses.

WALTER AIKEN.

Witnesses:

G. W. GREGORY,
W. H. SIGSTON.