

No. 693,397.

Patented Feb. 18, 1902.

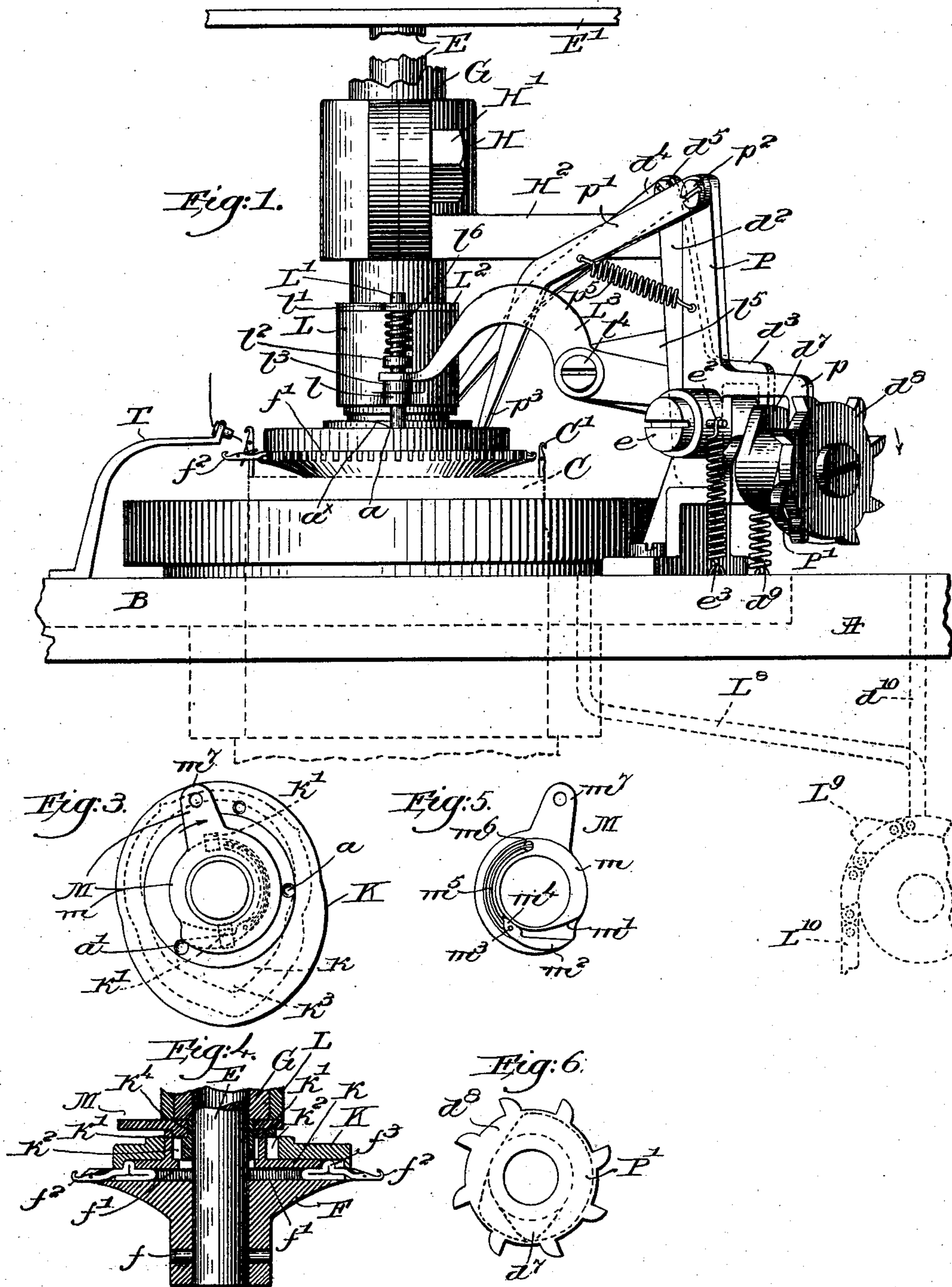
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(Application filed Feb. 4, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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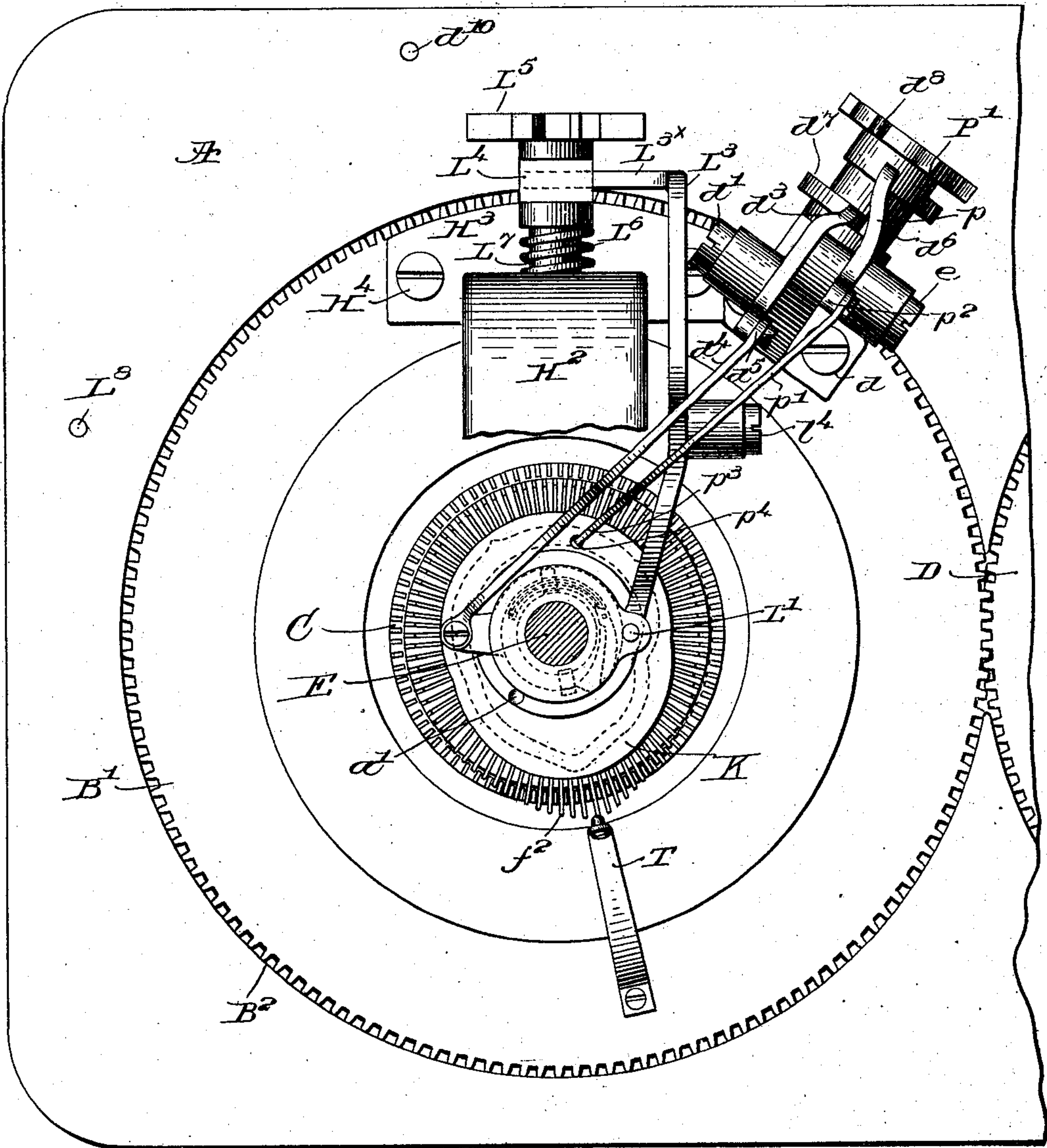
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2 Sheets—Sheet 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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TUCKING AND WELTING ATTACHMENT FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 693,397, dated February 18, 1902.

Application filed February 4, 1901. Serial No. 46,003. (No model.)

To all whom it may concern:

Be it known that we, WARREN D. HUSE and LEON C. HUSE, citizens of the United States, residing at Laconia, county of Belknap, State of New Hampshire, have invented an Improvement in Tucking and Welting Attachments for Knitting-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The invention to be hereinafter described relates to tucking and welting attachments for knitting-machines of that general type designed for producing a tubular ribbed fabric and known as "dial-machines."

In the formation of stockings and other articles of wearing-apparel it is desirable to knit the foot or other portion of plain web, the leg or other adjacent portion of ribbed web, and to finish the end of the leg with a tuck or welt, or both. In forming the ribbed portion of the web it is necessary that the dial and cylinder needles shall be operated by their respective cams to take yarn and knit, the paths of the dial and cylinder needles intersecting, as will be understood, and when a plain portion of the fabric is to be formed that the dial-needles shall be thrown out of action while the cylinder needles continue to knit, as in ordinary circular machines. When a tuck-stitch is to be produced, it is essential that while the dial-needles continue to be moved by the dial-cams such movement shall not be sufficient to cause the dial-needles to shed their loops, the cylinder-needles during such time being operated as usual in the production of a plain web and the yarn being laid upon the dial-needles, but not drawn through the loops retained by them. After a sufficient number of courses of plain web have been knitted by the cylinder-needles it is then necessary to return to full active operation the heretofore functionally inoperative dial-needles, which then, in conjunction with the cylinder-needles, receive yarn and knit. When a welt of the form contemplated herein is to be formed, it is essential that the dial-needles shall be first rendered functionally inoperative, although being moved some lit-

tle by the dial-cams to permit the yarn to be laid thereon, as in the formation of the tuck-stitch above described. Instead, however, of returning the dial-needles into functionally-operative action after a few courses of plain web have been knitted by the cylinder-needles such dial-needles are rendered fully inoperative either to receive yarn or knit, although they still retain their loops, and when there-after a sufficient length of plain web has been knitted by the cylinder-needles the dial-needles are returned to their full operative position, so that they receive yarn and knit in conjunction with the cylinder-needles to perfect the welt.

It is the object of this invention to provide an attachment for dial knitting-machines comprising a dial-cam plate and means to so manipulate it under the calls of a pattern-surface that the above operations of the dial-needles shall be secured; and to this end this invention consists of the parts and combinations, as will hereinafter be more fully described, and definitely pointed out in the claims.

In the drawings, Figure 1 is a side elevation of so much only of a dial knitting-machine as is necessary to illustrate the application of our attachment thereto, parts being broken away. Fig. 2 is a plan view of the same, partly in section, and with parts broken away to more clearly show the construction. Fig. 3 is a detached detail view of the dial-cam plate and its connected parts. Fig. 4 is a central vertical section of the dial-needle plate, dial-cam plate, and coöperating parts on the line $x x$, Fig. 2. Fig. 5 is a detail under side view of the switch-plate. Fig. 6 is a detail of the toothed wheel for operating the cams which control the actuating-levers.

Referring more particularly to Figs. 1 and 2, A represents the bed or table of the machine, in which are supported the usual cam and needle cylinders B and C, respectively, and which being of any usual and well-known construction and forming no part of this present invention are only shown in part and as of general character. The cam-cylinder B has projecting therefrom the flange B', provided with teeth B², which, intermeshing with the

corresponding teeth of a gear D, (partly shown in Fig. 2,) driven from any suitable means, is given the necessary movement as usual to reciprocate the needles C'.

5 Secured to a suitable stationary support, as E', is the dial-supporting spindle E, on the lower end of which the dial-needle plate F is mounted and fixedly connected thereto by the pin f. (See Fig. 4.) The upper portion of
10 the dial-needle plate F is provided with the usual needle-grooves f', in which the dial-needles f², having the heels or ribs f³, are adapted to reciprocate under the action of the dial-cams, to be hereinafter described.

15 Loosely surrounding the dial-supporting spindle E is the sleeve G, which, being connected to the cam-cylinder B through the collar H, clamped upon the sleeve E by the bolt H', and the arm H², secured to the collar
20 H and to the cam-cylinder B by the bracket H³ and screws H⁴, is caused to partake of the movements of said cam-cylinder, as will be obvious. The sleeve G terminates above the dial-cam plate K, the latter being loosely
25 mounted upon the spindle E above the dial-needle plate F, and in order to cause the dial-cam plate K to move with the sleeve G, and consequently with the needle-cylinder C, we interpose a locking device between the said
30 sleeve and dial-cam plate and provide means under the control of a pattern to trip said locking device at desired times during the knitting operation, as will now be explained.

Mounted in any suitable manner upon the
35 sleeve G, so as to move therewith, is a hub L, having at its lower end a suitable ear l, in which slides a locking-pin L', said pin being also preferably guided at its upper end by an ear l', formed on a plate L², secured to move
40 with the sleeve G and hub L. Upon the locking-pin L' are two collars l² and l³, which receive between them the bifurcated end of a trip-arm L³, pivoted at l⁴ to a bracket l⁵, carried upon the top of the cam-cylinder B. The
45 free end L^{3x} of the trip-arm L³ is turned into contact with a cam L⁴, suitably supported on a pin L⁶, projecting from the bracket H², carried by the cam-cylinder B, a spring L⁷ being interposed between the face of the cam and
50 bracket to prevent too easy turning of the pin L⁶. A spring l⁶, interposed between the ear l' and the collar l² on the locking-pin, serves to normally retain the locking-pin L' with its lower end in engagement with one of two
55 holes a a' in the top of the dial-cam plate K, in which disposition of parts the dial-cam plate will be caused to move with the sleeve G, and consequently with the cam-cylinder B. In order to disengage the locking-pin from
60 the dial-cam plate during the exigencies of knitting, as will be explained, we provide on the end of the pin L⁶ a toothed wheel L⁵, the teeth of which will strike a pin or pins L⁸ when during the rotation of the cam-cylinder
65 such pin or pins are projected above the bed-plate of the machine, as by risers L⁹ on a pattern-chain L¹⁰, said chain being of any de-

sired character and operated in the usual manner of such devices, which, being well understood, need not be further elucidated. The
70 locking-holes in the dial-cam plate are so located with respect to the dial-cams that when one of said holes is engaged by the locking-pin L' the needles will be projected, as shown
75 in Fig. 1, in proper relation to the thread-guides T of any usual form, so as to receive thread and knit; but when the locking-pin L' is disengaged from the hole a, the dial-cam
80 plate being thereby freed from connection with the cam-cylinder and remaining stationary with the dial-needle plate, the locking-pin L' will move over the top of the dial-cam
85 plate and engage the other locking-hole a', thus changing the relation of the dial-cams with respect to the thread-guide, so that while the dial-needles are fully reciprocated, as before, they are not in a position to receive
90 thread from the guides, and consequently will not knit.

From the above it will be evident that when
90 the locking-pin is in engagement with the hole a, as in Fig. 1, both the dial and cylinder needles will receive thread from the guide T and produce a ribbed fabric; but when the pin is released from the hole a and put into
95 engagement with the hole a' the dial-needles will not receive thread and will not therefore knit, yet the cylinder-needles will continue to receive yarn and will operate to produce a plain knitted web, on the completion of which
100 the locking-pin is tripped from hole a' and moved over the now stationary cam-plate K into engagement with hole a, as before, whereupon rib-knitting is resumed. Thus by the changes noted either a plain or a ribbed fabric
105 may be produced.

The dial-cam plate and its connected cams are of peculiar construction, as will appear from Figs. 3 and 4. The said dial-cam plate
110 K is loosely mounted upon the spindle E and carries on its under side, as shown in Fig. 4, a cam k, having upwardly-projecting pins k' k', which pass through elongated slots k² k² in the cam-plate K. Thus the cam k is adapted
115 to be slid on the cam-plate within certain limits defined by the length of the slots k² k², and when the cam is in position with the end k³ thereof projected the dial-needles will be caused to reciprocate the usual knitting
120 length to receive thread from the thread-guide T and shed their loops to knit in the usual manner; but when said cam k is in position with the end k³ thereof retracted, as shown by Figs. 3 and 4, the dial-needles, although still reciprocated somewhat, are not
125 moved a sufficient distance to shed their loops, and as a consequence the thread from the guide is simply laid upon the needles, which, however, still retain their loops. In order to effect this movement of the cam k, we mount
130 loosely upon the hub k⁴ of the dial-cam plate a switch-plate M. (Shown detached in Fig. 5.) This switch-plate has a flange m, cut away at m', and at the end of said cut-away

portion is pivoted at m^3 a cam-switch m^2 , the end m^4 of which has an extended bearing on the reduced portion of the flange m , being normally held in position, as indicated in Fig. 5, by the spring m^5 , secured to the switch-plate at m^6 , said spring thus permitting the cam-switch to yield to any pressure upon its exterior surface, the extended bearing on the reduced portion of the flange m preventing further outward movement of the switch. In normal working conditions during the knitting of ribwork, at which time the cylinder and dial needles take thread from the guide T and knit, the projecting pins k' embrace the flange m of the switch-plate, as shown by dotted lines in Fig. 3; but when in the production of tuck-stitch the dial-needles are to be rendered functionally inoperative to shed their loops, yet are to have the yarn laid thereon, the switch-plate M is moved so as to engage one of the projecting pins k' between the cut-away wall m' and the cam-switch m^2 , and thereby withdraw or retract the cam k into the position indicated in Fig. 3; and the requisite movement of the switch-plate M is imparted by the following mechanism:

Pivoted on a stud d' , carried by a bracket d , secured to the cam-cylinder B, is a switch-plate actuator comprising an arm d^2 , provided with a projecting toe d^3 and having pivoted at its upper end at d^5 an arm d^4 , pivotally joined to the projecting lug m^7 , secured to or formed as a part of the switch-plate, a spring d^9 , Fig. 1, normally tending to hold said toe d^3 upon a cam d^7 , formed on a stud d^6 , journaled in the bracket d . To the outer end of the stud d^6 is secured a toothed wheel d^8 , into the path of which as it is carried around by the cam-cylinder a pattern-controlled pin or pins d^{10} are adapted to be projected under the call of suitable risers on the pattern-chain L^{10} or any other suitable means, so that the toothed wheel is adapted to be turned as desired and at the required time to operate the cam d^7 to permit the arm d^4 to turn the switch-plate, and consequently withdraw the dial-cam k , so that it no longer acts to cause the dial-needles to knit, as above explained, although they take thread which is loosely laid thereon. Assume the dial and cylinder needles in position with relation to their actuating-cams and the thread-guide to produce a ribbed fabric—that is, yarn being supplied to both the dial and cylinder needles, as represented in Fig. 1—and assume, further, that it is desired to form a tuck-stitch. Under these conditions the tooth-wheel d^8 , carrying the cam d^7 , is caused to turn by certain pattern-controlled pins, as d^{10} , which are projected into the path of the teeth by the usual risers on the pattern-chain L^{10} , and the cam d^7 being moved to bring a low part under the toe d^3 the switch-plate actuator is thereby caused to move under the action of its spring m^5 to turn the switch-plate over the top of the dial-cam plate and withdraw the dial-cam k from its projected position, in which it gave

full knitting operation to the dial-needles, into the retracted position, Fig. 3, where it gives only a part operation to said needles, which thereupon receive yarn, but do not shed their loops. The cylinder-needles at this time continue to knit in plain stitch until the requisite number of plain courses have been produced, whereupon the pattern-controlled pins d^{10} are again projected into the path of the toothed wheel d^8 to turn it, and the cam d^7 coming under the toe d^3 the switch-plate is moved back to its original position, freeing the pin k' from the action of the cam-switch m^2 and by the cut-away wall m' of the flange m moving the dial-cam k forward, so that it again assumes full functional knitting position with respect to the dial-needles and thread-guide T, and the dial and cylinder needles then proceed to knit as before.

In order that a welt may be formed, it is necessary not only that the dial-needles shall be rendered functionally inoperative, as above set forth, but the dial-cams must be put in such relation with the thread-guide that the needles, though still slightly moved by the cam, shall not be in a position to have yarn laid thereon, and to this end the following mechanism has been devised:

Mounted upon a stud e , secured to the bracket d , carried by the cam-cylinder B, is a cam-plate actuator comprising a lever P, having a toe p , normally resting on a cam P' , secured to the stud d^6 , said toe being yieldingly pressed toward said cam by a spring e' , one end of which is secured to a pin e^2 on the hub of the lever P and the other end to the cam-cylinder at e^3 . To the upper end of lever P is pivoted at p^2 an arm p' , bent as shown in Fig. 1 and having its free end p^3 resting in a depression p^4 in the top of the dial-cam plate K, a spring p^5 , connecting the arm p' with the lever P, normally maintaining the end of the arm seated in the depression p^4 . By reference to Fig. 1 it will be noted that the hole a in the dial-cam plate K has one of its walls beveled or cut away at a^x , so that under a force tending to turn the dial-cam plate to the right (in Fig. 1) the locking-pin L' will be forced upward against the tension of its spring l^2 to thereby free the dial-cam plate from the locking-pin and permit it to be turned to carry the nose or projecting end k^3 of the dial-cam from the position in which it projects the dial-needles adjacent the thread-guide T to receive yarn or thread to a second position away from the thread-guide, so that the said needles will no longer receive yarn or thread, such movement of the dial-cam plate being secured by the arm p' , under the control of the actuator P, which is itself moved by the cam P' on the stud d^6 as the toothed wheel d^8 is turned by the pins d^{10} under the call of the pattern, as already described. As the dial-cam plate K is thus turned to put the cam in such position with relation to the thread-guide T that the dial-

needles shall not have yarn laid thereon it is necessary also to simultaneously turn to the same amount the switch-plate M, in order to maintain the dial-cam in its retracted position, as described, and this is secured by the shape of the cam d^7 , which being mounted on the same stud, d^6 , as the cam P' is moved simultaneously therewith. The parts being in the position last described, with the dial-cam retracted and the dial-cam plate in position so that the dial-needles no longer have yarn laid thereon, the cylinder-needles continue to knit a plain web until the requisite or desired length of such plain web is produced, whereupon the pins d^{10} under the call of the pattern are again projected into the path of the toothed wheel d^8 , which is turned to raise the toe of the actuator d^2 upon the high portion of the cam d^7 to thereby move the arm d^4 and its connected switch-plate to free the pin k' from between the wall m' and the cam-switch m^2 and force the cam K into its full projected position, the toe p of the actuator P being at the same time depressed by its spring e' into the low portion of the cam P', and thereby draw the dial-cam plate K back to its original position, with the locking-pin L' in engagement with the hole a in the dial-cam plate, the dial-needles at such time being in position to receive yarn from the thread-guide and knit, thus, in connection with the cylinder-needles, completing the welt.

As hereinbefore pointed out, the cam-switch m^2 is spring-controlled, the object of which is to permit the cam-switch m^2 to be held as indicated in Fig. 5, in order that when the switch-plate is turned in the direction of the arrow, Fig. 3, by its actuator one of the pins k' on the cam k shall be engaged by the switch and the cam be moved or slid on the cam-plate; but when, as in passing from rib-knitting to plain knitting, the dial-cam plate is released from engagement with the locking-pin L', and consequently remains stationary, the pins k' may pass over the outer surface of the cam-switch as the latter is carried around by the cam-cylinder in a direction opposite the arrow in Fig. 3, as will be clearly understood, without causing a sliding movement of the dial-cam, the pins k' at such time pressing the cam-switch inward against the action of its spring m .

It will be noted that the dial-cam is constructed in a single piece, and that when rib-knitting is being performed the said cam is projected, with its nose or end k^3 , in position with respect to the dial-needles that the latter are given a full reciprocation to receive thread and knit; but when plain knitting is to be performed by the cylinder-needles either in the formation of a tuck or welt the said dial-cam is retracted with respect to the dial-needles, so that in the rotation of the dial-cam plate the needles are given only a partial reciprocation, the same not being sufficient to cause them to shed their loops, but yet sufficient to have the yarn or thread laid

thereon. In other words, the dial-cam has a sliding movement as a whole on the dial-plate to put the dial-cam either in an operative position to cause the dial-needles to receive yarn and knit or in another and functionally inoperative position to cause the dial-needles to make a partial reciprocation only, at which time they receive yarn or thread, but retain their loops and do not knit.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a knitting-machine, the combination of a dial-needle plate carrying needles, a dial-cam plate provided with a needle-actuating cam movable on said dial-cam plate, and pattern-controlled devices including a switch-plate carrying a movable switch for moving said cam into retracted position so that the needles shall be caused to move only a part of their full reciprocation and to thereafter return said cam to its projected position to move the needles their full reciprocation.

2. In a knitting-machine, the combination of dial and cylinder needles and dial and cylinder cams for operating said needles in the production of ribbed work, pattern-controlled means including a switch-plate carrying a pivoted switch for changing the position of the dial-cam to cause the dial-needles to reciprocate only a part of their full knitting stroke to have thread laid thereon without shedding their loops in the formation of tuck-stitch, and to thereafter return said dial-cam to position for giving the dial-needles their full knitting stroke to continue ribbed work.

3. In a knitting-machine, the combination of a thread-guide, dial and cylinder needles and cams for operating the cylinder-needles, a dial-cam for operating the dial-needles, pattern-controlled means for moving the dial-cam to cause the dial-needles to reciprocate only a part of their full knitting stroke to have thread laid thereon without shedding their loops, pattern-controlled means independent of the first-mentioned pattern-controlled means to thereafter place said dial-cam in position with respect to the thread-guide that the dial-needles will neither knit nor have thread laid thereon, both of said pattern-controlled means being thereafter actuated to return the dial-cam to position to give full knitting stroke to the dial-needles and to return the cam to position with respect to the thread-guide that the dial-needles will take thread and knit in completion of the welt.

4. In a knitting-machine, the combination of a stationary dial-needle plate, a dial-cam plate loosely superposed thereon, cylinder-needles and cam-cylinder for operating them, a locking device for locking the dial-cam plate to rotate with the cam-cylinder, and a pattern-controlled trip for disengaging the locking device to permit the dial-cam plate to remain stationary with the dial-needle plate for a part revolution of the cam-cylinder.

5. In a knitting-machine, the combination

of a thread-guide, dial and cylinder needles and cams for operating them in the production of ribbed work, pattern-controlled means for changing the position of the dial-cam with respect to the needles to cause the dial-needles to reciprocate only a portion of their full stroke and have thread laid thereon without shedding their loops, a second pattern-controlled means independent of said first-mentioned pattern-controlled means to thereafter turn the dial-cam away from the thread-guide so that the dial-needles shall neither take thread nor knit, both of said pattern-controlled means being thereafter simultaneously actuated to return the dial-cam to full operative position with respect to the needles and to return the dial-cam to position with respect to the thread-guide that the dial-needles will take thread and knit in completion of the welt.

6. In a knitting-machine, a dial-needle plate carrying dial-needles, a dial-cam plate, a dial-cam carried by said plate and adapted to slide thereon, a switch-plate having operative engagement with the dial-cam and provided with a switch and a pattern-controlled actuator for moving the switch-plate and its switch to throw the dial-cam radially when moved in one direction and to be movable in the opposite direction without imparting movement to the dial-cam.

7. In a knitting-machine, a dial-needle plate carrying dial-needles, a dial-cam plate provided with slots, a dial-cam having pins projecting through said slots, a switch-plate having a cam-switch for engagement with one of said pins to slide the dial-cam on the dial-cam plate when moved in one direction only, and pattern-controlled means for operating the switch-plate.

8. In a knitting-machine, a needle-cylinder, a cam-cylinder, means for operating the latter, a dial-needle plate carrying dial-needles, a dial-cam plate having a dial-cam slidably mounted thereon, said dial-cam plate being loosely mounted with respect to the dial-needle plate, a locking device for locking the dial-cam plate to rotate with the cam-cylinder, a switch-plate for sliding the dial-cam on

the dial-cam plate, an actuator for turning the dial-cam plate with respect to the cam-cylinder, and pattern-controlled means for operating said switch-plate and actuator.

9. In a knitting-machine, a thread-guide, a needle-cylinder, a cam-cylinder, means for operating the latter, a dial-needle plate carrying dial-needles, a dial-cam plate having a dial-cam slidably mounted thereon, a switch-plate carrying a pivoted cam-switch for sliding said cam on said cam-plate into two positions, one to cause the dial-needles to take thread and knit in conjunction with the cylinder-needles for the production of ribbed work, and the other to cause the dial-needles to take thread but not cast their loops while the cylinder-needles continue to knit a plain web in the formation of tuck-stitch, and pattern-controlled means for operating the switch-plate at desired times.

10. In a knitting-machine, a thread-guide, a needle-cylinder, a cam-cylinder, means for operating the latter, a dial-needle plate carrying dial-needles, a dial-cam plate having a dial-cam slidably mounted thereon, a switch-plate for sliding said cam on said cam-plate into two positions, one to cause the dial-needles to take thread and knit in conjunction with the cylinder-needles for the production of ribbed work, and the other to cause the dial-needles to take thread but not cast their loops while the cylinder-needles continue to knit a plain web in the formation of tuck-stitch, an actuator for turning the dial-cam plate into two positions with respect to the thread-guide, one such that the dial-needles shall be operated at a point adjacent the thread-guide and the other at a point remote from said guide, and pattern-controlled means for operating the switch-plate and dial-cam-plate actuator in the production of a welt.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WARREN D. HUSE.
LEON C. HUSE.

Witnesses:

GEO. W. GREGORY,
GEO. H. MAXWELL.