(No Model.)

D. F. SULLIVAN.

CIRCULAR SPRING NEEDLE KNITTING MACHINE.

No. 459,714. Patented Sept. 15, 1891.

Fig. 1.

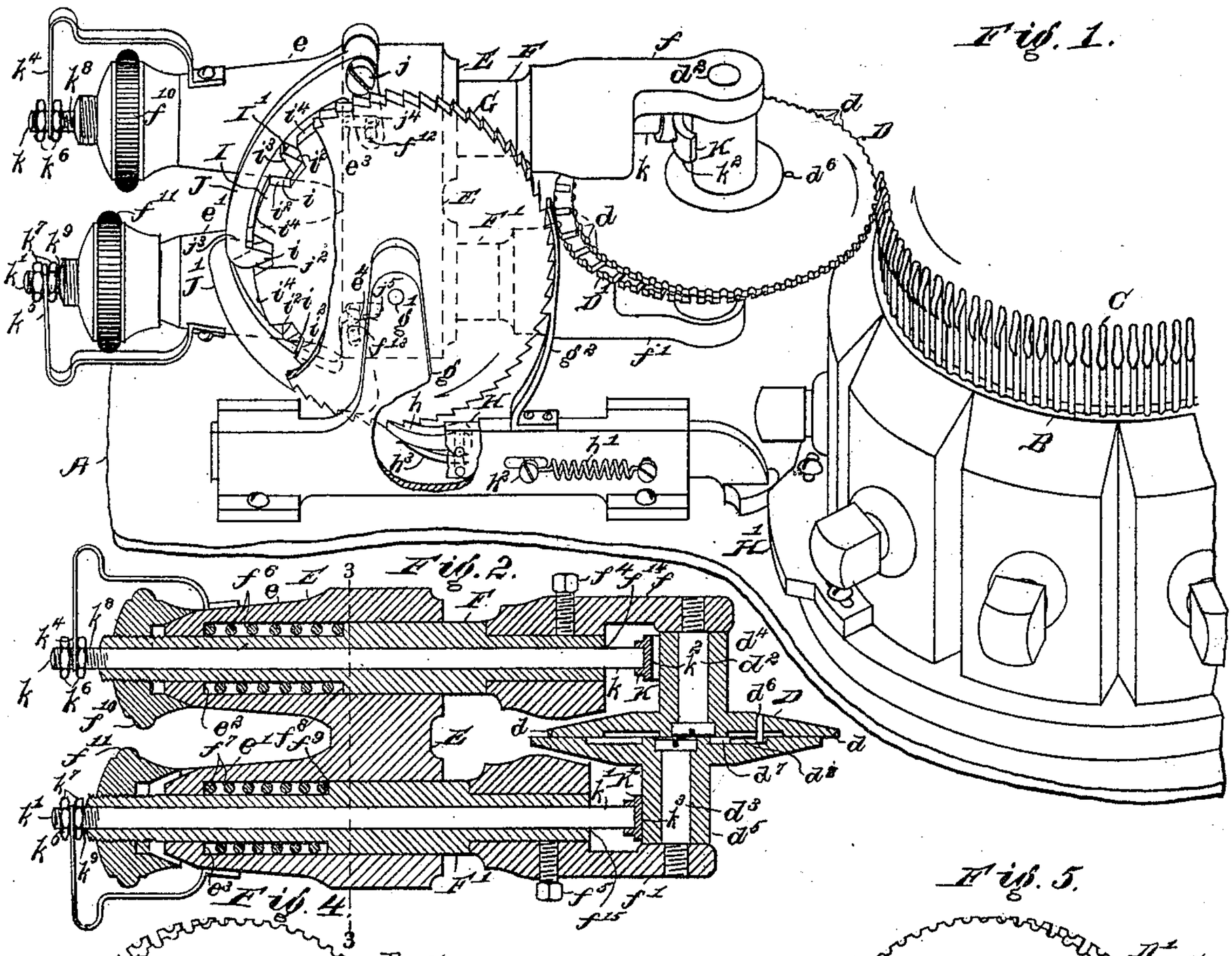


Fig. 2.

Fig. 4.

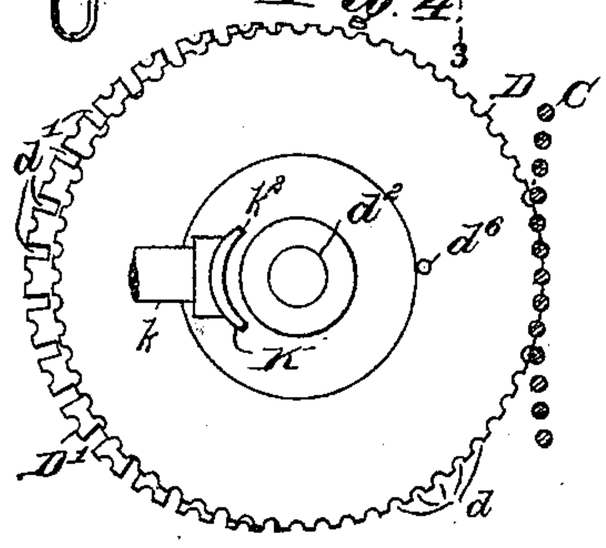


Fig. 3.

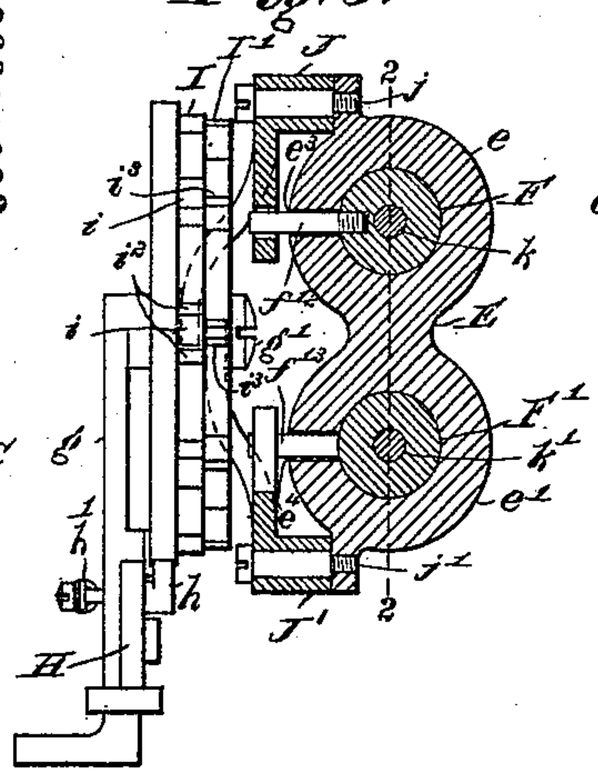


Fig. 5.

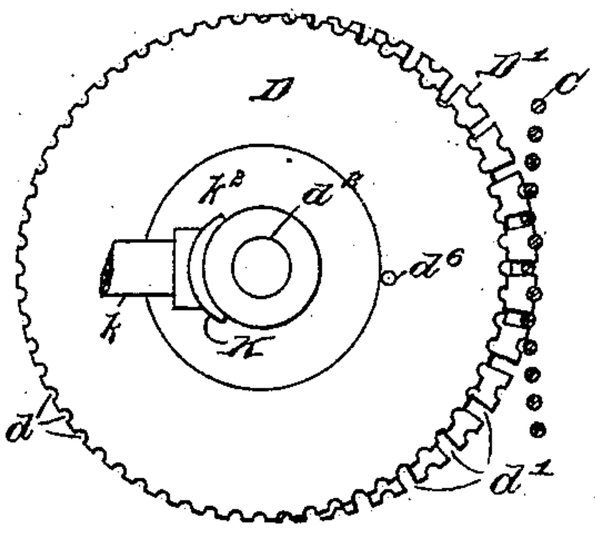


Fig. 6.

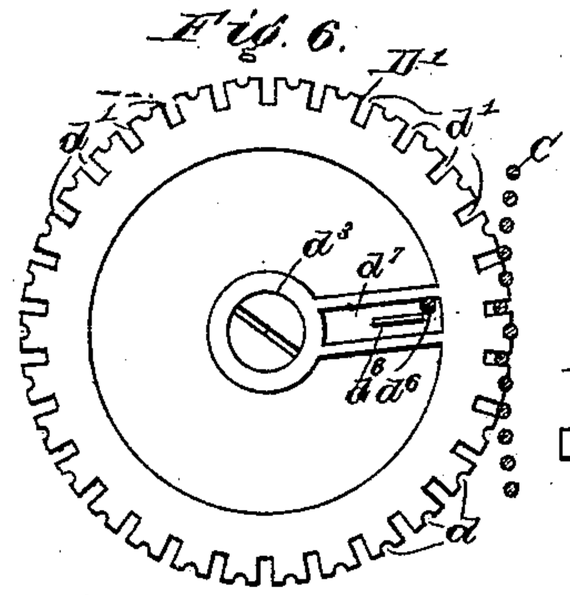
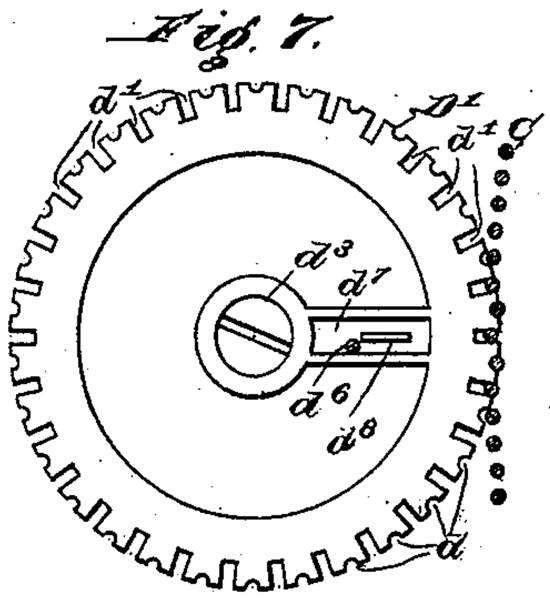


Fig. 7.



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UNITED STATES PATENT OFFICE.

DANIEL F. SULLIVAN, OF LOWELL, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO GEORGE F. BLAIR, OF SAME PLACE.

CIRCULAR SPRING-NEEDLE KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 459,714, dated September 15, 1891.

Application filed October 27, 1890. Serial No. 369,490. (No model.)

To all whom it may concern:

Be it known that I, DANIEL F. SULLIVAN, a citizen of the United States, residing at Lowell, in the county of Middlesex and Commonwealth of Massachusetts, have invented a certain new and useful Improvement in Circular Spring-Needle Knitting Machines, of which the following is a specification.

My invention relates to circular spring-needle knitting machines, and comprises a plain presser or presser-wheel adapted to close the beards of all the needles and a cut-presser or presser adapted to close the beards of some of the needles, but having radial slots of a sufficient depth and suitably arranged to receive others of the needles without closing their beards, with automatic means for moving said presser-wheels or pressers into and out of contact with the circle of needles in the needle-cylinder, to vary the stitch, and automatic means for changing the action of the cut-presser from one set of needles to another set of needles to change the tuck-stitches or raised stitches from one set of needles to the other.

In the accompanying drawings, Figure 1 is an isometric perspective view of a part of the table, needle-cylinder, and needles of a circular spring-needle knitting machine and of my improvement applied thereto, part of the ratchet-wheel being broken away to show the cams which determine the position of the pressers, showing the plain presser in contact and the cut presser out of contact with the beards of the needles; Fig. 2, a central vertical section of the presser-wheels, their supporting-studs, brackets, spindles, springs, and the stand which supports them, the pressers being in the position shown in Fig. 1; Fig. 3, a vertical transverse section on the line 3 3 in Fig. 2 of the presser-wheel stand and a right side elevation of the ratchet, cams and their supporting-stand, the cam-levers, and the pins which project from the spindles to engage said levers, said levers being partly in section; Fig. 4, a plan of the presser-wheels, the brake of the plain or upper presser, and a part of the stem of said brake, and a row of needles, the upper presser being represented as acting on needles, showing also the pin carried by the upper presser and adapted to engage and rotate the lower presser. Fig. 5 is like Fig. 4, except that the lower presser is represented as operating upon the beards of alternate needles; Figs. 6 and 7, plans of the lower or cut presser, showing the pin which projects from the plain presser into a groove in the lower or cut presser in horizontal section, said pin in Fig. 6 being in the position it occupies when the upper or plain presser is in operation and in Fig. 7 in the position it occupies when the lower or cut presser is in operation.

The table A, needle-cylinder B, needles C, and plain presser D are all of the usual construction and operation, except as hereinafter stated with relation to the plain presser. These parts are used in connection with stitch-wheels which press the yarn against and between the needles below the needle-beards and carry said yarn under the beards—that is, between the beards and the shanks of the needles—and with a push-back which carries the loops down below the beards of the needles, and with other wheels and parts commonly used in such machines, the object of the presser or presser-wheel being to close the beards in against the shanks of the needles to allow the old loops to be drawn over the new ones and off from the needles.

The presser-wheel stand E is essentially like the presser-wheel stand in ordinary use, except that it is provided with two sleeves *e e'*, arranged one above the other, the upper sleeve *e* receiving the spindle F, which carries the upper presser D, which in this case is a plain presser of common form, except that usually the plain presser when new has a circular edge without notches, but when used for some time it becomes notched by wearing on the needles, so as to be substantially like the presser D shown in the drawings, which is notched before use at *d* at intervals corresponding with the intervals between the needles, in order that said presser D may always have the same number of revolutions to a single revolution of the needle-cylinder and in order that the cut presser may be so controlled by means hereinafter described as to operate upon the required set of needles. The presser D turns upon a stud d^2, having a screw-threaded end which enters a bracket *f*

in the usual manner, except that the stud d^2 is commonly driven into the bracket in the reverse direction from what is shown in the drawings, the bracket being retained on the inner end of the spindle or end nearest the needle-cylinder by a set-screw f^4, which turns radially in said bracket and thrusts against said spindle in the usual manner. The spindle is thrust inward—that is, toward the needle-cylinder—in the usual manner by a spring f^6, compressed between the shoulder f^8 on the spindle, and another internal annular shoulder e^2 on the sleeve e. The pressure of the presser D upon the needles is limited by a "star" or nut f^{10}, which turns on the spindle F beyond the outer end of the sleeve e. The sleeve e' is like the sleeve e, and the spindle F', bracket f', set-screw f^5, stud d^3, spring f^7, star or nut f^{11}, and shoulders f^9 e^3 are precisely like the parts of the same name above described and bearing the same letters of reference with an index-figure one less, and have the same functions with relation to the cut presser D' as those parts have with relation to the plain presser D. The cut presser D' is provided with shallow notches d, precisely like those in the plain presser D, except that they are farther apart, being represented in the drawings as twice as far apart, the place of the alternate notches d in the plain presser being supplied in the cut presser by radial studs d' of a sufficient depth to allow the needles to enter them without pressure upon the beards of the needles. It is evident that if the nuts f^{10} f^{11} are so adjusted as to allow the pressers D D' to be concentric with each other and in contact with the needles both pressers will have no more effect upon the beards of the needles than would be exerted by the plain presser D alone. It is also obvious that if the presser D be drawn out of contact with the needles and the presser D' be allowed to remain in contact with the needles only every other needle will be pressed, and the stitches will accumulate on the unpressed needles and will there remain until the beards of the needles on which the stitches have accumulated are pressed or until the beards of the needles have been broken out by the accumulated stitches catching in the loop-wheels and other wheels of the machine.

"Tuck-work," so called, is made by drawing single loops or stitches of one course through several loops or stitches allowed to accumulate on the same needles for two or more courses, thus forming "tucks" or bunches of stitches which project slightly from the surface of the fabric by a course, meaning the stitches formed in one revolution of the needle-cylinder. To give a diagonal arrangement to the tucks or bunches of stitches it is necessary that the cut presser should operate upon a different set of needles in forming each horizontal line of tucks around the fabric. Thus, supposing the tucks are intended to be each "four and one," or four loops united by a single loop, and that the tucks in each row are desired to be below the intervals between the tucks of the next preceding row, it would be necessary to apply the cut presser alone to the needles for four courses or revolutions of the needle-cylinder, then to apply the plain presser for one course, and then to apply the cut presser to the needles not pressed by it in forming the last preceding set of tucks. I therefore provide the means described below, by which the plain presser D is drawn out of contact with the needles to allow the cut presser D' to operate alone on alternate needles and similar means by which the cut-presser is drawn out of such contact and stopped or retarded long enough to cause said cut presser, when again thrown into contact with the needles, to operate upon a different set of needles from those last previously operated upon by it, said pressers being held in such contact, respectively, by the springs f^6 f^7 and one of said pressers being at all times in such contact.

Upon a suitable stand g, on a horizontal arbor g', turns a ratchet-wheel G, operated by a pawl h, pivoted on a bar H, guided radially to the needle-cylinder in said stand g and drawn by the contraction of a spring h' (attached at its respective ends to said stand g and to a stud h^2, which projects laterally from said bar H) into the path of a cam H', secured to said needle-cylinder, so that once in every revolution of said needle-cylinder said bar H is moved endwise and by means of said pawl h rotates the ratchet G an angular distance measured by one tooth thereof, said pawl being kept in engagement with said ratchet by a spring h^3 in a well-known manner. The ratchet G is prevented from being carried too far by its own momentum by a friction spring or brake g^2, secured to the stand g and pressing against the teeth of said ratchet. Cam-wheels I I' are secured to the ratchet G concentrically therewith, and the cam-wheel I is provided with a series of notches i, having backwardly-inclined sides i^2, said notches alternating with curved faces i^4, concentric with said cam-wheel I, and each notch i being represented as of about one-half the angular measurement of one of said curved faces and as of twice the angular measurement of a tooth of the ratchet G. The other I' of said cam-wheels is represented as provided with a series of projections i^3, arranged at the same intervals apart as the intervals between the notches i, measuring from the middle of one notch to the middle of the next notch.

Cam-levers J J' are pivoted at j j' on the sleeves e e', respectively, and are bent at the free ends of their longer arms at j^2 j^3 into contact with the peripheries of said cam-wheels, respectively. Each of the spindles F F' is provided with a laterally-projecting pin f^{12} f^{13}, which pins project through longitudinal slots e^3 e^4 in the sleeves e e', which surround said spindle, and through slots j^4 j^5 in the ends of the shorter arms of the levers J J', so

that when the bent free ends j^2 j^3 of the levers J J′, respectively, rest upon the cam-surface i^4 i^3 of the cam-wheels the presser carried by the corresponding spindle is held out of engagement with the needles, but when said free end of either lever enters a notch of the cam-wheel the corresponding spindle F F′ is thrown by its spring f^6 f^7 toward the needle-cylinder, and the presser carried by said spindle is brought into operation.

The plain presser D has rigidly secured thereto a downwardly-projecting pin d^6, which enters a radial groove d^7 in the upper surface of the cut presser D′, the sides of said groove d^7 being struck by said pin d^6 and limiting the rotary movement of said pressers on each other, said groove d^7 being just wide enough to allow either presser to turn on the other an angular distance measured by the arc which connects the centers of two adjacent needle-notches d of the plain presser D.

Each spindle F F′ is provided with an axial hole f^{14} f^{15}, in which slides the stem k k' of the brakes K K′, provided with shoes k^2 k^3, each having a surface adapted to press with sufficient friction upon the hubs d^4 d^5 of the pressers D D′ to stop the rotation of either presser when the same is drawn away from the needles and against said brake. The outer end of the stem of each brake K K′ extends through a hole or slot in the free end of one of the springs k^4 k^5, secured to the presser-wheel stand E, and is prevented from moving in said spring by nuts k^6 k^7, turning on the outer screw-threaded ends k^8 k^9 of said stems on opposite sides of said springs, which nuts should be adjusted to prevent any pressure of the brake upon the hub of the presser when the latter is in working position. When either presser is drawn out of contact with the needles and into contact with its brake, it is momentarily stopped, while the other presser continues to be rotated by engagement with the needles, and the pin d^6 is thereby instantly brought against a side of the groove d^7, causing the idle presser to be rotated by the operating presser, so that when such idle presser is again thrown into engagement any notch d of such presser engages a needle next adjacent to the needle previously received by the same notch d. The friction upon the idle presser of its brake continues while such presser is out of engagement with the needles, but is too slight to prevent the rotation of said idle presser by the operating-presser, as above described, and only sufficient to overcome the momentum of said idle presser. It is immaterial which notch d of the plain presser engages any given needle, because all said notches are alike; but causing any notch d of the cut presser to engage a needle next to the needle engaged in its last previous contact with the needles causes the needle so previously engaged to enter a slot d' of said cut presser when the plain presser is next drawn out of engagement with the needles and allows the stitches to accumulate on said last-named needle, as above described, until the plain presser is again thrown against the needles. It is not necessary that the outer surfaces or ends of the cams i^3 should be of any definite length for the reason that the cut presser requires to be disengaged from the needles only long enough to be retarded by its brake, as above described, because its engagement has no effect upon the needles when the plain presser is operating; but the length of the curved surfaces i^4 of the cam-wheel I, which draws and holds the plain presser out of operation, determines the number of courses formed by the cut presser. When the ratchet and cam wheels are proportioned as above described, and as shown in the drawings, the loops will accumulate during four courses on alternate needles, the stitches on the other needles being fully formed in the usual manner. During the fifth course the accumulated stitches will be gathered in tucks, and the sixth course will be knit plain in the usual manner, the operation being then repeated, the seventh and three following courses being like the first four courses, the eleventh and twelfth like the fifth and sixth, and so on. There is a danger of either presser being jarred out of its proper position after coming out of contact with the brake and before it engages with a new set of needles, and therefore the groove d^7 is divided nearly from end to end by a radial partition d^8, there being room enough between the ends of the partition and the ends of said groove to allow the pin d^6 to move from side to side of said groove when one presser is fully in engagement with the needles and the other presser is at the greatest distance from said needles, the partition at all other times preventing the partial rotation of one presser on the other.

I claim as my invention—

1. The combination of a needle-cylinder and its series of needles, a presser adapted to close the beards of all said needles, another presser adapted to close the beards of a part of said needles only at regular intervals in said series, means for disengaging said pressers alternately with each other from said needles and for re-engaging said pressers with said needles, and means for causing the presser which operates upon a part of said needles only to operate upon a different set of needles at each engagement thereof, as and for the purpose specified.

2. The combination of a needle-cylinder and its series of needles, a presser-wheel provided with notches at equal intervals with said needles, another presser provided with notches arranged at twice the intervals of said needles and provided with radial slots equal in number to said last-named notches and alternating with said notches at equal intervals, means for disengaging said pressers alternately with each other from said needles and for re-engaging said pressers with said needles, and means for causing said radially-slotted presser to operate upon a different set

of needles at each engagement thereof, as and for the purpose specified.

3. The combination of a needle-cylinder and its series of needles, a presser adapted to close the beards of all said needles, another presser adapted to close the beards of a part of said needles only at regular intervals in said series, and means for disengaging said pressers alternately with each other from said needles and for re-engaging said pressers with said needles, one of said pressers being provided with a groove and the other of said pressers being provided with a pin which enters said groove, said groove being of such width as to allow either of said pressers to turn on the other an angular distance measured by the arc which connects two adjacent grooves in said first-named presser, as and for the purpose specified.

4. The combination of a needle-cylinder and its series of needles, a presser adapted to close the beards of all said needles, another presser adapted to close the beards of a part of said needles only at regular intervals in said series, means for disengaging said pressers alternately with each other from said needles and for re-engaging said pressers with said needles, one of said pressers being provided with a groove and the other of said pressers being provided with a pin which enters said groove, said groove being of such width as to allow either of said pressers to turn on the other an angular distance measured by the arc which connects two adjacent grooves in said first-named presser, and brakes to check the rotation of said pressers when disengaged from said needles, as and for the purpose specified.

5. The combination of a needle-cylinder and its series of needles, a presser adapted to close the beards of all said needles, another presser adapted to close the beards of a part of said needles only at regular intervals in said series, means for disengaging said pressers alternately with each other from said needles and for re-engaging said pressers with said needles, one of said pressers being provided with a groove and the other of said pressers being provided with a pin which enters said groove, said groove being of such width as to allow either of said pressers to turn on the other an angular distance measured by the arc which connects two adjacent grooves in said first-named presser, and a partition dividing said groove nearly from end to end, but leaving space enough for said pin to move from side to side of said groove between said partition and the ends of said groove to prevent said pressers from rotating on each other while either of said pressers is being moved into engagement with said needles, as and for the purpose specified.

6. The combination of a needle-cylinder and its series of needles, a presser adapted to close the beards of all said needles, another presser adapted to close the beards of a part of said needles only at regular intervals in said series, means for disengaging said pressers alternately with each other from said needles and for re-engaging said pressers with said needles, one of said pressers being provided with a groove and the other of said pressers being provided with a pin which enters said groove, said groove being of such width as to allow either of said pressers to turn on the other an angular distance measured by the arc which connects two adjacent grooves in said first-named presser, brakes against which said pressers are drawn to check the rotation of said pressers when moved out of engagement with said needles, and a partition dividing said groove nearly from end to end to prevent said pressers from rotating on each other when either of said pressers is out of contact with its brake and disengaged from said needles, as and for the purpose specified.

In witness whereof I have signed this specification, in the presence of two attesting witnesses, this 22d day of September, A. D. 1890.

DANIEL F. SULLIVAN.

Witnesses:
ALBERT M. MOORE,
MYRTIE C. BEALS.