

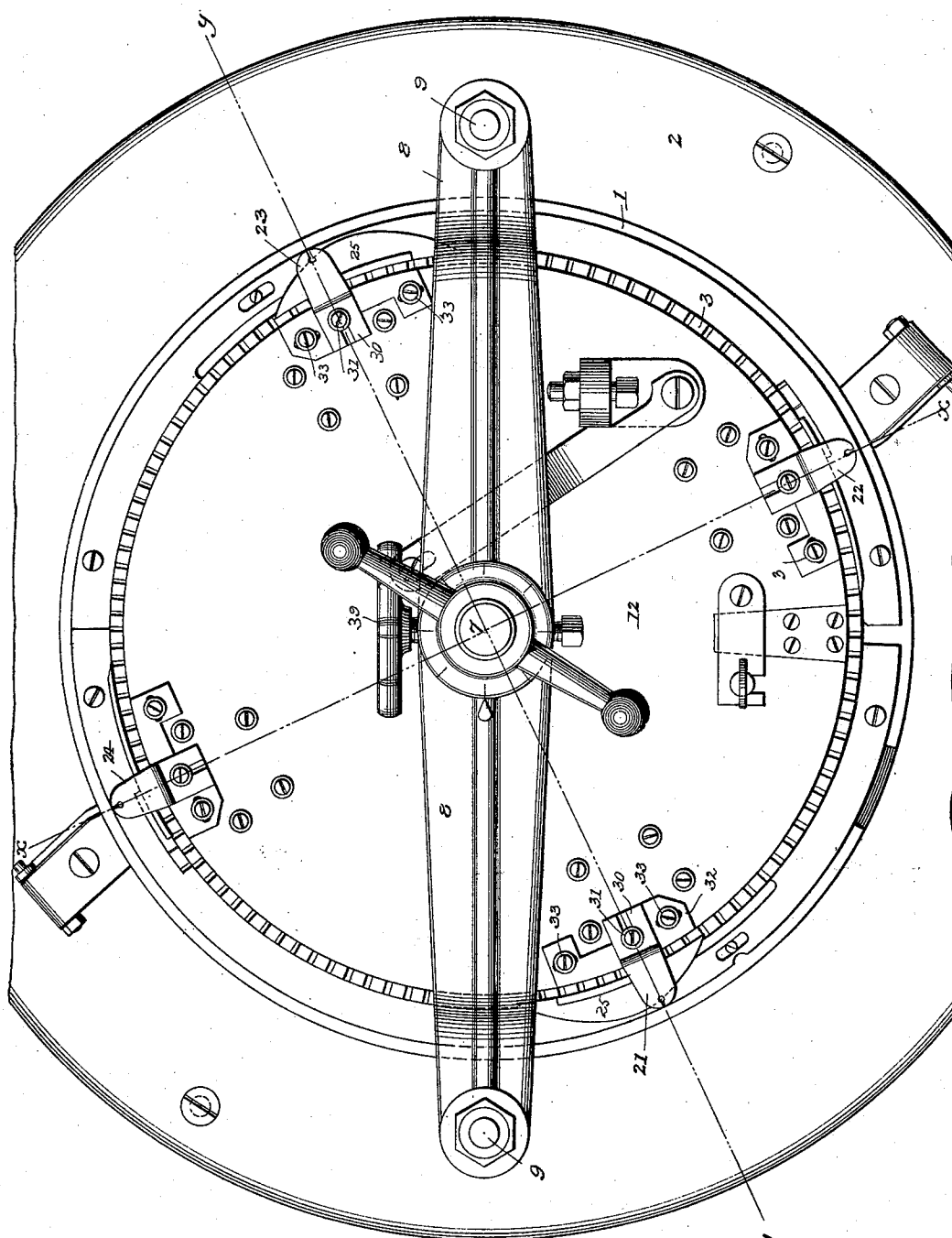
(No Model.)

4 Sheets—Sheet 1.

A. TOWNSEND.
KNITTING MACHINE.

No. 539,837.

Patented May 28, 1895.



Witnesses
Raymond A. Barnes.
J. S. Elmon.
Fig. 1.

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By *P. T. Lodge*
Attorney

(No Model.)

4 Sheets—Sheet 2.

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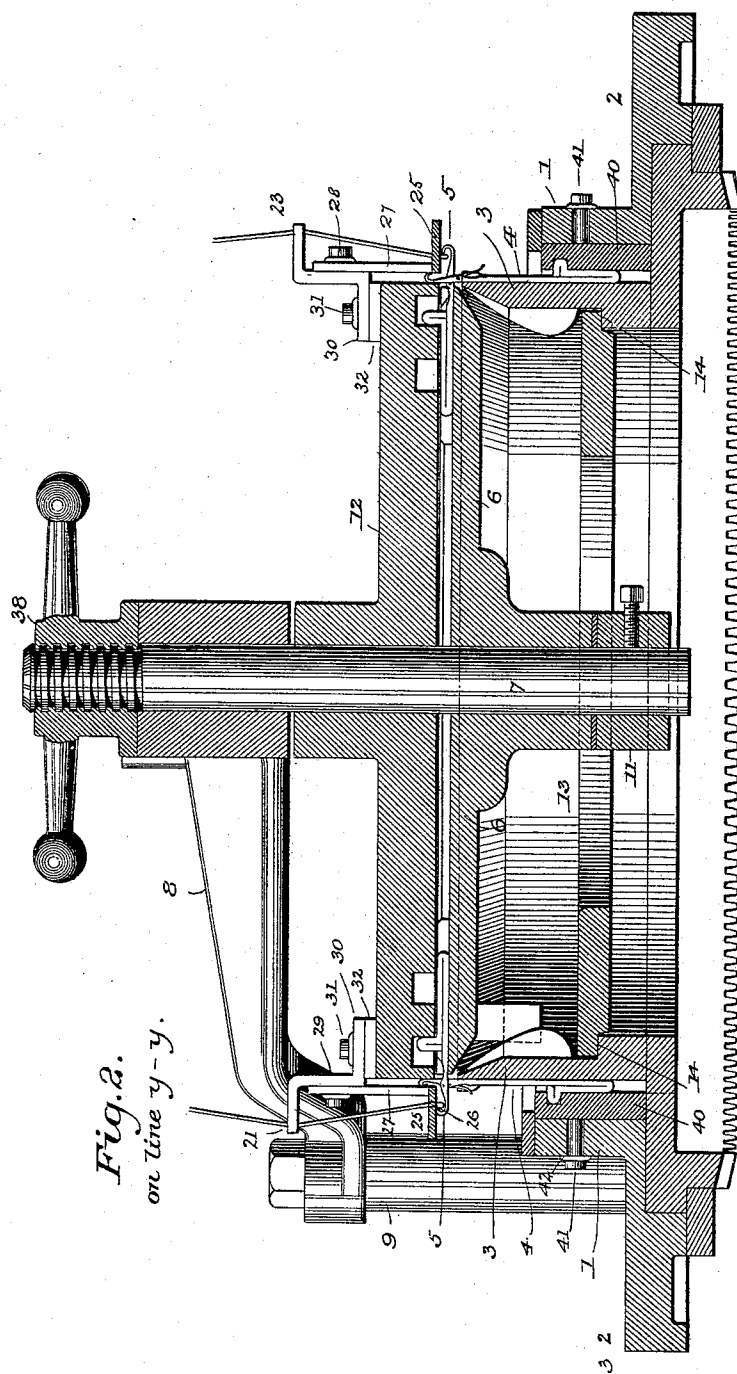


Fig. 2.

on line y-y.

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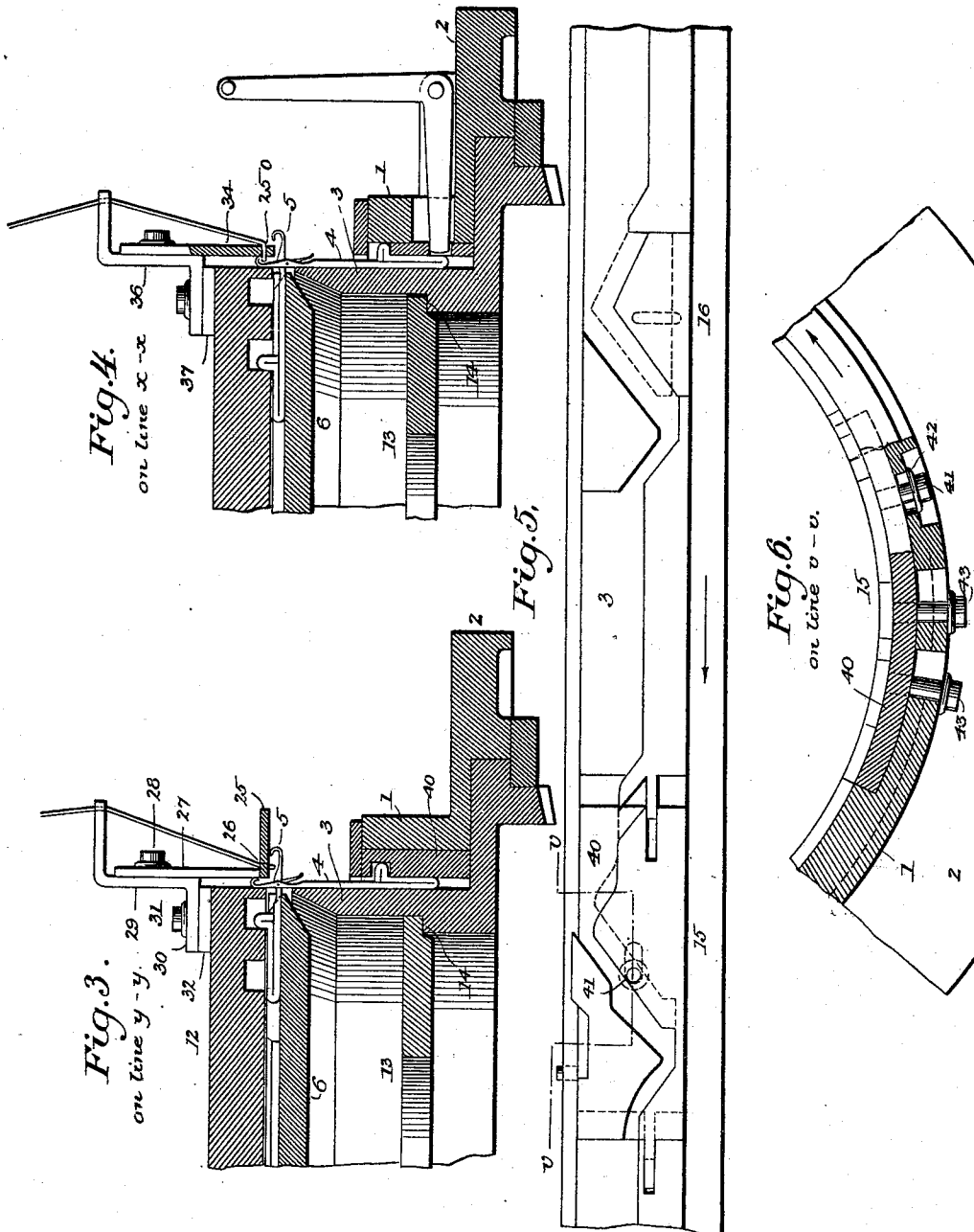
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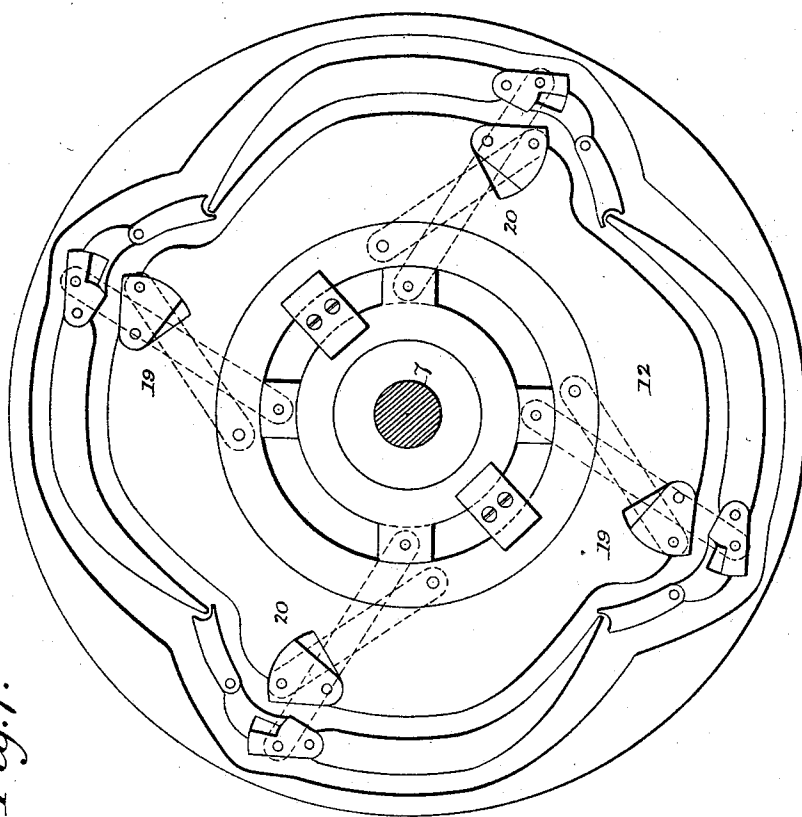


Fig. 7.

Witnesses

Raymond A. Bane
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UNITED STATES PATENT OFFICE.

ARTHUR TOWNSEND, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
NYE & TREDICK, OF SAME PLACE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 539,837, dated May 28, 1895.

Application filed May 21, 1894. Serial No. 512,009. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR TOWNSEND, of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Knitting-Machines, of which the following is a specification.

My invention has reference to circular knitting machines in which two sets of needles, one in a cylinder and the other in a dial, co-operate to produce a tubular ribbed fabric.

The object of the invention is to produce a machine of this character for knitting heavy fabrics such as sweaters.

It has heretofore been proposed to construct a machine for knitting a tubular ribbed fabric of a uniform nature; that is to say, of such structure that the ribs on both sides of the fabric will be alike. This is accomplished by so disposing the two sets of cams for the dial and cylinder needles that both series of needles after having taken up the yarn and formed their respective loops, will cast their stitches simultaneously, the result being that both the dial and cylinder needles act with the same degree of tension on the yarn. In connection with this peculiar arrangement of cams, in the prior construction referred to a work guide is so applied that the tension which the work take-up exerts, will act in such a direction that the stitches of both sets of needles will be affected alike. As a result the fabric produced will be of uniform structure throughout, the ribs on both the inside and outside being the same.

My invention is applicable to a machine of this character and consists, first, in an improved manner of feeding the yarn to the two sets of needles alternately, preferably four yarn guides being employed corresponding to the four sets of stitching cams, the yarn being laid to the dial and cylinder needles alternately, and not alone to the cylinder needles as has been the case heretofore.

The invention further consists in providing the cylinder of knitting machines in which the cylinder needles co-act with dial needles and in which the dial is vertically adjustable with relation to the cylinder, with a circumferentially adjustable cam or cams for the purpose of maintaining the proper relative

movements of the needles irrespective of any variation in the relative position in a circumferential direction of the dial.

The invention also consists in the details of construction and combination of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a top plan view of a knitting-machine having my invention embodied therein. Fig. 2 is a vertical section through the machine on the line *yy* of Fig. 1. Fig. 3 is a vertical section through the yarn-guide for delivering the yarn to the dial-needles on the line *yy* of Fig. 1. Fig. 4 is a similar view through the yarn-guide for the cylinder-needles on the line *xx* of Fig. 1. Fig. 5 is an elevation of the circumferentially-adjustable cylinder-cams. Fig. 6 is a horizontal section through the same on the line *vv*. Fig. 7 is a bottom plan view of the dial-plate.

Referring to the drawings, 1 represents a vertical cylindrical shell fixed to a horizontal annular frame plate 2, suitably supported by standards or otherwise, and constituting the frame of the machine to support the operative parts hereinafter described. Within this cylindrical shell, a vertical rotary needle cylinder 3 is mounted, its lower edge being formed with bevel gear teeth, as usual, which are adapted to be engaged by a suitable driving gear mounted in the frame. The needle cylinder is provided in its outer side with a series of vertical grooves or channels in which are mounted needles 4, reciprocated vertically by appropriate cams on the inner face of the shell. These needles co-operate with a series of horizontal needles 5, mounted in a horizontal dial 6 which is sustained by a central post 7, which in turn receives support from a cross-tree 8, fixed at its ends on the upper ends of two posts 9, rising from the frame plate. The dial rotates on the central post and rests upon a collar 11, fixed to the lower end of the post. Above the dial, a dial plate 12 is mounted on the central post, which plate is formed with a vertical collar encircling the post and fixed thereto by a set screw or by other suitable means. The lower face of the dial plate is provided with appropriate cams to cause the needles to be reciprocated in the proper manner to co-operate with the cylinder needles

and form the stitches. The dial is provided with lugs which are engaged by lugs on the needle cylinder and serve to transmit motion from the needle cylinder to the dial.

5 The foregoing parts may be of the ordinary and usual construction and except in so far as hereinafter indicated, they form no part of the present invention.

The accompanying drawings illustrate my invention as applied to a machine provided with a dial plate having separate cams to be engaged by needles of two forms, substantially as shown in patent to G. E. Nye, No. 498,139, dated May 23, 1893. It is to be understood, however, that my invention is not to be confined in its application to a machine having a dial plate of this particular form, and that it is applicable to machines of other forms in which a single set of dial needles are employed and reciprocated by a single set of cams.

The relative arrangement of the cams of the dial and cylinder is such in the present instance that adjacent needles of the two sets will cast their stitches simultaneously for the purpose, as has been before stated, of equalizing the tension of the needles on the yarn, and in connection with this arrangement of cams a work guide is employed for causing the tension of the take-up to be exerted equally on the stitches of both sets of needles. This work guide is shown in Fig. 3 and is in the form of a ring 13, having a central opening through which the work passes, and which is supported at its peripheral edge on a shoulder 14, projecting from the inner face of the needle cylinder. The inner diameter of this ring is such that the work being engaged by the same, will be deflected from its usual course and be caused to extend from the needles at an angle of about forty-five degrees. In this way the tension on both sets of needles will be the same. This relative arrangement of cams of the dial and cylinder and this work guide is not of my invention, but it is to machines embodying these features that the first part of my invention, namely, the alternate feeding of the yarn to the dial and cylinder needles is applicable.

50 The machine is shown as provided with four sets of stitching cams 15, 16, &c., for the cylinder, which reciprocate the needles at the proper times to correspond with the reciprocations by the four sets of stitching cams 19, 20, &c., for the dial, the yarn being fed by suitable yarn guides at these four points to the needles.

Instead of laying the yarn as heretofore in machines embodying more than one feed, to the cylinder needles only, I provide for the feeding of the yarn alternately to the dial and cylinder needles, for which purpose I employ four yarn guides 21, 22, 23 and 24, two for laying the yarn to the dial needles and the other two for laying the yarn to the cylinder needles. The guides are alternated in position, the yarn being led by the guide 21 first to the

dial needles, then by the guide 22 to the cylinder needles, then by the guide 23 to the dial needles again, and finally by the guide 24 again to the cylinder needles. As a result of this peculiar and novel manner of feeding the yarn, the dial needles first take the thread and draw it around the cylinder needles, which action produces the broad rib or wale on the outside of the fabric. At the next feed the cylinder needles taking the yarn, draw it down around the dial needles which act to draw the ribs close together. A fabric is thus produced with the broad ribs peculiar to sweaters, which ribs are drawn closely together, and will remain in this position when not subjected to a stretching action. The elasticity of the fabric thus formed by feeding the thread alternately to the cylinder and dial needles is greater than that of fabrics produced heretofore in machines where the yarn is fed to the cylinder needles alone.

Each of the yarn guides for feeding the yarn to the dial needles consists of a horizontal plate 25, which is sustained a slight distance above the upper face of the dial, in such position that when the dial needles are projected, they will extend close to the under surface of the plate. The plate is provided near its inner edge with a vertical hole 26 through which the yarn extends to the under side of the plate at which point the dial needles after having been projected, will on being retracted, take the yarn and draw the same around the cylinder needles. This horizontal plate is sustained on the lower end of a vertical plate 27, the upper end of which is provided with a vertical slot through which a set screw 28 extends into a vertical bracket 29. The vertical bracket extends horizontally outward at its upper end and is provided with a vertical perforation through which the yarn extends, while at its lower end the bracket is provided with a horizontal foot 30 having an open slot therein by which it is adjustably secured by a set screw 31 to a plate 32, which is in turn adjustably secured by two set screws 33 to the upper side of the dial plate near its edge, the slots or openings for the set screws 33 extending in a direction to permit adjustment of the plate in a circular direction. From this description it will be seen that the horizontal plate 25 through which the yarn extends and by which it is delivered to the dial needles, is adjustable vertically with respect to the needles by loosening the screw 28. It is further adjustable radially of the dial by loosening the set screw 31, and finally it is adjustable circumferentially by loosening the two set screws 33. I thus obtain a universal adjustment of the guide to meet the various conditions encountered in the operation of the machine.

In addition to serving as a yarn guide, the horizontal plate and its vertical sustaining plate act as a latch opener for the two sets of needles.

Each of the guides for laying the yarn to

the cylinder needles comprises a vertical plate 34, extending a slight distance from the side of the dial plate in such position that as the cylinder needles rise to take the yarn, they will extend closely to the inner side of the vertical plate. The plate is provided with a horizontal hole 250, through which the yarn extends to the inner side of the plate where it is taken by the vertical cylinder needles as they descend and is drawn around the dial needles. The vertical plate is adjustably connected at its upper end to a vertical bracket 36, which is connected adjustably at its lower end to a horizontal adjustable plate 37 located near the edge of the dial plate, the details for effecting the adjustment of the parts being identical with those described in connection with the guide for the dial needles. The vertical plate 34 serves also as a latch opener for the dial and cylinder needles as in the case with the yarn guide first described.

It will, of course, be understood that other forms of guides for alternately laying the yarn to the dial and cylinder needles may be employed without departing from the limits of my invention, those shown however being effective and of the form I prefer to use. The essence of the invention in this regard resides in the feeding of the yarn alternately to the dial and cylinder needles, as distinguished from the feeding of the yarn to the cylinder needles alone, and this irrespective of the particular form of the guides for effecting this feeding.

In circular knitting machines of the present general form, it is the practice to provide for the vertical adjustment of the dial and dial plate with respect to the cylinder for the purpose of changing the distance between the two sets of needles to modify the character of the stitch, or for other purposes. This adjustment is effected as shown in the drawings, more particularly Fig. 2, by forming on the upper end of the central post 7 carrying the dial and dial plate, a screw thread on which a hand nut 38 is screwed, the lower face of the nut abutting against the upper face of the cross tree at its center. By turning the hand nut, the central post, the dial, and dial plate will be lifted vertically bodily after which they can be held by a set screw 39, extending through the cross tree and bearing against the post.

The successful operation of the machine in the production of the fabric which it is intended to produce requires that adjacent needles of the two series shall cast their stitches simultaneously, or as nearly so as possible, and therefore the dial plate and cam cylinder are adjusted relatively to each other to bring their cams into harmonious relation to produce this effect. Manifestly the circular shifting of either the cylinder or dial plate would destroy this harmonious relation and affect the operation of the machine, and therefore, with the view of compensating for such shifting, and of maintaining a proper relation

of the operating cams, I provide for the bodily movement of the stitching cams for the cylinder circumferentially with respect to the cylinder and in this manner compensate for or counteract the effect of the circular shifting of the dial plate or of the cam cylinder relatively to each other.

The effect of the bodily movement of the cylinder cams is not to vary the throw of the needles, but to vary the point or time at which they will ascend and descend to co-operate with the dial needles, so that no matter what the position of the dial cams may be, the cylinder cams may be adjusted to maintain the proper relation between the two sets of cams to cause the needles of the two series to coact as above set forth.

On reference to Figs. 5 and 6, it will be seen that the stitching cams 15 are mounted on a plate 40, which is seated in a recess formed in the inner face of the cylindrical shell. The recess is longer than the plate to admit of the circumferential movement of the latter to a limited extent. The plate is retained in the recess and moved when the occasion may require by a screw 41, which extends through a horizontal slot in the cylinder into the plate, the screw being provided with a washer 42, engaging on opposite sides of the slot and serving to prevent the radial movement of the plate at the same time admitting of its circumferential movement. I provide other screws 43 to assist in adjusting and holding the plate after it has been properly set. From this description it will be seen that when in practice it is desired to effect the movement of the cylinder cams to compensate for any change in the movement of the dial cams circumferentially, it will be but necessary to loosen the screws, shift the plate carrying the cams slightly, and thereafter tighten up the screws to hold the plate in its adjusted position.

While in the present instance I have shown my improved circumferentially adjustable cams as applied to the cylinder, it is to be understood that the dial cams could be made adjustable with relation to the dial to effect the same end. I prefer, however, to make the cylinder cams adjustable as has been described and while such construction is claimed, it is the intention to cover the application of the cams to the dial as well.

In the present instance in the machine shown in which four feeds are employed, it is but necessary to make two sets of the cylinder cams adjustable, those corresponding to the feeds for the dial needles. The other two sets of cams may be fixed with respect to the cylinder. This part of my invention is not to be confined in its application to machines of the character described, but is applicable to all machines which employ a dial and a cylinder and in which the dial is vertically adjustable with respect to the cylinder.

While in the drawings is shown a machine having four feeds corresponding to the four

sets of cams, and while my improved manner of feeding the yarn alternately to the dial and cylinder needles is described as being applied to a machine of this character, it will be understood that it is applicable also to machines having a greater or less number of feeds and the claims are not to be limited to a four feed machine, the essence of the invention in this regard residing in the feeding of the yarn alternately to the dial and cylinder needles, as distinguished from the feeding to the cylinder needles alone, irrespective of the number of feeds with which the machine is provided.

Having thus described my invention, what I claim is—

1. In a knitting machine the combination with the needle cylinder, its needles, and the dial and its needles, of means for laying the yarn to the dial and cylinder needles alternately in each revolution of the machine both sets of needles being in action at each feed of the yarn.

2. In a knitting machine the combination with the dial, the needle cylinder and the needles therefor, of four sets of stitching cams for the needles, four yarn guides arranged at equal distances around the machine for laying the yarn to the needles, the opposing guides constructed to lay the yarn respectively to the dial and cylinder needles alternately.

3. In a knitting machine employing a plurality of feeds the combination with the dial, the needle cylinder and their needles, of the cams arranged to cause the needles to cast their stitches simultaneously, a work guide for equalizing the tension of the work on both sets of needles, and means for laying the yarn to the dial and cylinder needles alternately.

4. In a knitting machine the combination of the dial, the needle cylinder and the dial and cylinder needles, the yarn guides, one of said guides comprising a horizontal plate with a vertical guide leading beyond to the dial needles, and the other comprising a vertical plate with a horizontal guide for leading the yarn to the cylinder needles each of said guides being sustained in constant relation to the needles supplied thereby and both sets of needles being in action at each feed of the yarn.

5. In a knitting machine the combination with the dial, the needle cylinder and the dial and cylinder needles, of yarn guides for the respective needles, one of said guides having a vertical guiding opening for laying the yarn to the dial needles, and the other having a

horizontal guiding opening for laying the yarn to the cylinder needles each of said guides being sustained in constant relation to the needles supplied thereby and both sets of needles being in action at each feed of the yarn.

6. In a circular knitting machine the combination of the dial and its needles, the cylinder and its needles, cams for operating the two sets of needles disposed relatively to each other to cause adjacent needles in the two sets to cast off simultaneously, or substantially so, and thread guides constructed and arranged to supply the two sets of needles alternately, both sets of needles being in action at each feed of the yarn.

7. In a knitting machine the combination of the dial, the needles therefor and the stitching cams, the needle cylinder, its needles and the circumferentially adjustable stitching cam for the cylinder.

8. In a knitting machine the combination with the needle cylinder and its needles, of the vertically adjustable dial and needles, the said dial being so mounted that its vertical adjustment is capable of moving the same circumferentially, and the circumferentially adjustable stitching cam for the cylinder; whereby the said circumferential movement of the dial may be compensated for by the adjustable stitching cam to preserve the proper relative positions of the two sets of needles.

9. In a knitting machine the combination with the rotary needle cylinder and fixed cylindrical shell, of the circumferentially adjustable stitching cam mounted in said shell, the vertically adjustable dial and dial plate, and the rotary dial vertically adjustable with respect to the needle cylinder, the said parts being so mounted that their vertical adjustment is capable of moving the same circumferentially;—whereby this movement of the dial may be compensated for by the adjustable cam to preserve the proper relative positions of the two sets of needles.

10. In a knitting machine the combination with the dial, of the rotary needle cylinder, the needles therein, the cylindrical shell provided in its inner side with a recess, the plate mounted in said recess and circumferentially adjustable, and the cams fixed to the plate.

In testimony whereof I hereunto set my hand this 24th day of April, 1894, in the presence of two attesting witnesses.

ARTHUR TOWNSEND.

Witnesses:

JOHN C. BREWIN,
LAURA L. MULLINER.