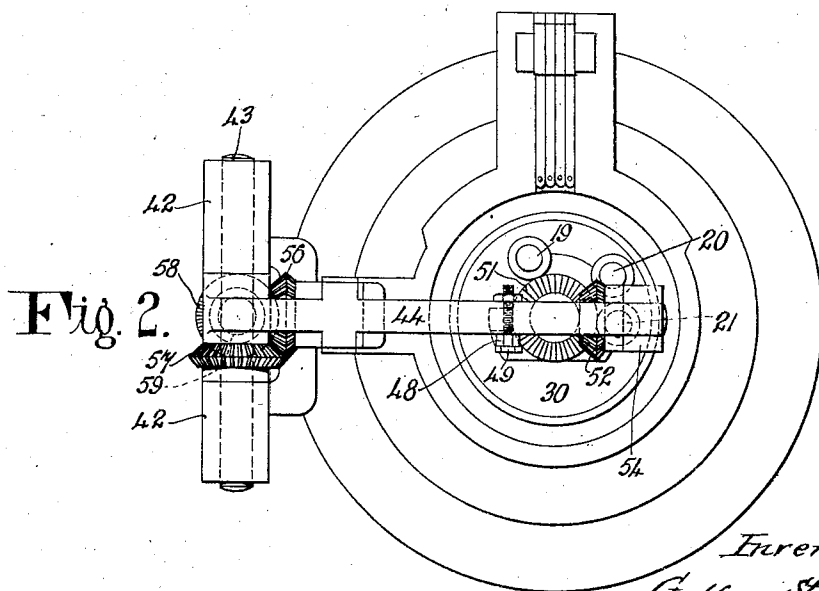
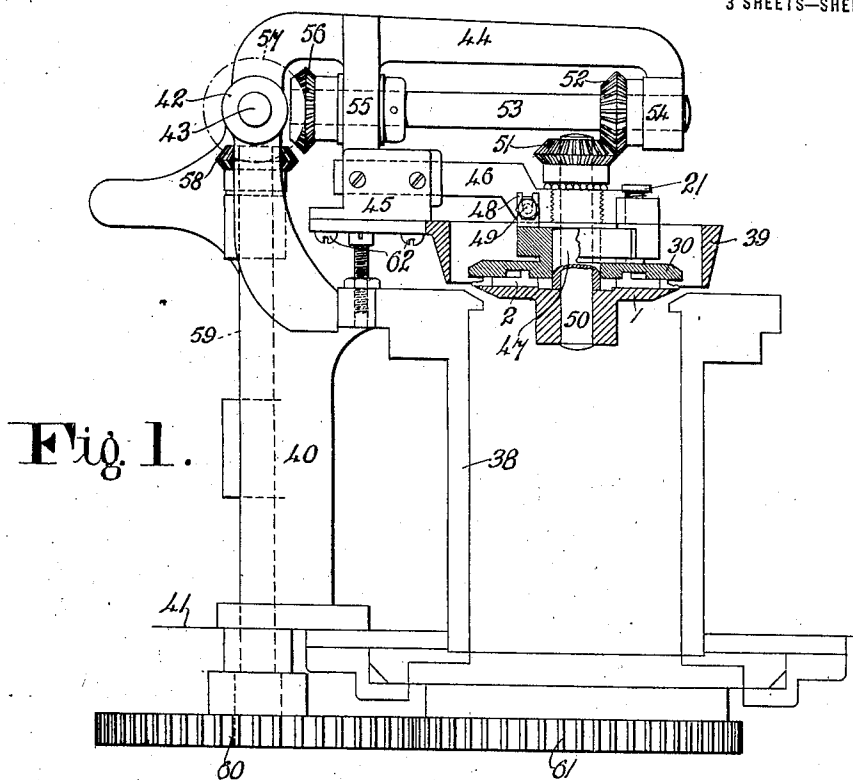


1,361,291.

G. STIBBE.
CIRCULAR KNITTING MACHINE.
APPLICATION FILED JUNE 27, 1917.

Patented Dec. 7, 1920.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

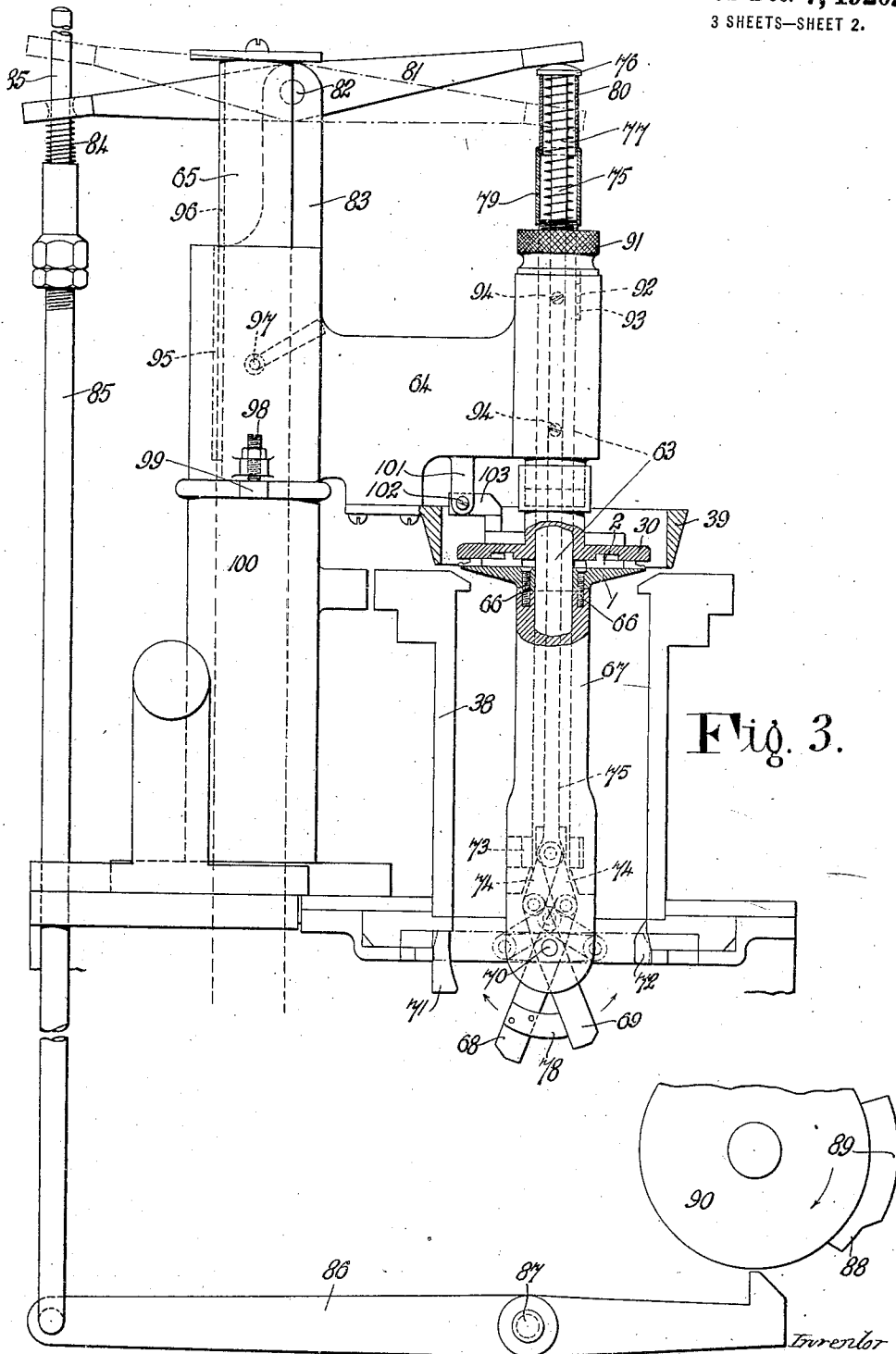


Fig. 3.

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3 SHEETS—SHEET 3.

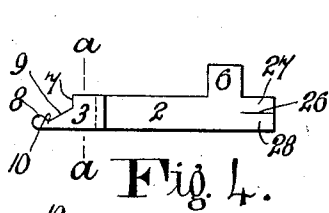


Fig. 4.

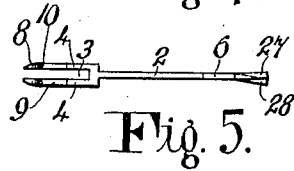


Fig. 5.

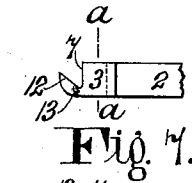


Fig. 7.

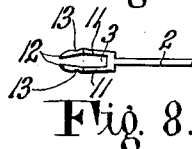


Fig. 8.

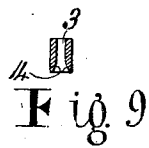


Fig. 9.

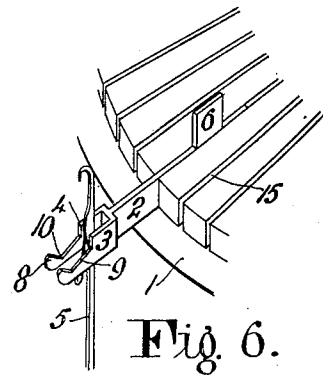


Fig. 6.

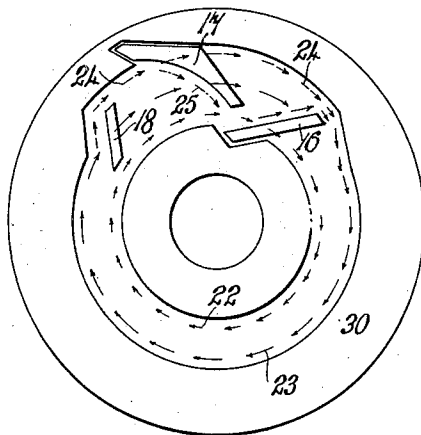


Fig. 10.

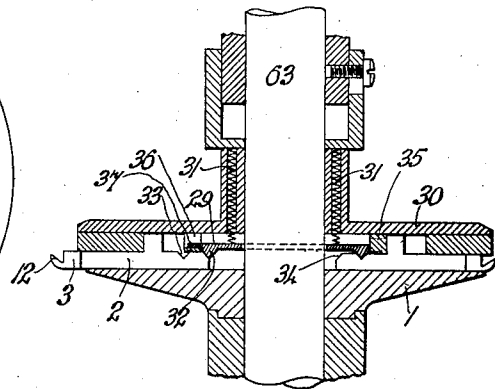


Fig. 11.

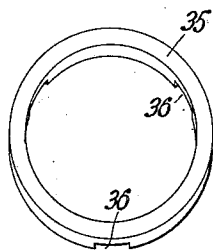


Fig. 13.

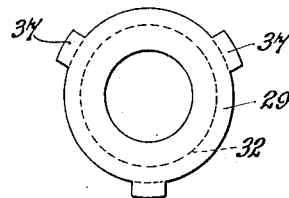


Fig. 12.

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UNITED STATES PATENT OFFICE.

GODFREY STIBBE, OF LEICESTER, ENGLAND.

CIRCULAR-KNITTING MACHINE.

1,361,291.

Specification of Letters Patent.

Patented Dec. 7, 1920.

Application filed June 27, 1917. Serial No. 177,267.

To all whom it may concern:

Be it known that I, GODFREY STIBBE, subject of the King of Great Britain, residing at Leicester, in the county of Leicester, Eng-

land, have invented certain new and useful Improvements in or Relating to Circular-Knitting Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to circular knitting machines and more particularly though not exclusively those of the kind employed for the production of seamless hose and half hose.

The invention concerns latch needle machines equipped with means for retaining or holding up certain loops and afterward transferring them to the needles such for example as for the purpose of forming turned welts.

Machines of this class are sometimes furnished with a dial, carrying needles, jacks or points for holding up and transferring the loops, and the present invention contains improved means of this character as will be hereinafter described.

When latch needles have been used in the dial, difficulty has been experienced in insuring that the latches shall be turned back to enable the needles to receive thread in the case where the initial courses of the article are set up on empty needles. Again when jacks or points have been used instead of needles in the dial it has, in most cases, been found necessary to employ in conjunction with these devices, subsidiary means to prevent displacement of the loops from said devices seeing that the latter have of necessity been of such form as will allow them to cast off the retained loops when they have been subsequently retracted.

The present invention makes use of devices in the dial which for loop retaining purposes combine the advantages of the needle and jack or point without the disadvantages of these articles. That is to say, the improved loop holding device is constructed to hold a loop without requiring the aid of any subsidiary means and it also resembles a jack in that it is without a latch.

The loop retaining members are slidable in radial tracks in a dial and the present invention includes means for preventing free movement of said members.

In circular knitting machines of the type having a rotating needle cylinder, when a dial carrying loop retaining and transferring members is provided as herein described, it is obviously necessary that the dial shall rotate in company with the needle cylinder at such times as loop retaining and transferring is to take place even if it does not do so at others. An important feature of the present invention is the provision of means for driving the dial and maintaining the correct correlation between the dial and cylinder during the time these parts are working together.

These and other improvements will be fully described with reference to the accompanying drawings wherein:—

Figure 1 is a side elevation (partly section), and Fig. 2 is a plan of the upper part of a circular knitting machine provided with an improved arrangement of dial supporting and driving means.

Fig. 3 is a sectional elevation showing a modified form of dial supporting and driving means.

Fig. 4 is an elevation and Fig. 5 is a plan showing one form of loop retaining and transferring instrument for use in the dial.

Fig. 6 is a fragmentary perspective view showing the loop retaining and transferring instrument in position in the dial.

Fig. 7 is an elevation and Fig. 8 is a plan showing a modified formation of the head end of the loop retaining and transferring instrument.

Fig. 9 is a cross section taken on the lines *a—*a** of Figs. 4 and 7.

Fig. 10 is an underside face view of the cam cap of the dial and shows the cams for operating the sliding loop retaining and transferring instruments.

Fig. 11 is a vertical section of the dial and cap and shows means covered by this invention for retarding the movements of the instruments.

Fig. 12 is a plan of the retarding ring.

Fig. 13 is a perspective underside view of an annulus for retaining the retarding ring in position on the dial cap.

The loop retaining and transferring instruments are carried in a dial 1 and according to this invention these instruments may consist of a jack (Figs. 4 and 5) comprising a shank 2 having a bifurcated head 3 be-

tween the limbs 4 of which the coöperating cylinder needle 5 rises as indicated in Fig. 6. The shank 2 is furnished with a butt 6 to be acted upon by the cams on the dial cap and each limb 4 of the head 3 is formed with a shoulder 7 to engage the thread and carry it forward when the jack moves outward. To prevent the thread or loop from slipping off the jack, each limb 4 terminates in a formation which while it serves the same purpose as a hook or equivalent, nevertheless, avoids an open hook formation and instead consists of a raised, rounded, ball-shaped or similar end such for example as the end 8 which is sufficiently hook-like to retain the thread or loop behind it for the purpose of holding up the thread or loop, but will, when necessary, allow said thread or loop to slip thereover without requiring the assistance of any subsidiary device or means such as a latch or guard.

The upper edge of each limb 4 may be upwardly inclined at 9 from the terminal enlargement 8 to the shoulder 7 such inclines tending to throw the thread or loop forward to the point 10 so that the cylinder needle can rise behind it.

According to a modification of the jack, the bifurcated head may be provided with loop or thread supporting limbs of the form shown in Figs. 7 and 8 in which construction the limbs 11 are upwardly and forwardly inclined direct from the shoulders 7. The thread or loop is supported at the point 12 and in order to obviate expanding the loop laterally the outside faces of the limbs 11 may be hollowed, recessed or grooved vertically as shown at 13.

The inner sides of the limbs of both the forms of jack hereindescribed may be beveled as shown at 14 in Fig. 9, thereby providing a bifurcation which is flared or enlarged at the underside to facilitate the entrance of the cylinder needle between the limbs of the head.

The jacks are arranged to slide in radial tricks 15 in the dial 1 (Fig. 6), and it will be understood that the thread or loop to be transferred is supported bridge-like across the limbs of the bifurcated head so that after the jack has been advanced, the cylinder needle can rise between the limbs behind the thread or loop which, when the jack is retracted, is slipped off the limbs over the extremities thereof and retained on the cylinder needle.

A convenient arrangement of cams for actuating the jacks in the dial is shown in Fig. 10, the tracks of the butts 6 being indicated by the arrows. The cams 16, 17 and 18 are plunger cams and normally raised above the butts being held up out of action by spring actuated plungers 19, 20 and 21 respectively (Figs. 1 and 2.) These plungers are depressed to bring the respective

cams into action this operation being performed by suitable intermediate means from a controlling drum or pattern mechanism (not shown). When out of action the jack butts follow the course 22 in which case the jacks are right in. When the cam 16 comes into action the butts follow the track 23 in which case the sliding jacks are all moved forward to the back of the cylinder needles in preparation for forming a setting-up course. The cam 18 operates to move the jacks to their most forward position the butts following the track 24, while for transferring the held up loops from the jacks to the cylinder needles, the cams 18 and 17 operate, the cam 18 moving the jacks right out as aforesaid and the cam 17 causing the butts to follow the track 25 whereby the jacks are withdrawn to the normal inward position so that they leave their loops on the cylinder needles which prior to the withdrawal have risen behind the loop as already described.

To prevent free movement of the jack within the trick, the tail end of the shank 2 may be split horizontally and longitudinally as shown at 26 (Fig. 4), the upper and lower portions 27, 28 of the tail thus formed being bent laterally in opposite directions as shown in Fig. 5 whereby they may frictionally engage the opposite sides or walls of the trick for the purpose stated.

Alternatively to the method just described, other means may be employed for retarding the sliding movements of the jacks in the dial said means being of such a character that while they operate to prevent free movement of the jacks to such an extent that the latter are always under control, undue friction is avoided so that undesirable strain upon the cams and butts is not engendered. This feature, which is found particularly advantageous when jacks of the kind previously described herein are used but is not exclusively applicable to these, comprises a ring 29 (Figs. 11 and 12) suitably arranged in the dial cap 30 and having combined with it springs 31 which serve to press it downward toward the dial 1. The ring 29 is situated over the tail ends of the shanks 2 of the jacks and is pressed into contact with the same so as to frictionally retard them when they slide radially in the dial. For the purpose of more definitely holding the jacks in the inner and outer positions the ring 29 has an annular projection 32 of V shape, semi-circular section or other appropriate form adapted to engage with correspondingly shaped notches 33 in the shanks or tails of the jacks, said projection being caused to enter such notches by the pressure of the springs 31 as the jacks are brought into the proper position to be so engaged. It will be understood that the ring 29 is capable of a lift-

ing movement above the jacks and the engagement of the projection 32 with the shanks is such that when the jacks are moved by their cams the projection will
 5 be forcibly raised by the movement of the shanks thereunder. Conveniently the shanks may have a single notch 33 to be engaged by the projection 32 to hold the jacks in the inner position as shown on the
 10 right hand side of Fig. 11, said projection 32 dropping behind the tail end of the shank to hold the jack in the outer position as shown on the left hand side of said figure. The tail end of the shank is beveled or inclined at 34 to enable it to raise the pro-
 15 jection to pass under same when the jack is moved inward.

The retarder ring 29 is mounted on the dial cap 30 by means of an annulus 35
 20 (Figs. 11 and 13) this being secured to the underside of the cap and having a number of gaps 36 formed therein. The ring 29 has a number of lugs 37 projecting from its periphery said lugs being received in the
 25 gaps 36 as shown in Fig. 11. The engagement of the lugs 37 with the gaps 36 prevents relative turning movement between the ring and dial cap the said gaps however, being made deep enough to admit of the
 30 rising and falling movements of the ring 29 taking place. The annular projection 32 engaging the jacks may act as a concentric cam race and replace such usual part on the dial cam cap.

As previously stated herein, in circular
 35 knitting machines having a revolving needle cylinder, the dial must at times rotate in unison with the cylinder. Particularly in fine gauge machines is it essential
 40 that the correct correlation between the dial and cylinder should be maintained to insure that when the cylinder needles rise, the jacks will be in proper position to enable the held up loops to be taken by the said
 45 needles.

An important feature of this invention therefore is the provision in conjunction with the aforesaid loop holding and transferring means of an improved arrange-
 50 ment of mechanism for imparting the requisite rotation to the dial and insuring the maintenance of a proper correlation between the dial and cylinder, such mechanism nevertheless permitting the dial and latch
 55 ring to be raised from position over the cylinder when necessary.

In one form of the improved means for supporting and driving the dial an important advantage is obtained in that while
 60 the dial and latch ring are movable to and from the operative position over the cylinder, such bodily displacement of the said parts does not disturb the correlation of the dial and cylinder seeing that the con-
 65 necting driving elements between said cylin-

der and dial remain in constant mesh, thus no setting of the dial in relation to the cylinder or mating of gears is necessary after each displacement of the dial and latch guard.

The form of mechanism just referred to is illustrated in Figs. 1 and 2 where 38 is the needle cylinder mounted and driven in the usual manner. For supporting the dial 1, cam cap 30 and latch ring 39 there is pro-
 70 vided a post or stand 40 rigidly attached to the bed 41 of the machine and provided at the top with bearings 42 in which a rod 43 is rotatable and has attached to it an arm 44. Adjustably mounted in a depend-
 80 ent bracket 45 on the arm 44 is a support 46 fitted with a sleeve 47, upon which the dial cap 30 fits and is held against rotary movement by the engagement of an upstand-
 85 ing lug 48 thereon with an adjusting screw 49 in the support 46. This screw 49 provides for rotative adjustment of the cam cap relatively to the needle cylinder. The dial 1 is fast with a short vertical spindle
 90 50 rotatable in the sleeve 47 and furnished at its upper end with a bevel wheel 51 which gears with a companion wheel 52 on a horizontal shaft 53 arranged in bearings 54, 55 on the arm 44. The horizontal shaft 53 is
 95 driven by bevel gears 56, 57 the latter running loose on the aforesaid rod 43 and being driven by a companion wheel 58 on a vertical shaft 59 which is suitably mounted and receives motion from the cylinder by means of gear wheels 60, 61.

The whole of the driving mechanism is arranged to rotate the dial 1 in strict time with the cylinder 38, and by means of the rod 43 which constitutes an axle in the bearings 42, the arm 44 and all the parts carried
 105 thereby may be raised from the operative position, the said rod turning in the bearings 42. As the bevel wheel 57 is arranged on the axle rod 43, this wheel and the wheel 56 do not disengage when the arm is raised
 110 and if while the arm occupies the raised position the cylinder is turned or the machine run, the dial will come into proper relation with the cylinder when the arm is again lowered seeing that the driving mechanism
 115 remains constantly in gear. The latch ring 39 is attached to the bracket 45 by screws 62 and is thereby raised and lowered with the arm and dial.

The arrangement of mechanism just de-
 120 scribed may be modified without departing from the principle involved.

In a modified form of means for supporting and driving the dial illustrated in Fig. 3 a what may be called "solid drive" is ob-
 125 tained between the needle cylinder and dial thereby eliminating practically entirely any possibility of variation between these parts during rotation. In this arrangement the dial may be disconnected from the cylinder
 130

when not required but provision is made whereby whenever the dial is coupled up with the cylinder the relationship between the cylinder and dial will always be the same so that the needles in the cylinder will always cooperate with the same loop holding and transferring instruments in the dial.

In this modified arrangement the rotary drive is transmitted from the needle cylinder to the dial by means of dogs on the latter which engage with lugs or projections on the cylinder, said dogs being so arranged as to be capable of disengagement from the driving lugs to put the dial out of action and also provide space for the passage of the knitted fabric through the cylinder.

In the illustrated embodiment (Fig. 3) the dial 1 is mounted upon a vertical spindle or axle 63 supported by an arm 64 or other fitment from a rigid post 65 on the machine frame the dial being capable of rotation on the spindle 63. Dependent from the dial and attached thereto by screws 66 is a tubular sleeve 67 which extends through the needle cylinder 38. The sleeve carries at its lower end a pair of dogs 68, 69 arranged upon a pin 70 and adapted to move outward to a radial position (indicated by dotted lines) so that their ends come into engagement with lugs or projections 71, 72 respectively on the inside of the needle cylinder or some convenient part attached thereto. The contactual engagement between the lugs or projections in the needle cylinder with the dogs on the dial sleeve causes the dial and sleeve to rotate with the cylinder.

Preferably the lugs or driving projections in the needle cylinder are situated at or below the bottom end of the same so that when the dogs 68, 69 are in engagement therewith there will be sufficient space left in the cylinder between the dogs and the needle to accommodate the welt or other tubular fabric which it may be necessary to form while the engagement between the dogs and driving lugs is maintained. It will be understood however, that by mounting or forming the driving lugs on a suitable lower extension of the needle cylinder and providing the dial with a dependent sleeve of corresponding length, the driving connecting means between the cylinder and dial may be situated so remotely from the needles as to provide any reasonable amount of space that may be desired for the purpose of receiving the fabric.

The spindle or axle 63 is stationary and the sleeve 67 rotates upon a collar 73 fixed to the said axle the portion of the sleeve situated below the collar being bifurcated to receive the dogs and provide the necessary space for their movement upon the pin 70 to take place. The dogs consist of a pair of levers arranged scissorwise and actuated

by links 74 connected to one end thereof, the opposite ends of the links being connected to the lower end of a rod 75 passing through and slidable within the spindle or axle 63. Arranged between the upper end of the axle 63 and a washer 76 on the end of the rod 75 is a compression spring 77 which normally holds the rod raised and by the pull of the latter upon the links 74 the dogs 68, 69 are caused to assume the inoperative position indicated by full lines. An endwise downward movement of the rod 75 within the axle 63 straightens out the dogs and brings them to the outward radial position for their ends to engage the driving lugs or projections of the cylinder.

The driving lugs or projections and the dog levers are positioned diametrically on opposite sides of the center thus obtaining an equal and square drive, and in order to insure that whenever driving connection is made each dog shall be engaged by the same respective lug whereby the dial will always bear the same circumferential relation to the cylinder when they are cooperating, the lug or projection 71 is made longer than the other and the respective dog 68 is also made longer. The actuating rod 75 is first given sufficient movement to bring the long dog 68 into the path of the long lug 71 and after these members are in engagement, a further movement of the rod 75 brings the short dog 69 into engagement with the short lug 72. To prevent the dogs and the connected links 74 straightening out when closed and forming a dead center, a short arm 78 on one dog makes contact with the other dog to limit the closing of these members. The spring 77 is preferably inclosed within a telescopic housing comprising a part 79 attached to the axle 63 and a part 80 attached to the washer 76.

The actuating rod 75 is operated conveniently by a rock lever 81 pivotally mounted by a pin 82 in an upstanding bracket 83 on the arm 64. One end of the rock lever presses upon the upper end of the rod 75 while the opposite end of said lever is pressed upward by a spring 84 adjustable upon a rod 85 which passes through a hole in the rock lever and is attached at its lower end to a lever 86 fulcrumed upon a pin 87 on the machine frame. The lever 86 is actuated by cams 88, 89 on a rotating pattern drum 90, the cam 88 effecting an actuation of the rod 75 to cause the long dog 68 and lug 71 to engage after which the cam 89 brings about a further actuation of the rod 75 to completely straighten out the dogs 68, 69 to the operative position wherein they both engage with their respective lugs. Upon the release of the lever 86 by the cam 89 the spring 77 restores the dogs to the inoperative position.

It will be understood that when the dial

is being used the drive is transmitted thereby by the direct contact of the driving lugs with the dogs and the tubular fabric produced is allowed to accumulate above the dogs. When the dial is not being used the dogs are closed (full line position in Fig. 3) and thereby disengaged from the lugs in which case the fabric passes down between the dogs and lugs. The driving lugs or projections may be adjustable circumferentially in order that the position of the dial may be altered rotatively in relation to the needle cylinder if necessary.

The vertical spindle or axle 63 supporting the dial 1 and sleeve 67 also carries the dial cap 30 and is adjustable vertically within the arm 64, as for example by means of a collar 91 screw threaded on the upper end of the axle and resting on the top of the arm. By rotating the collar 91 the axle 63 is adjusted vertically to vary the vertical relationship of the dial to the needle cylinder. To prevent rotation of the axle in the arm it may have a key 92 which engages with a keyway 93 in the arm, and the axle may be fastened in the arm after adjustment by one or more screws 94. To enable the dial to be lifted clear above the cylinder, the arm 64 is movable up and down the post 65 said arm being prevented from turning by a key 95 which coöperates with a keyway 96. By means of a locking screw 97 in its side the arm may be fastened in the normal operative position on the post or in the raised inoperative position, the normal position being determined by the contact of an adjusting screw 98 on the arm with a lug 99 on the fitment 100 which supports the post 65. The screw 98 provides for the vertical adjustment of the arm while, as aforesaid, the collar 91 provides for the vertical adjustment of the dial.

It will be understood that when the arm 64 is moved upward on the post 65 it raises with it the axle 63 and all the parts carried thereby as well as the lever 81 which latter moves up the rod 85. The arm 64 also carries the latch ring 39 and is furnished with a bifurcated lug 101 provided in each side with a screw 102. A short arm or extension 103 on the dial cap 30 is situated between the two screws 102 and rotation of the dial cap is thus prevented, while the screws 102 provide for rotative adjustment of the dial cap with respect to the cylinder needle cams.

The friction between the butts of the sliding jacks and the cams may be relied upon to retard the rotation of the dial sufficiently to prevent backlash when gears are used to drive the dial, and to keep the dogs in contact with the driving lugs when this form of drive is employed or a suitable brake may be provided to act upon the dial for the same purpose.

What I claim then is:—

1. For a knitting machine a loop holding and transferring instrument comprising a shank, a bifurcated head thereon, each limb of said head having a shoulder and terminating in a loop holding part, and the outside faces of said limbs being hollowed vertically in the region just in front of the shoulder, for the purpose described.

2. For a knitting machine a loop holding and transferring instrument comprising a shank a bifurcated head thereon, each limb of said head having a shoulder and terminating in a loop holding part, the inner sides of said limbs being beveled and the outside faces thereof being hollowed vertically in the region just in front of the shoulder, for the purpose described.

3. In a circular knitting machine a dial, loop holding and transferring jacks slidable radially therein, means to operate said jacks, and a spring pressed ring engaging said jacks to frictionally retard their movement in the dial.

4. In a circular knitting machine, a dial, loop holding and transferring jacks slidable radially therein, means to operate said jacks, a spring pressed ring situated over said jacks, and an annular projection on said ring adapted to engage said jacks and frictionally retard their movement and to enter a notch in said jacks to hold them in a definite position in the dial.

5. In a circular knitting machine, a dial, loop holding and transferring jacks, slidable radially therein, means to operate said jacks, a spring pressed ring situated over said jacks, and an annular projection on said ring adapted to engage said jacks and frictionally retard their movement and to enter a notch in and fall behind the end of said jacks to hold them in definite positions in the dial.

6. In a circular knitting machine, a dial, loop holding and transferring jacks slidable radially therein, a dial cap, cams on said cap to operate the jacks, a spring pressed ring situated over said jacks and adapted to frictionally retard the movement of same in the dial, an annulus attached to the dial cap and provided with recesses therein, and lugs on the retarder ring engaging said recesses in the annulus.

7. In a circular knitting machine, in combination, a rotary needle cylinder, a rotary dial, supporting means for the dial which permit movement thereof to and from an operative position in relation to the cylinder, driving means between the cylinder and dial for rotating the latter in company with the cylinder, said means being self-registering to obtain and maintain the correct operative correlation between the needle cylinder and dial irrespective of movement of the latter from and to the said operative position, loop

holding and transferring jacks radially in said dial and means to operate said jacks.

8. In a circular knitting machine, in combination, a rotary needle cylinder, a rotary dial, supporting means for the dial which permit movement thereof to and from an operative position in relation to the cylinder, driving means between the cylinder and dial consisting of dogs on the latter which are movable into and out of contactual engagement with lugs in the cylinder, said dogs and lugs being self-registering to obtain the correct operative correlation between the needle cylinder and dial when moved into engagement and automatic means for effecting the movement of said dogs to and from such engagement.

9. In a circular knitting machine, in combination, a needle cylinder, a fixed post, an arm movable up and down said post, a dial rotatably supported by said arm, a sleeve fast with said dial and extending within the cylinder, movable dogs carried by said sleeve, lugs in the cylinder, and means to

move the dogs into and out of engagement with the lugs.

10. In a circular knitting machine, in combination, a needle cylinder, a fixed post, an arm movable up and down said post, a dial rotatably supported by said arm, a sleeve fast with the dial and extending within the cylinder, pivoted dogs carried by said sleeve, an endwise movable rod and links connecting the same with the dogs, a spring to move said rod in one direction, a lever carried by said arm to move the rod in the other direction, pattern mechanism for moving said lever whereby the dogs are opened and closed, and lugs in the cylinder to make contactual engagement with the dogs and impart rotation to the dial.

In testimony whereof I affix my signature in presence of two witnesses.

GODFREY STIBBE.

Witnesses:

R. D. C. TAYLOR,
GEORGE LESTER.