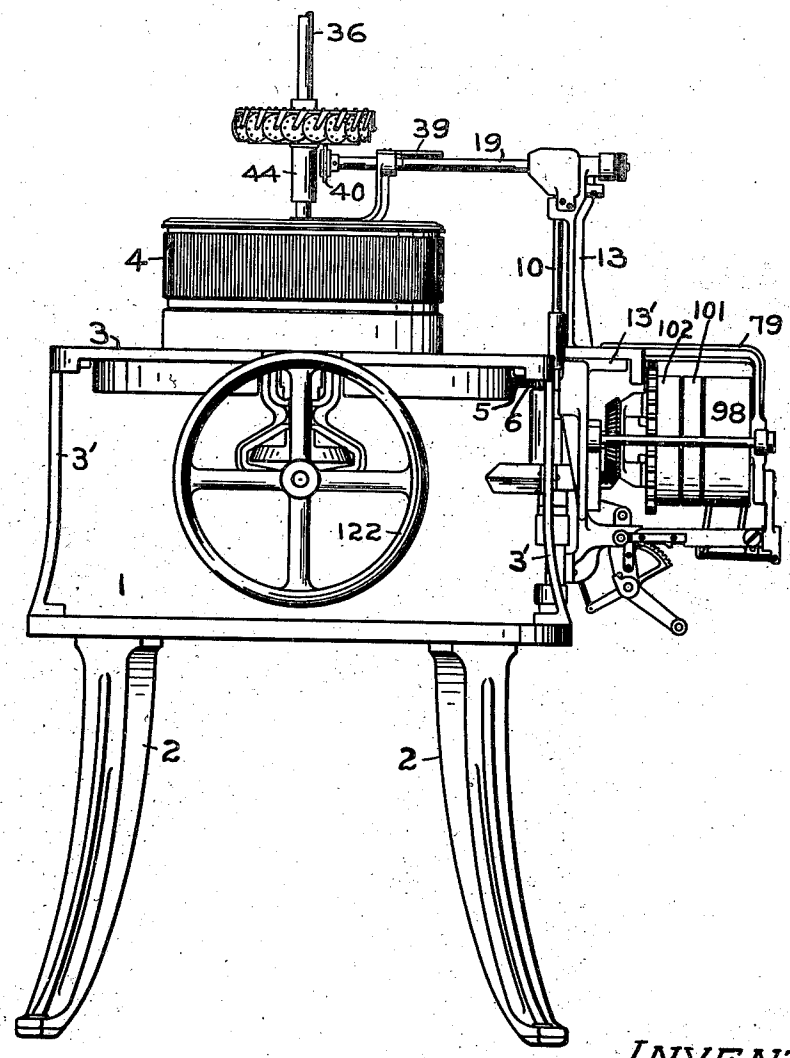
March 1, 1938. R. H. LAWSON 2,109,945

INDICATING MEANS AND METHOD FOR KNITTING OR OTHER MACHINES

Original Filed March 28, 1933 5 Sheets-Sheet 1

FIG. 1.



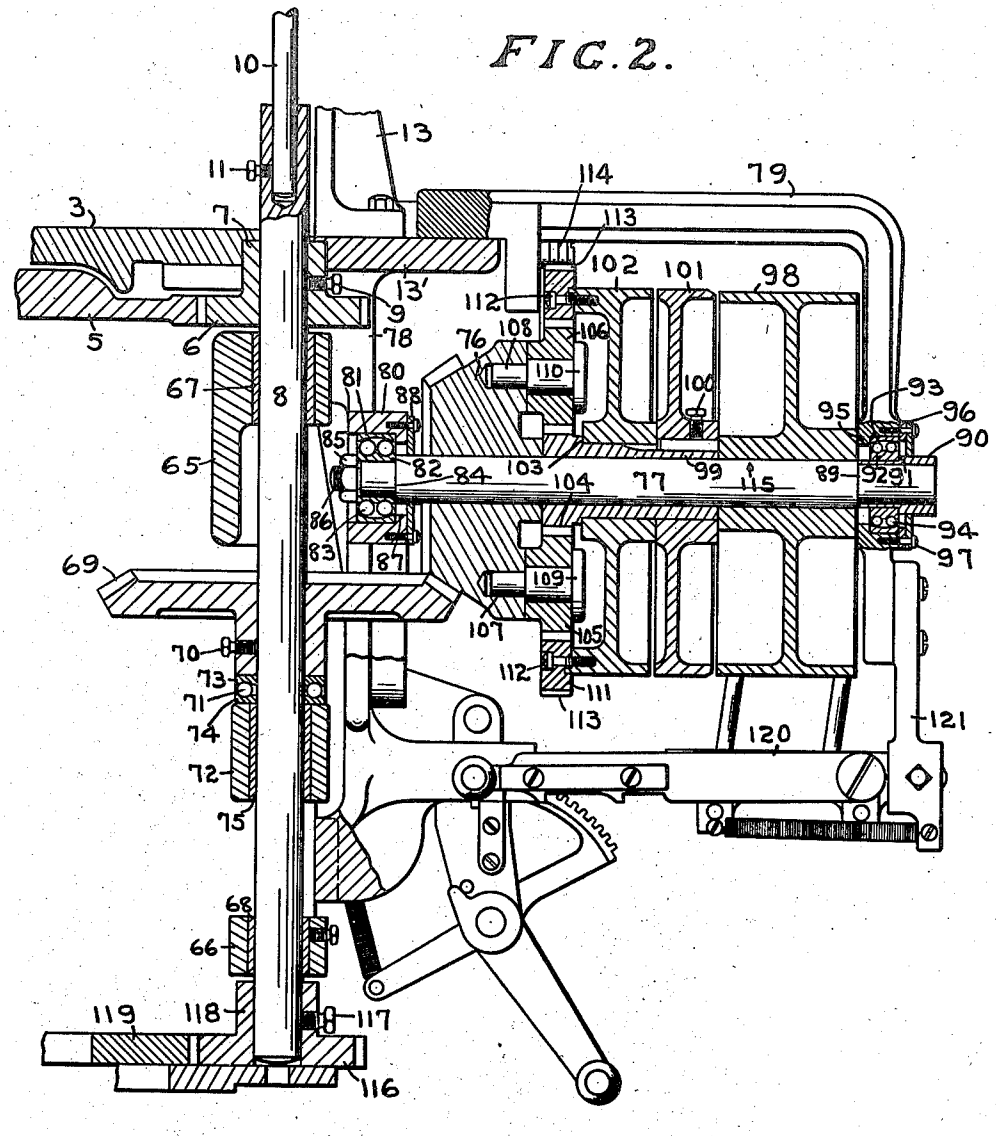
INVENTOR:
ROBERT H. LAWSON,
By Roy F. Lovell,
ATT'Y.

March 1, 1938. R. H. LAWSON 2,109,945

INDICATING MEANS AND METHOD FOR KNITTING OR OTHER MACHINES

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FIG. 2.



INVENTOR:
ROBERT H. LAWSON,

BY Roy F. Lovell,
ATT'Y.

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INDICATING MEANS AND METHOD FOR KNITTING OR OTHER MACHINES

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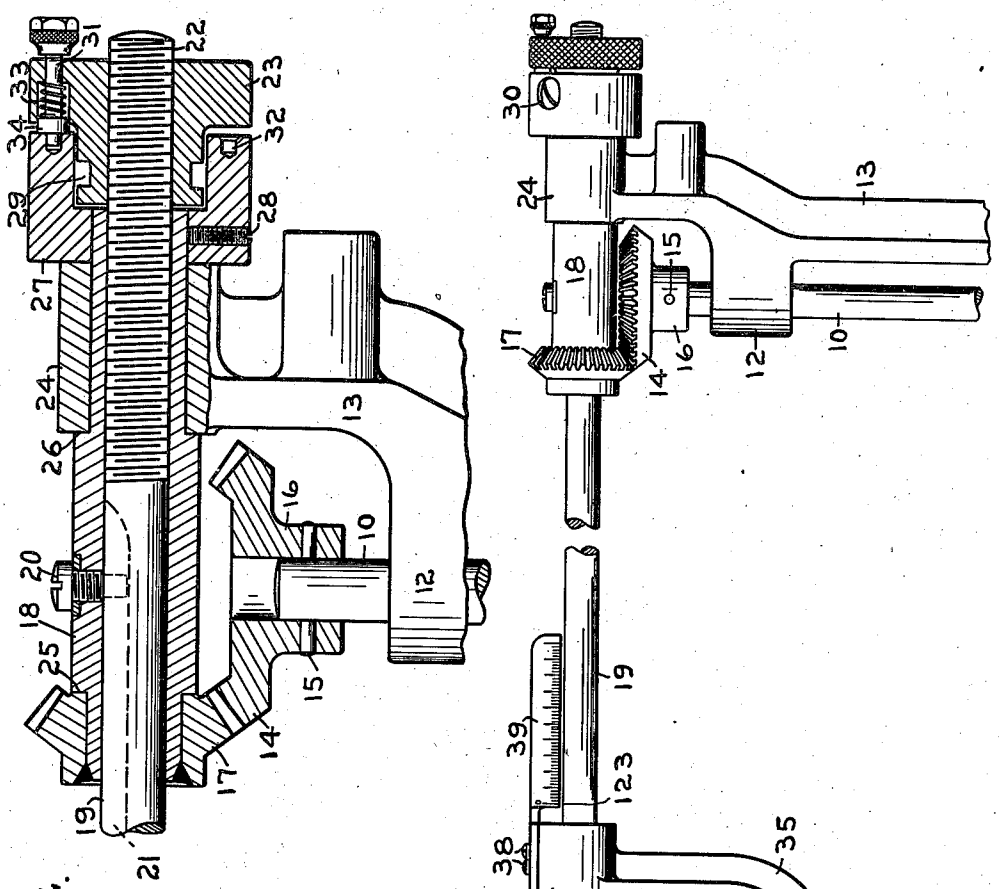


FIG. 4.

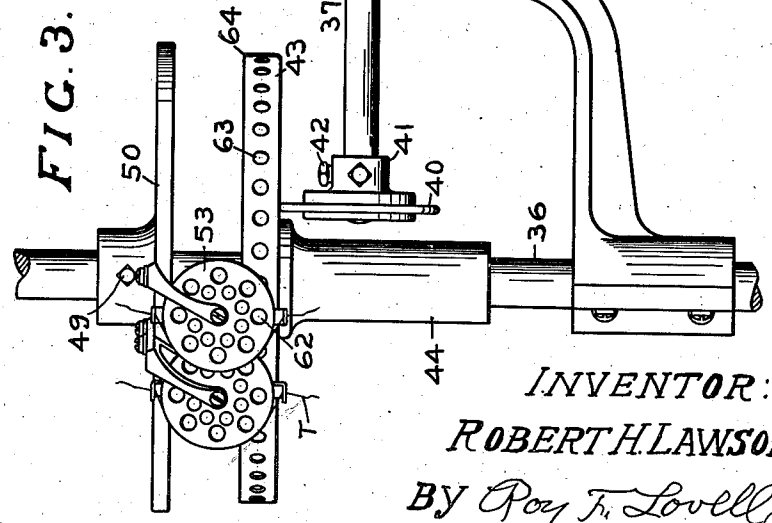


FIG. 3.

INVENTOR:
ROBERT H. LAWSON,
BY Roy F. Lovell,
ATT'Y.

March 1, 1938. R. H. LAWSON 2,109,945

INDICATING MEANS AND METHOD FOR KNITTING OR OTHER MACHINES

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FIG. 5.

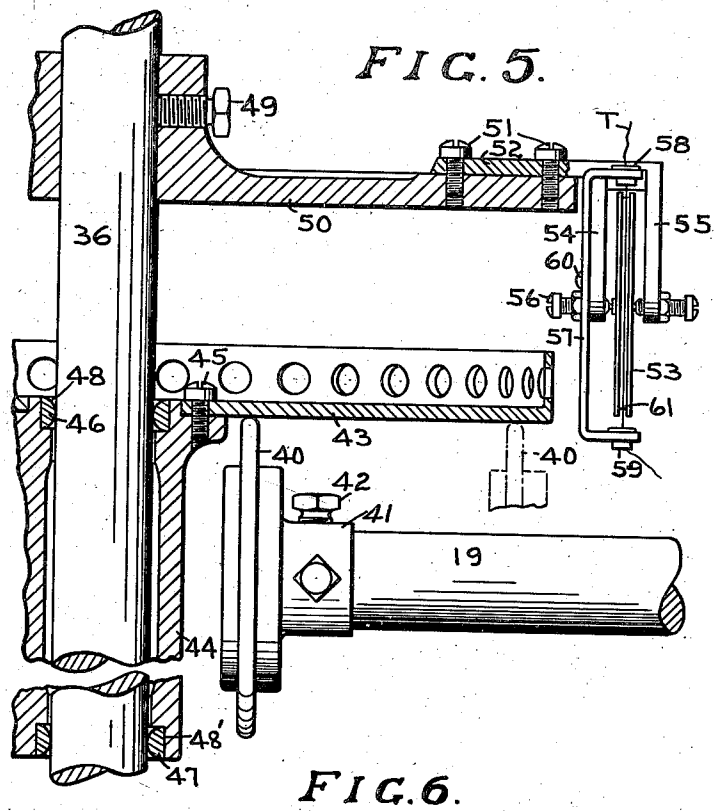


FIG. 7.

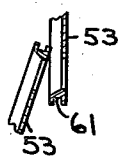
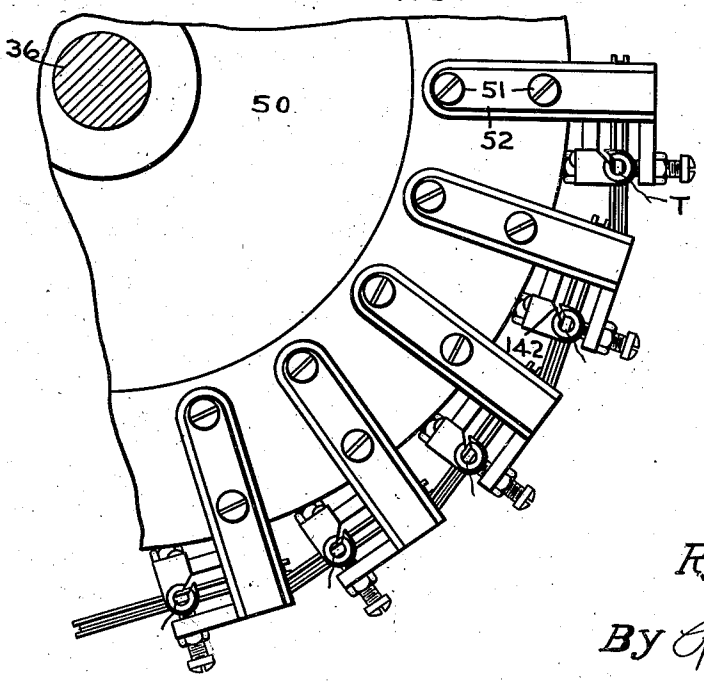


FIG. 6.



INVENTOR:
ROBERT H. LAWSON
By Roy F. Lovell
ATT'Y.

March 1, 1938. R. H. LAWSON 2,109,945

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FIG. 8.

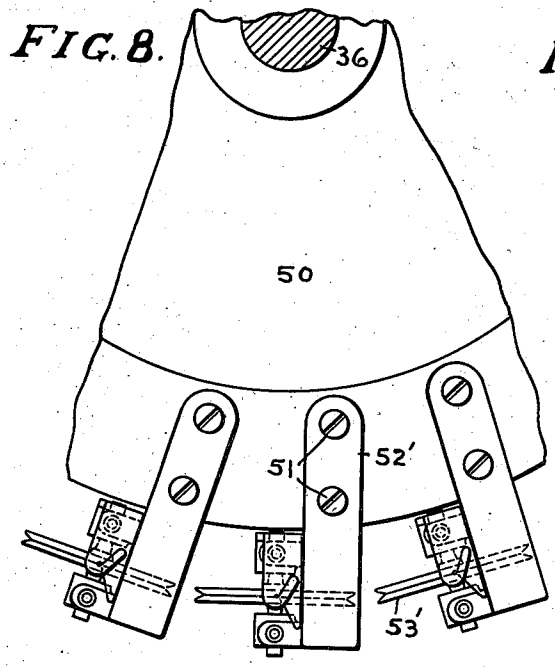


FIG. 10.

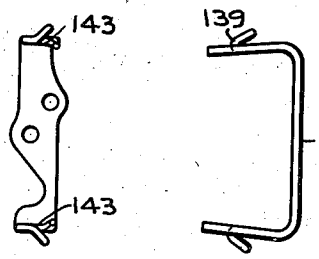


FIG. 11.

FIG. 13.

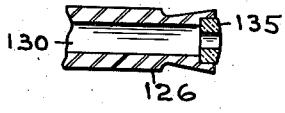


FIG. 12.

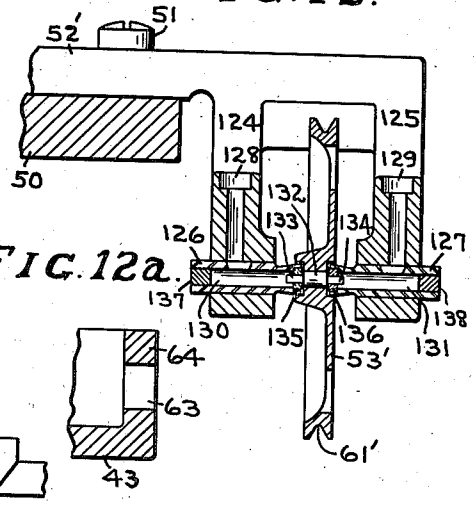
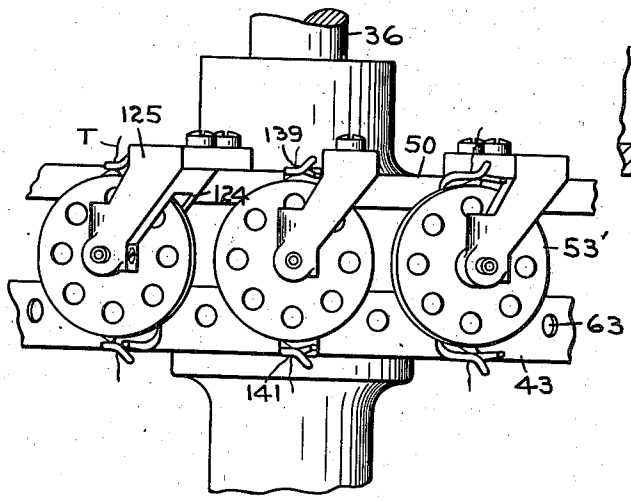


FIG. 12a.

FIG. 9.



INVENTOR:
ROBERT H. LAWSON,
By Roy F. Lovell,
ATT'Y.

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UNITED STATES PATENT OFFICE

2,109,945

INDICATING MEANS AND METHOD FOR KNITTING OR OTHER MACHINES

Robert H. Lawson, Pawtucket, R. I., assignor to Hemphill Company, Central Falls, R. I., a corporation of Massachusetts

Application March 28, 1933, Serial No. 663,183
Renewed July 30, 1937

28 Claims. (Cl. 66—125)

This invention relates to improved and automatic mechanism for controlling the relative rates of feeding of two or more moving elements, the invention being particularly directed to the feeding of two or more yarns to the needles of a knitting machine and being an improvement upon the subject matter disclosed in application Ser. No. 639,688, filed October 26, 1932.

In the drawings:

Fig. 1 is a view in front elevation of a so-called body knitting machine with the improvements applied;

Fig. 2 is a relatively enlarged view, partly in section, showing the driving means for the needle cylinder and other moving parts of a knitting machine;

Fig. 3 is a relatively enlarged view of the portion of the mechanism shown in Fig. 1 to which this invention relates;

Fig. 4 is a relatively enlarged view partly in section of a portion of the driving mechanism that is shown in Fig. 3;

Fig. 5 is a fragmentary view partly in section of a portion of the mechanism shown in Fig. 3;

Fig. 6 is a fragmentary plan view of the parts shown in Fig. 5;

Fig. 7 is a fragmentary detail view of portions of two yarn-rotated discs;

Fig. 8 is a fragmentary plan view similar to Fig. 6 but showing a modified construction;

Fig. 9 is a fragmentary view in elevation of the modification shown in Fig. 8;

Figs. 10 and 11 are elevational views of one of the yarn guiding brackets shown in Figs. 8 and 9;

Fig. 12 is a fragmentary view partly in section showing supporting means for one of the yarn-rotated discs illustrated in Figs. 8 and 9;

Fig. 12*a* is a fragmentary sectional view of the master disc and showing its relation to the yarn-rotated disc, Fig. 12; and

Fig. 13 is a fragmentary sectional view showing a jewel bearing for a yarn-rotated disc.

The machine indicated generally by the numeral 1 is provided with supporting legs 2 and a circular base plate 3 supported by uprights 3' carried by the framework of the machine. Within the base plate 3 is mounted for rotary movements a needle cylinder 4 in which are adapted to be mounted needles (not shown). The needle cylinder 4 is fastened to a ring gear 5 (Fig. 2) which meshes a spur gear 6 which latter is provided with a hub 7 made fast to a vertically disposed shaft 8 as by means of a set screw 9. The shaft 8 at its upper end is provided with an axial recess within which is seated a shaft 10 which is retained in the shaft 8 by means of a set screw 11. As more particularly shown in Figs. 3 and 4, the shaft 10 passes through an arm 12 of a bracket 13 which bracket is mounted upon a plate 13' (Fig. 2). The arm 12 serves as a bearing for the shaft 10 which has connected to its upper end a bevel gear 14, a pin 15 passing through a hub 16 of the gear and also through the shaft 10. Meshing with the gear 14 is another bevel gear 17 which is made fast to a sleeve 18 which surrounds and in which is axially movable a shaft 19, the sliding connection being provided by a screw or key 20 which is received within a keyway 21 longitudinally disposed along the shaft 19. One end of the shaft 19 is threaded as at 22, said threaded end projecting beyond the sleeve 18 and the said threads being engaged by a knurled wheel or collar 23. The bracket 13 is provided with an integral and horizontally disposed bearing 24 within which is disposed the sleeve 18 which is reduced at its ends thereby providing shoulders 25 and 26 against which seat respectively the gear 17 and tubular bearing 24. Abutting the other face of the tubular bearing 24 is a collar 27 which is made fast to the sleeve 18 as by means of a set screw 28. The wheel 23 is provided with an annular recess 29 within which seats the shank of a screw 30 for a purpose presently to be described. A pin 31 is adapted to seat in any one of a series of recesses or notches 32 which are provided in the adjacent face of the collar 27, a coil spring 33 engaging a collar 34 fast to the pin 31 and thereby normally retaining the pin 31 in engagement with a recess 32.

The shaft 19 is also supported by an angle bracket 35 which is fastened to a shaft 36 disposed axially of the needle cylinder 4. To the upper surface of the shaft supporting hub 37 of the bracket 35 is fastened as by means of screws 38 a graduated indicator or scale 39 which functions in a manner hereinafter to be described. A disc 40 is provided with a hub 41 through which pass set screws 42 which are maintained in clamping engagement with the shaft 19 thereby rigidly mounting the disc 40 in a fixed circumferential and axial position on the said shaft 19.

The shaft 36 supports a bracket (not shown) upon which are mounted bobbins for supplying yarns to the needles. Also, mounted upon the shaft 36 and adjacent to the shaft 19 is a master indicator in the form of a wheel or disc 43 (Figs. 3 and 5) which is made fast to a hub 44 as by means of set screws such as 45. The hub 44 is loosely mounted on the shaft 36, turning on ring

bearings 46 and 47 seated in recesses 48, 48' in hub 44, said hub being otherwise spaced from the shaft 36. Thus the disc 40 provides the sole support for the disc 43 and also drives the said disc 43 at a speed determined by the axial or radial position of the disc 40, the disc 43 being driven at a relatively high rate of circumferential speed when the disc 40 is in the full line position, Fig. 5, and being driven at a relatively low speed when the disc 40 is moved to the dotted line position indicated in said Fig. 5.

Made fast to the shaft 36 above the disc or wheel 43 as by means of a set screw 49 is a circular plate 50 to the periphery of which are attached as by means of screws 51, plates 52. The plates 52 constitute brackets which provide bearings for yarn-driven discs 53. The bearings for each disc 53 consist of arms 54, 55 which depend from the horizontally disposed portion of a bracket plate 52. Attached to the arm 54 as by means of a screw 56 is a U-shaped bracket 57, the arms of which are provided with porcelain or other eyelets 58, 59. In order to prevent movement of the bracket 57 upon the shank of the screw 56 as a pivot, a pin 60 may be provided which passes through the bracket 57 and into a hole provided in the arm 54. Yarns or threads T are, as hereinbefore described, supplied from bobbins (not shown) passing therefrom downwardly, one such yarn or thread passing through companion eyelets 58, 59 and in an annular groove 61 provided in a disc 53. The discs 53 are mounted in substantially frictionless bearings and are consequently freely rotatable in such bearings by the frictional engagement of the moving threads T in the grooves 61, the direction of rotation of the discs 53 being, preferably but not necessarily, opposite to the direction of rotation of the disc 43, the direction of rotation of the said discs 53 being determined by the path taken by the threads within the grooves 61.

As more particularly shown in Fig. 3, the discs 53 are, adjacent to their peripheries, provided with equally spaced holes 62 while the disc 43 is provided with a series of equally spaced holes 63 in an upstanding flange 64. The holes 62 and 63 cooperate in a manner hereinafter to be described. The disc 43 and holes 63 therein as well as the auxiliary discs 53, are concentrically disposed with respect to the needle cylinder.

As shown in Figs. 1 and 2, the shaft 8 is supported in brackets 65 and 66 carried by the machine frame, fast to which brackets are bronze bushings 67, 68 which provide bearings for the said shaft 8. Intermediate the ends of the shaft 8 is fixed a bevel gear 69 as by means of a set screw 70. The bevel gear 69 may be supported upon ball bearings 71 which in turn are supported by a collar or hub 72 which is part of an upright 3'. The ball bearings 71 are seated between two plates 73, 74, a bronze bushing 75 which is attached to the collar or hub 72 also serving as a bearing for the shaft 8. The gear 69 is in mesh with another bevel gear 76 which is rigidly mounted upon a horizontally disposed shaft 77 which latter is supported at one end by means of a bracket arm 78 depending from the plate 13' and at its other end by a bracket arm 79 also connected to and carried by the plate 13'. The bracket arm 78 provides a bearing 80 within which are seated rings 81, 82 between which are ball bearings 83. The ring 82 bears at one end against a shoulder 84 formed by reducing the shaft 77 and at its other end against a nut 85 in threaded engagement with the shank of a screw 86 connected to shaft 77. The ring 81 rests against a flange 87 provided by recessing the bearing 80. The space between the flange 87 and the shaft 77 provides an oil well, the oil being retained therein by means of a cap plate 88 which is fastened to the bearing 80 in any suitable manner. The other end of the shaft 77 is also reduced providing a shoulder 89 against which rests a sleeve 90 which is also reduced at one end forming a shoulder 91. Seated against the shoulder 91 is a ring 92 in cooperation with which is a ring 93 and between the said two rings are seated ball bearings 94. The ring 93 is seated against a flange 95 provided by recessing the bearing carried by the bracket 79. Oil or other lubricant for the ball bearings may be retained between the said bearings and cap plates 96 which fit over the bushing 90 and are retained in such position as by means of screws 97.

A loose pulley 98 is loosely mounted upon the shaft 77 between flange 95 and a sleeve 99 to which is rigidly connected as by means of a set screw 100 a relatively slow speed pulley 101. At the other side of the pulley 101 is a high speed pulley 102 which latter loosely surrounds the sleeve 99, the hub of the said pulley 102 abutting a shoulder 103 carried by the sleeve 99.

The sleeve 99 to which the pulley 101 is connected is provided at its other end with a spur gear 104 which is in mesh with two spur gears 105 and 106. The gears 105 and 106 are loosely mounted upon pins 107 and 108 which are held in recesses provided in the gear 76. The respective pins 107 and 108 are reduced at the ends received within the said recesses and at their other ends are headed as at 109 and 110. Meshing with the gears 105, 106 is an internally toothed gear ring 111 which is connected to one face of the pulley 102 as by screws 112. The outer surface or periphery of the ring gear 111 is provided with ratchet teeth 113 adapted to be engaged by one or more pawls 114.

The operation of the driving connections just described and illustrated in Figs. 1 and 2 will be apparent from inspection of the drawings. The pulley 98 is loosely mounted upon the shaft 77 and consequently when the driving belt (not shown) is on the pulley 98, the shaft 77 is not driven. When the driving belt is shifted so as to overlap the pulley 101 such pulley drives the shaft 77 indirectly and at a slow speed, the direct connection between the pulley 101 and sleeve 99 causing the said sleeve to rotate in the direction indicated by the arrow 115, rotation of the sleeve 99 and gear 104 causing the gears 105 and 106 to rotate relatively to the gear 76 through the medium of the pins 107 and 108. A pawl 114 at such time is in engagement with the ratchet 113 thereby preventing rotation of the ring gear 111 and pulley 102; however, the internal gear 111 being in engagement with the teeth of the gears 105 and 106, causes the gear 76 to rotate at a relatively reduced speed as compared with the speed of rotation of the sleeve 99 and pulley 101, the speed reduction being due to the greater number of teeth in the ring gear 111 as compared with the number of teeth in the gear 104, e. g., if there are ten times as many teeth in the ring gear 111 as there are in the gear 104, then one complete rotation of the sleeve 99 will cause the intermeshing of the gears 105, 106 with the gear 111 to advance the gear 76 through one-tenth of a complete revolution. When the driving belt is shifted onto the high speed pulley

102 it also drives the pulley 101, the internal gear 111 and the gear 104 being then driven at the same circumferential speed and as a consequence thereof the intermediate gears 105, 106 do not turn on their axes relatively to the gear 76, the result being that the gear 76 rotates one and one with the pulleys 101 and 102 prior to the driving of the pulley 102 in the manner described, pawl 114 is automatically released from engagement with ratchet teeth 113.

Connected to the lower end of the shaft 8 is a spur gear 116, a set screw 117 passing through a hub 118 of the gear 116 and into engagement with the shaft 8. The said gear 116 meshes with a gear 119 which drives the take-up rolls (not shown).

A belt shipper 120 which may be of any suitable construction is carried by brackets attached to the frame of the machine, one such bracket being indicated at 121 as an arm connected to and depending from the bracket 79.

A hand wheel 122 may be provided for manually rotating the gear 5.

In multi-feed knitting machines, such as so-called body machines wherein a plurality of threads are knitted into the fabric at the same time, it is essential that the stitch drawing cams at the several feeding stations be adjusted to draw the same length of stitch; otherwise the fabric does not have a uniform appearance. Furthermore, it is occasionally desirable that the number of stitches per inch knitted at the several feeding stations be changed as from a coarse fabric to a fine fabric. It is for the purpose of effecting the said two purposes that the mechanism hereinbefore described has been applied to a multi-feed knitting machine. The first object, namely, uniformity of fabric, is made possible by means of the rotating discs 53 in conjunction with the master disc 43; the second object, namely, a change in the number of stitches per inch at each feeding station, is made possible by adjustment of the shaft 19, and adjustment of each disc 53 towards and from the axis of the master disc 43.

Assuming that the machine has been knitting sixty stitches per inch and it is desired to change to a finer fabric of eighty stitches per inch, the shaft 19 is adjusted by withdrawing the pin 31 and turning the wheel or collar 23 which, being retained in a fixed axial position by the screw 30 engaging the recess 29, causes the shaft 19 to be moved longitudinally to bring the marking line 123 opposite the place on the scale 39 where eighty stitches per inch is indicated, then the several stitch cams are adjusted to draw a somewhat shorter stitch. After the initial adjustments of the stitch cams are completed, the machine is started and if the cams have been properly adjusted, the yarns rotate their discs 53 in synchronism with the rotations of the disc or plate 43 in which event a hole 62 in a disc 53 is always in register with a hole 63 in the master disc 43. However, it is practically impossible to obtain an accurate initial adjustment of the cams to cause the desired number of stitches per inch to be knitted and as a consequence thereof, the holes 62 and 63 will not remain in register but one set of holes will gain with respect to the other thereby causing an optical illusion of spots moving either to the right or to the left. If the spots appear to be moving to the right, the stitch cams have not been raised sufficiently; in other words, the needles are drawing more yarn than is necessary and knitting less than the required eighty stitches per inch. By raising the stitch cams a slight additional amount, a point is reached where the holes 62 and 63 are always substantially in register in which case there is no continuous movement of spots either to the right or to the left and the required adjustment has been obtained. By slowly walking around the machine each disc 53 may be observed and if not rotating in proper timed relation with the master disc 43, a necessary adjustment of the stitch cam companion to such disc 43, is made until all of the stitch cams are drawing the same length of stitch and consequently knitting the same number of stitches per inch.

As hereinbefore stated, the master disc 43 preferably rotates in a direction opposite to the direction of the rotation of the disc 53; however, it is also possible to adjust the knitting of yarns so as to knit uniform fabric of a required number of stitches per inch by observing the rotations of the master disc 43 and the discs 53 when they rotate in the same direction.

In Figs. 1, 3, 6 and 7 adjacent discs 53 are shown as overlapping, and while the overlapping of adjacent discs 53 provides an additional check in that the feeding of yarns to the needles at two adjacent feeding stations may be brought into synchronism, the overlapping is not essential, and the discs 53 are not shown as overlapping in the modification now to be described.

In Figs. 8–12*a* inclusive, a construction somewhat modified as compared with that disclosed in Figs. 1–7 inclusive, is shown. The bracket plates 52' are connected to the circular plate 50 as by screws 51 and are provided with depending arms 124, 125 in which are horizontally disposed holes which receive tubular bearing members 126, 127 which latter are provided with suitable oil holes that communicate with oil ducts or openings 128, 129, the lubricating material thereby being adapted to pass from the said ducts into the horizontally disposed oil passages 130, 131. Passing centrally through each disc 53' is a pintle bearing member 132, pintles 133, 134 thereof being received in openings provided in jewel bearings 135, 136. The openings or oil passages 130, 131 are closed in any suitable manner as by plugs 137, 138.

The construction just described provides substantially frictionless bearings for the discs 53' thereby permitting the same to be rotated freely by the threads T when the same are drawn from their sources of supply by the needles of the knitting machine.

The threads T pass downwardly from sources of thread or yarn supply (not shown) each thread passing through an eyelet 139 which eyelet is part of a U-shaped bracket 140 which is also provided with a second eyelet 141 through which the said thread T also passes, the said thread, between the two eyelets, being received within the periphery 61' of a disc 53' whereby the disc may be rotated, either in the same direction as the rotation of the master disc 43 or in the opposite direction.

For convenience of threading the yarns T through the eyelets 58, 59 and around the periphery of the discs 53', one or both of the eyelets in the arms of the brackets 57, 140 may be cut or split as shown at 142, Fig. 6, or at 143, Figs. 10 and 11.

The method hereinbefore described and the mechanism for assisting in the carrying out of the steps of the method, determine the exact amount of yarn knitted into a fabric per unit length thereof by the needles of a knitting ma-

chine and especially of knitting machines having rotary needle cylinders. Furthermore, the method permits such exact measuring by adjusting indicator mechanism while the needle cylinder is revolving at a constant speed, said indicator mechanism being independent of the usual yarn feeding mechanism.

If, as hereinbefore described, the master disc 43 and auxiliary discs such as 53 or 53', are driven to rotate in the same direction, the master disc 43 may, in place of the holes 63, have colored and equally spaced spots, in which case if the master disc and auxiliary discs are moving in timed relation, the observer will see a substantially unvarying color that may appear dark or light or a mixture of the two. If, on the other hand, the auxiliary discs are rotating out of time with respect to the master disc, the observer will receive an optical impression of dark spots or dashes interspersed with white spots or dashes which will appear to be traveling in one direction or in the other, the direction depending upon whether the master disc is gaining or losing with respect to the auxiliary disc or discs.

It is obvious that the described indicating means may be used to compare yarn speeds in a multi-feed machine wherein all the feeds are to be adjusted to a single standard, or alternatively, certain of the feeds may be adjusted to draw one length of stitch while other feeds may be adjusted to draw a different length of stitch. In the first instance all feeds will be set to draw stitches of the same length and the number of stitches in a wale per unit length of fabric may be set to any desired quantity. In the second instance certain of the feeds about the machine may be set to draw stitches of a given length or some predetermined number of stitches per unit length of fabric while other feeds may be set to draw stitches corresponding in length to a different number of stitches per unit length of fabric.

One example of this use of the mechanism in setting a machine wherein all the courses knitted are not knitted of stitches of a single length would be evident in a certain non-run type of fabric knitted in the following manner: First, two courses of plain fabric are knitted fairly loosely, say, with a stitch length which would give about 34 courses per inch of fabric. Then one course of so-called pile tuck stitches is knitted very tightly. Preferably, this course would be knitted with a length of stitch corresponding to about 60 to 65 courses per inch of fabric. Thereafter a course of so-called float tuck stitches is knitted rather loosely but not as loosely as the said two courses of plain fabric. This will be repeated every four courses and obviously the fabric will be knitted on a machine having at least four feeds or a multiple of that number.

To set up the machine for knitting such a fabric as has been described by way of example, the alternate pairs of feeds which are to knit the plain courses would be set with the master indicator being driven at such a speed that the yarn driven indicator when rotating in synchronism with the master, would indicate yarn speed of about 34 courses or to some stitch length corresponding to a number of courses per inch desired. Then the master disc driving means would be adjusted as previously described to rotate at a different rate of speed so as to give in cooperation with the yarn driven discs, an indication of yarn speed and incidentally stitch length corresponding to 60 or 65 courses per inch. This would take care of the feeds which were to knit the said pile tuck courses. Thereafter the remaining feeds which were to knit float tuck would be adjusted with the master disc set at whatever number of stitches per inch it was desired to employ for governing the stitch length knitted throughout these float tuck courses.

The above will serve as an example of one manner in which the mechanism shown and described is easily used for the purpose of setting up a machine wherein different length stitches are to be knitted in different courses recurring throughout the fabric, and wherein spaced feeds knitting the same type of stitch may all be set to a common standard.

In the description and claims, reference has been made to the rotation or movement of the master disc 43 and auxiliary discs 53, 53' in timed relation, and by that is meant any substantially constant relation such as one to one, one to one and one-half or one to two.

Although the invention has been shown as applied to a knitting machine, it has other uses being adaptable to other textile and other machines, in view of which it is not the intention to limit the invention otherwise than by the express limitations in the claims themselves.

I claim:

1. In a knitting machine, means for readily changing the number of stitches knitted in a unit length of fabric, including a movable master indicator and one or more other movable indicators, means for moving the master indicator in a definite relation with respect to the number of knitted courses, and means for changing the speed of movement of the master indicator so that the speed of movement of the other indicator or indicators will have to be changed in order to maintain the movements of the master and other indicator or indicators in synchronism.

2. A knitting machine and in combination therewith means for readily effecting changes in the number of stitches per unit length of the knitted fabric, such means including a movable master indicator and another movable indicator, movements of the two indicators being adapted to be maintained in synchronism, the movements of the last named indicator being yarn-controlled and thus bearing a definite relation with respect to the number of stitches knitted per unit length of fabric, means for varying the speed of movements of the master indicator, the two indicators being adapted to disclose to the operator of the knitting machine whether or not they are moving in synchronism, and means for varying the speed of the movements of the master indicator and effecting a change in the number of stitches knitted per unit length of fabric.

3. A knitting machine having a rotary needle cylinder, means for readily effecting a change in the number of stitches knitted per unit length of fabric, said means including an indicator movable in time with the needle cylinder, the timed relation of the movements of the indicator with respect to the movements of the needle cylinder being variable at will so that a change in the number of stitches knitted per unit length of fabric may be readily effected.

4. In a knitting machine, a master indicator and auxiliary indicators cooperating therewith, said auxiliary indicators being movable and in their movements adapted, in conjunction with the master indicator, to give indications to the operator of the knitting machine so that yarns at two or more feeding stations can be fed to

the needles of the knitting machine at substantially the same rate.

5. In a knitting machine, means for readily changing the number of stitches knitted per unit length of fabric, in combination with indicating means moved by yarns to inform the operator whether or not the said yarns are being fed at the same rate, and means for readily effecting adjustment of the feeding of yarns at two or more feeding stations, whereby uniform fabric having a desired number of stitches per unit length can be knitted with two or more yarns.

6. In a knitting machine, means for readily changing the number of stitches knitted per unit length of fabric, said means including a master indicator movable in time with the movements of movable parts of the knitting machine, in combination with means for adjusting the movements of the master indicator so that the feeding of yarns at two or more feeding stations can be readily synchronized and uniform fabric having a desired number of stitches per unit length knitted.

7. A multi-feed knitting machine having a single scale calibrated to indicate the number of stitches per unit length of fabric, in combination with means for readily effecting an adjustment of the several feeds of the knitting machine to knit a fabric having any desired number of stitches per unit length of fabric indicated on the scale and in which fabric adjacent courses are knitted with different yarns.

8. A multi-feed knitting machine having a single scale calibrated to indicate the number of stitches per unit length of fabric, in combination with means, movable along the scale, for readily effecting an adjustment of the several feeds of the knitting machine to knit a fabric having any desired number of stitches per unit length of fabric indicated on the scale and in which fabric adjacent courses are knitted with different yarns.

9. In a circular knitting machine having a rotary needle cylinder, a master indicator rotatable in time with the needle cylinder, means for varying the said timed relation between the needle cylinder and master indicator, yarn-rotatable indicators adapted to rotate in timed relation with the master indicator, the master indicator and each yarn-rotatable indicator when rotating in a desired timed relation with respect to one another indicating this fact to the operator of the knitting machine.

10. A knitting machine of the rotary needle cylinder type, and in combination therewith indicator means rotatable in time with the needle cylinder and concentrically disposed with respect thereto, and means for rotating the indicator comprising a driven shaft having at one end a driving disc in constant engagement with the rotary indicator, the driving connection between the shaft and the source of power being such as to permit the shaft to be moved so as to cause the indicator to be driven at variable speeds.

11. A knitting machine of the rotary needle cylinder type, and in combination therewith indicator means rotatable in time with the needle cylinder and concentrically disposed with respect thereto, and means for rotating the indicator comprising a driven shaft having at one end driving disc means movable towards and from the axis of the rotary indicator in constant engagement with the rotary indicator, the driving connection between the shaft and the source of power being such as to permit the shaft to be moved so as to cause the indicator to be driven at variable speeds.

12. In an indicator for effecting the knitting of uniform stitches, a bracket having lubricated jewel bearings, and a yarn-rotatable member mounted in said bearings.

13. A method of effecting the knitting of uniform fabric having a desired number of stitches per unit length of fabric and with a plurality of yarns, adjacent courses of which fabric are knitted with different yarns, said method consisting in calibrating a scale to indicate the number of stitches to be knitted per unit length of fabric, thereafter adjusting indicator mechanism in accordance with readings on the scale, and then starting the knitting machine, and thereafter adjusting the several feeding stations of the knitting machine in accordance with indications of the indicator mechanism to knit the desired number of stitches per unit length of fabric.

14. A circular knitting machine having a rotary needle cylinder, and in combination therewith indicator means for effecting the knitting of uniform fabric with a plurality of yarns and at a plurality of feeding stations, said indicator means consisting of a master indicator and means for moving the same in timed relation with the needle cylinder, and auxiliary indicator means consisting of a yarn-rotatable member for each yarn at each feeding station, the master indicator and auxiliary indicators being adapted to indicate to the operator of a knitting machine whether or not the auxiliary indicators are each rotating in proper timed relation with the master indicator.

15. A circular knitting machine having a rotary needle cylinder, and in combination therewith indicator means for effecting the knitting of uniform fabric with a plurality of yarns and at a plurality of feeding stations, said indicator means consisting of a master indicator and means for moving the same in timed relation with the needle cylinder, and auxiliary indicator means consisting of a yarn-rotatable member for each yarn at each feeding station, the master indicator and auxiliary indicators being rotatable in opposite directions and adapted to indicate to the operator of a knitting machine whether or not the auxiliary indicators are each rotating in proper timed relation with the master indicator.

16. A circular knitting machine having a rotary needle cylinder, and in combination therewith indicator means for effecting the knitting of uniform fabric with a plurality of yarns and at a plurality of feeding stations, said indicator means consisting of a master indicator and means for moving the same in timed relation with the needle cylinder, and auxiliary indicator means consisting of a yarn-rotatable member for each yarn at each feeding station, the master indicator and auxiliary indicators being adapted to indicate to the operator of a knitting machine whether or not the auxiliary indicators are each rotating in proper timed relation with the master indicator, and means for rotating the master indicator, said means being adjustable so as to rotate the master indicator at various speeds, thereby causing the master indicator to rotate in different timed relations with respect to the rotation of the needle cylinder, whereby the knitting machine can be adjusted so as to knit loose fabric or relatively tight fabric.

17. A circular knitting machine having a rotary needle cylinder, and in combination therewith indicator means for effecting the knitting

of uniform fabric with a plurality of yarns and at a plurality of feeding stations, said indicator means consisting of a master indicator and means for moving the same in timed relation with the needle cylinder, and auxiliary indicator means consisting of a yarn-rotatable member for each yarn at each feeding station, the master indicator and auxiliary indicators being rotatable in opposite directions and adapted to indicate to the operator of a knitting machine whether or not the auxiliary indicators are each rotating in proper timed relation with the master indicator, and means for rotating the master indicator, said means being adjustable so as to rotate the master indicator at various speeds, thereby causing the master indicator to rotate in different timed relations with respect to the rotation of the needle cylinder, whereby the knitting machine can be adjusted so as to knit loose fabric or relatively tight fabric.

18. A method of measuring the exact amount of each of a plurality of yarns knitted into a fabric per unit length thereof by the needles in a knitting machine of the rotary needle cylinder type and while the needle cylinder is revolving at a constant speed, and of determining the exact length of yarn knitted per revolution of the needle cylinder, said method including observing indicator mechanism and adjusting the stitch length in accordance with the observations.

19. A method of measuring the exact amount of each of a plurality of yarns knitted into a fabric per unit length thereof by the needles in a knitting machine of the rotary needle cylinder type and while the needle cylinder is revolving at a constant speed, and of determining the exact length of yarn knitted per revolution of the needle cylinder, said method including observing indicator mechanism which is independent of the yarn feeding means and adjusting the stitch length in accordance with the observations.

20. A method of adjusting the length of stitches knitted at each of a plurality of feeding stations of a knitting machine, said method including the observing of the rates of movements of two or more yarns by the movements of a yarn movable member, then adjusting the relative feeding rates of the yarns.

21. A multi-feed knitting machine having in association therewith yarn movable means operative at each of a plurality of feeding stations, and means for informing the operator of the machine when the desired amount of yarn is being knitted into the fabric per unit length thereof, in combination with means for adjusting the rate of yarn feed and other means for adjusting the means for informing the operator of the machine when the desired amount of yarn is being knitted into the fabric.

22. A multi-feed knitting machine having mechanism to inform the operator of the machine as to the number of stitches being knitted in a given wale per unit length of fabric at one or more of a plurality of feeding stations, in combination with means for adjusting the said mechanism so as to readily effect a change to knit more or less stitches in a wale per unit length of fabric.

23. A multi-feed knitting machine having yarn movable means in association with each of a plurality of knitting stations of the knitting machine, in combination with means for informing the operator the number of stitches to be knitted into the fabric per unit length thereof at a given wale, the yarn movable means and means last-mentioned being so associated and operated that the knitting at each of a plurality of feeding stations may be readily adjusted to effect the knitting of uniform fabric at the several feeding stations.

24. A multi-feed knitting machine having mechanism to inform the operator of the machine as to the number of stitches being knitted in a unit length of fabric at one or more of a plurality of feeding stations, in combination with means for adjusting the said mechanism so as readily to effect a change to knit more or fewer stitches per unit length of fabric.

25. A multi-feed knitting machine having mechanism to inform the operator of the machine as to the number of stitches knitted per unit length of fabric and the relative sizes of stitches knitted at one or more of a plurality of feeding stations, in combination with means for adjusting the said mechanism so as readily to effect a change to knit a different number of stitches per unit length of fabric or to vary the size of the knitted loops at one or more of the feeding stations.

26. A multi-feed knitting machine adapted to knit stitches of different length at one or more feeding stations in combination with indicator means to inform the operator of the machine as to the number of stitches being knitted per unit length of fabric and of the size of individual stitches being knitted at one or more of a plurality of feeding stations, and means for adjusting the said indicator mechanism so that changes may be effected readily whereby a different number of stitches per unit length of fabric may be knitted or whereby the size of loops knitted at one or more of the feeding stations may be varied.

27. In a multi-feed knitting machine having mechanism therein for knitting uniform fabric wherein all stitches are of uniform length or for knitting uniform fabric wherein recurrent courses are knitted having relatively tight loops and other recurrent courses are knitted having relatively loose loops, means for indicating to the operator of the machine the number of stitches being knitted per unit length of fabric and the relative sizes of stitches being knitted at adjacent feeding stations, and means for varying the adjustment of said indicator means whereby changes in the number of stitches per unit length of fabric may be made without disturbing the relative proportions of tight and loose stitches being knitted at different feeding stations about said machine.

28. In a knitting machine the combination of knitting instrumentalities and means for adjusting the length of stitch drawn by said knitting instrumentalities with indicator means for showing the machine operator when stitches are being drawn at the several feeds of a length to produce fabric having uniform characteristics throughout recurrent cycles of knitting a plurality of courses, and means for adjusting said indicator means so that said knitting instrumentalities may be controlled for knitting different numbers of courses per unit length of fabric while preserving the original uniformity throughout said recurrent cycles.

ROBERT H. LAWSON.