Dec. 13, 1938. G. GASTRICH 2,140,472

LOOP LENGTH CONTROL MECHANISM

Filed Aug. 14, 1936 5 Sheets-Sheet 1

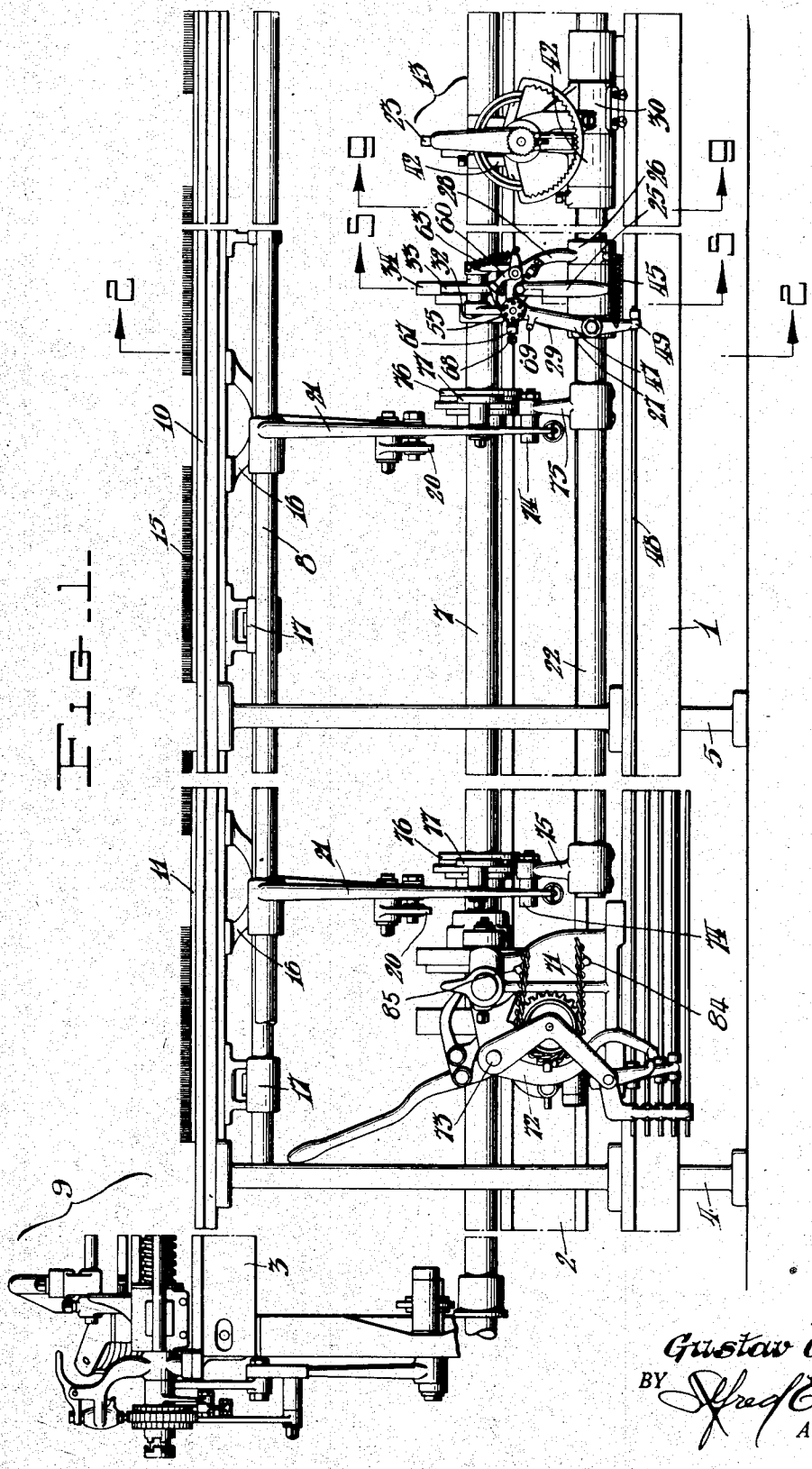


Fig. 1

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LOOP LENGTH CONTROL MECHANISM

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FIG. 2.

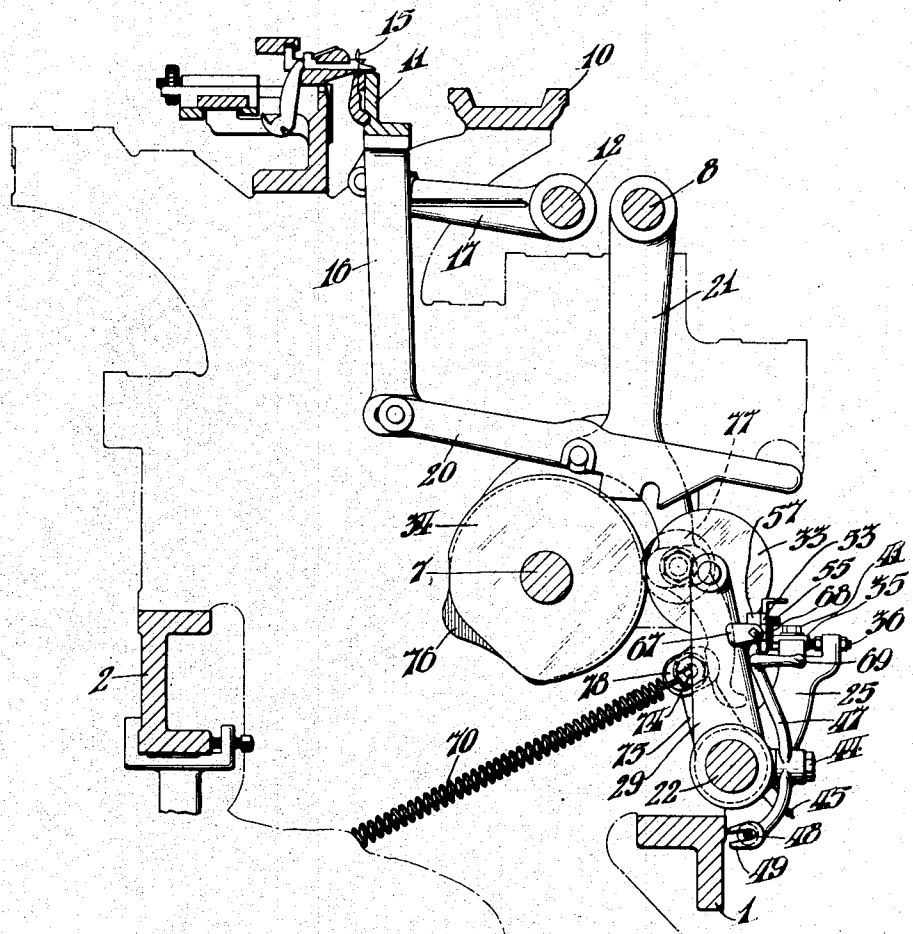
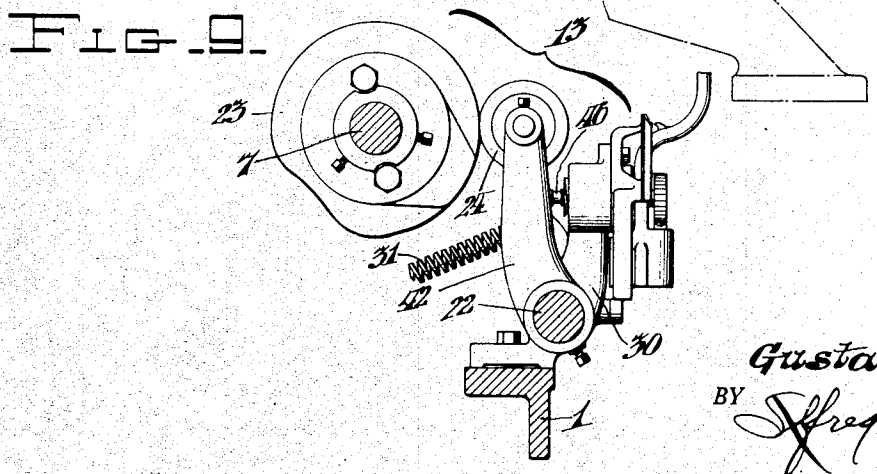


FIG. 9.



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LOOP LENGTH CONTROL MECHANISM

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FIG. 3.

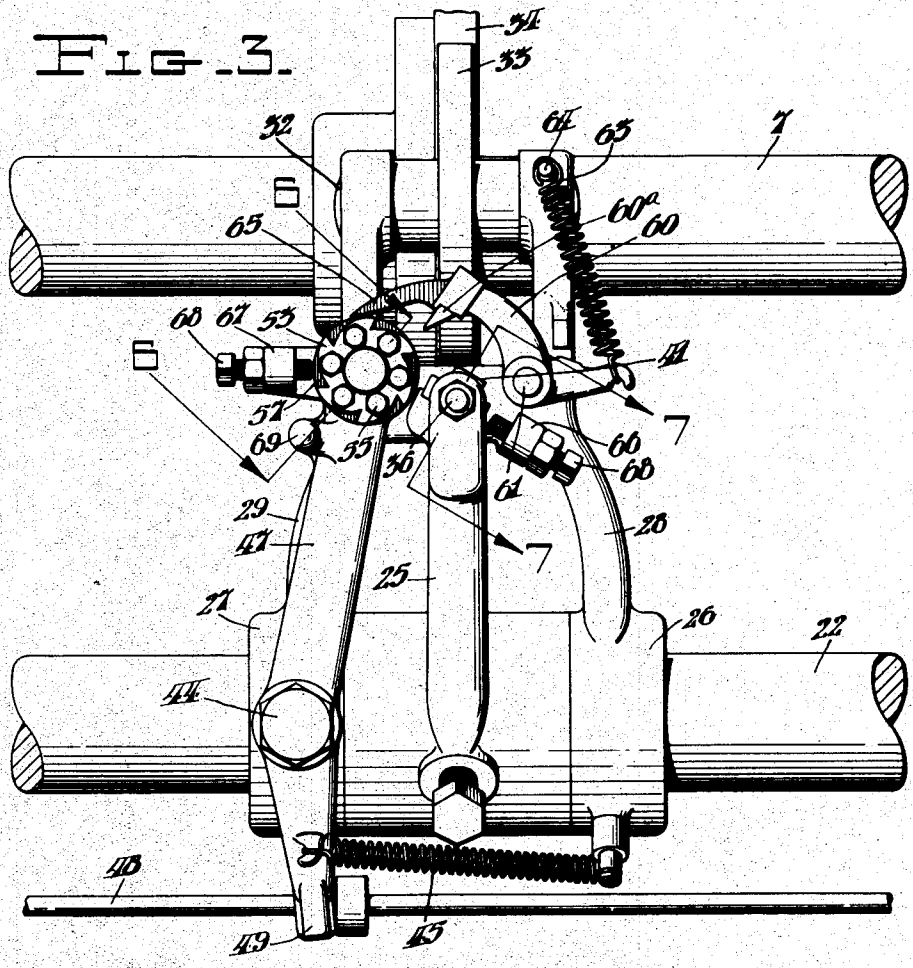


FIG. 8.

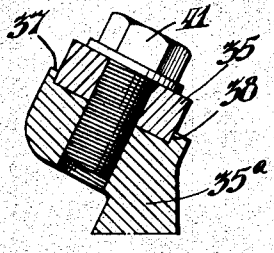


FIG. 6.

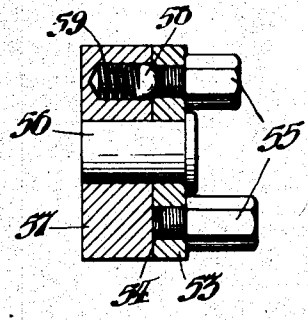
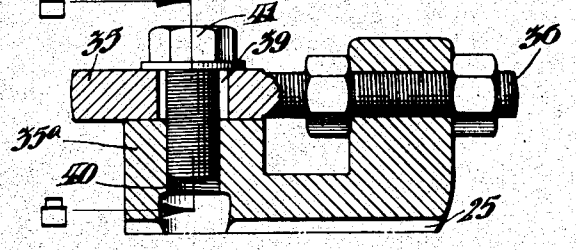


FIG. 7.



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LOOP LENGTH CONTROL MECHANISM

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FIG. 4.

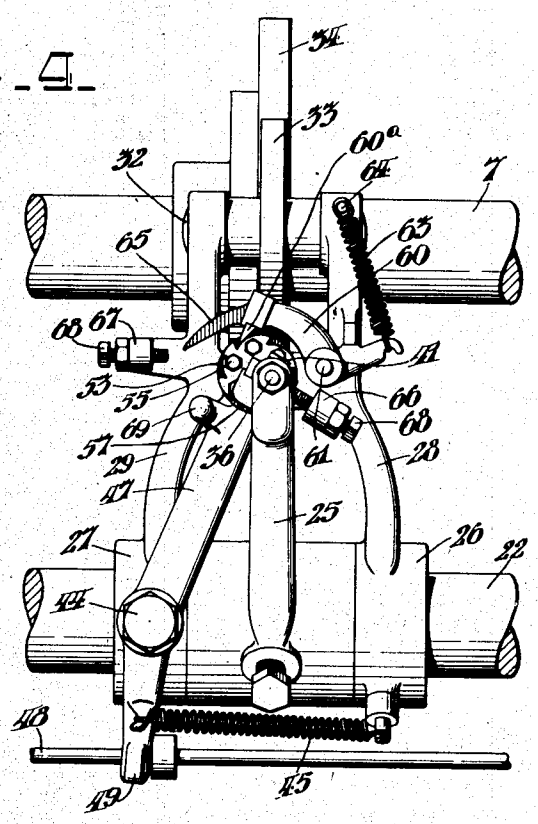
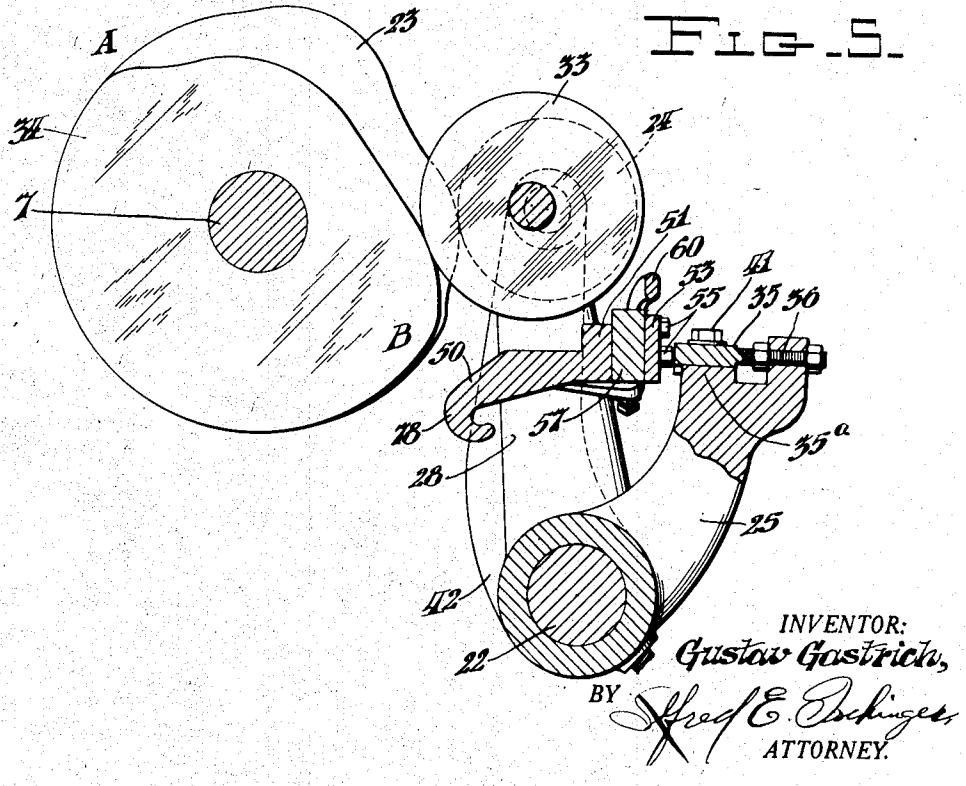


FIG. 5.



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LOOP LENGTH CONTROL MECHANISM

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FIG. 11.

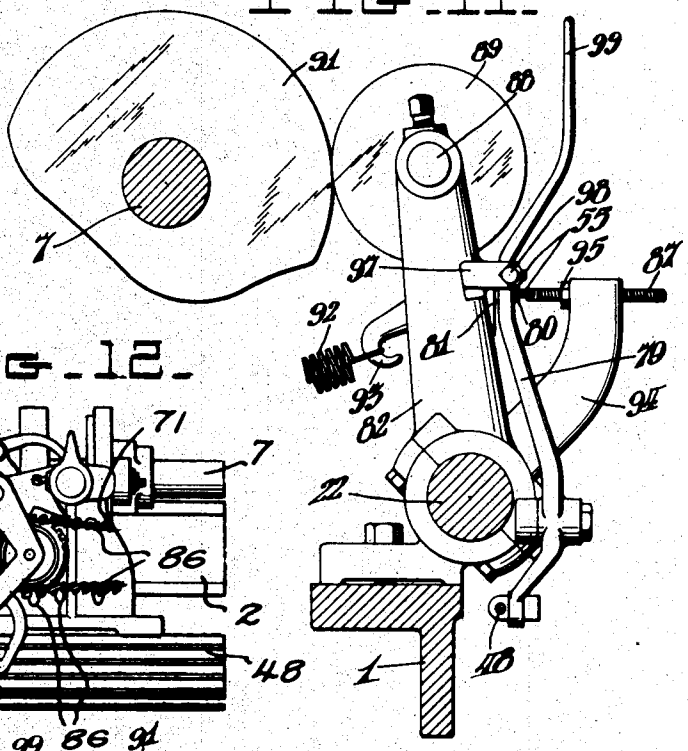


FIG. 12.

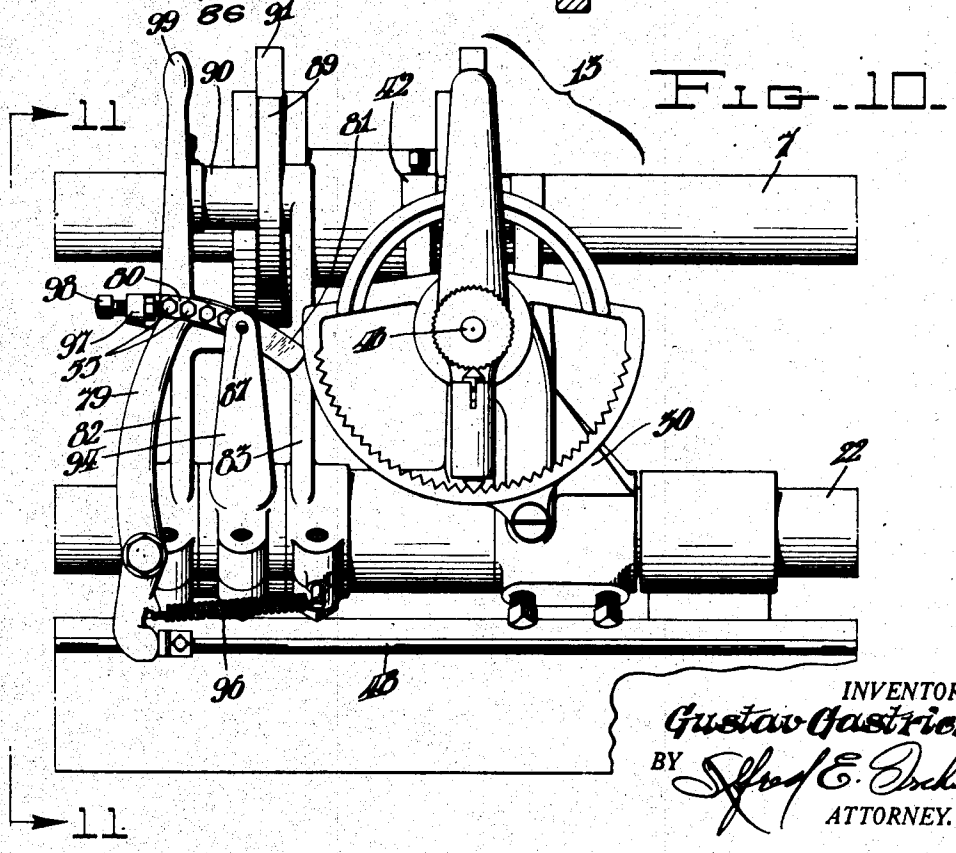


FIG. 10.

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Patented Dec. 13, 1938

2,140,472

UNITED STATES PATENT OFFICE

2,140,472

LOOP LENGTH CONTROL MECHANISM

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Application August 14, 1936, Serial No. 95,964

19 Claims. (Cl. 66—82)

This invention relates to control mechanism adapted for use in full fashioned knitting machines, and has particular reference to a new and improved mechanism for supplementing the normal loop forming mechanism of such machines when it is desired to produce loose courses and other courses in which the lengths of the loops deviate from normal length.

In the knitting of hosiery and the like it periodically becomes necessary to include distinct courses of loops which are of greater length than those loops which form the main body of the fabric. Such courses which are ordinarily referred to as loose courses are introduced into the fabric at various places, and it frequently becomes necessary to employ four different lengths of loops for as many loose courses in order to produce a stocking in accordance with the given specifications. Inasmuch as it was heretofore necessary to provide a different mechanism for each of the different lengths of loops it will be appreciated that a rather complicated arrangement of parts was ordinarily required in order to produce the desired fabric, particularly since each different length of loops to be produced required a separate regulating lever, each of which in turn required its individual operating mechanism.

This invention is specifically directed to novel mechanism associated with the normal loop regulating mechanism, and is intended to facilitate the varying of the length of loops in forming various loose courses by automatic means governed by the main or an auxiliary pattern chain. This new and improved mechanism dispenses with the individual loose course regulating levers and comprises a unitary device; the selective use whereof, effects the production of an unlimited number of loose courses containing different length loops. Upon the formation of a desired loose course in the fabric being knitted, this novel device becomes ineffective thus permitting the customary normal loop course regulating mechanism to control the subsequently formed courses of loops, until such time when a button on the pattern chain causes the throwing in of this device for the formation of another loose course. Inasmuch as the length of loops in a loose course is greater than any loop length governed by the customary normal loop regulating mechanism, it follows that the shifting of the loop governing mechanism of this device into effective position may supplement, or function over and above, the customary normal loop regulating mechanism even though the latter remains in a position where it could function if the former did not supplement it.

An object of this invention is to produce a novel arrangement of parts of the type referred to, which will eliminate the above and other difficulties incident to the operation of straight knitting machines.

Another object of this invention is to produce a structure which will eliminate the use of a plurality of individual loose course regulating mechanisms for the production of individual loose courses containing loops of different length.

A further object of this invention is to produce auxiliary mechanism acting in conjunction with the normal loop regulating mechanism, which, when in effective position, renders the normal regulating mechanism ineffective, and controls the loop lengths within loose courses.

Still another object of this invention is to produce a single unit pattern controlled mechanism that will enable the production of an unlimited number of loose courses respectively embodying loops of different lengths.

With these and other objects in view, which will become apparent from the following detailed description of the illustrative embodiments of the invention shown in the accompanying drawings, my invention resides in the novel elements of construction, devices and combination of parts in cooperative relationship, as hereinafter more particularly set forth in the claims.

In the drawings:

Figure 1 is a front elevational view of a full fashioned knitting machine embodying the new and improved mechanism which constitutes this invention; certain parts of the machine having been omitted for the sake of clarity;

Fig. 2 is a sectional view taken substantially along line 2—2 of Fig. 1, showing some of the novel mechanism of this invention;

Fig. 3 is an enlarged elevational view of a novel device constituting a part of this invention illustrating the ineffective position of the loose course loop length governing mechanism;

Fig. 4 is a view similar to Fig. 3, but illustrating the effective position of the loose course loop length governing mechanism;

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 1, only certain parts being shown, however, to better illustrate the relation of the normal regulating cam and the loose course cam;

Fig. 6 is an enlarged sectional view taken substantially along the line 6—6, Fig. 3, of the loose course loop length governing disc and its mount-

ing, including the resilient means maintaining the disc in selected position;

Fig. 7 is a sectional view taken substantially along line 7—7 of Fig. 3;

Fig. 8 is a section along line 8—8 of Fig. 7;

Fig. 9 is a section taken along line 9—9 of Fig. 1;

Fig. 10 is an elevational view of a modification of the new and improved mechanism constituting this invention;

Fig. 11 is a section taken along line 11—11 of Fig. 10; and

Fig. 12 is a view similar to the lower left hand portion of Fig. 1, of a corresponding pattern mechanism for the modified form of the invention of Figs. 10 and 11.

Certain of the figures disclose various parts of a "Reading" full fashioned knitting machine embodying the mechanism and elements of my invention. For the sake of clearness I have illustrated only those parts of the various mechanisms necessary for an understanding of the invention; the various other parts and mechanisms and their manner of operation are well known in the art, and are shown and described in detail in the pamphlet entitled "Full Fashioned Knitting Machines", copyright 1920, and/or the "Reading" Full Fashioned Knitting Machine catalogues, copyright 1929, 1935, and published by the Textile Machine Works, Reading, Pennsylvania.

Referring to Fig. 1 of the drawings, a portion of a "Reading" full fashioned knitting machine is shown including front beam 1, back beam 2, and center bed 3 rigidly supported by spaced supports 4 and 5. A cam shaft 7 is mounted in its customary relation to the frame, as is a needle bar rocking or pressure shaft 8. The usual narrowing mechanism is shown at its customary position and it is represented generally by the numeral 9. Knitting needles 15 are mounted on the needle bar 11 in the usual manner. One end of a needle bar fork 16 is rigidly attached to the needle bar 11, and the other end is pivotally connected with arm 20, see Fig. 2. A presser lever 21 is fixedly mounted on the presser shaft 8, and pivotally supports arm 20. The functioning of this assembly of levers imparts a horizontal reciprocation to the needle bar 11. The needle bar lifting arm 17 is rigidly attached to the needle bar shaft 12, and is adapted to impart vertical reciprocation to the needles simultaneously with the action imparted to them by the needle bar rocker arm assembly.

The positioning of the regulating shaft 22, and consequently of the needles relative to the presser edge during the couliering operation to regulate the length of the loops and the number of courses per inch, is normally controlled by mechanism generally indicated at 13, see Figs. 9 and 10, which is commonly referred to as the regulating motion. This mechanism is clearly illustrated and described in the Zwicky Patent No. 1,417,289 and is referred to at this point only to the extent of its cooperation with the structure of the present invention. The regulating motion 13 includes the shaft 22 upon which a regulating arm 42 pivots freely. Alongside of this regulating arm 42 is an adjusting arm 30 which carries adjustable linkage for controlling the positioning of the two arms relative to each other. The arm 30 is rigidly secured to the regulating shaft 22 by means of set screws, see Figs. 9 and 10. Included in this linkage is a screw member 46 which works against a flat portion of the regulating arm. This screw is kept in contact with the regulating arm at substantially all times by means of a coil spring 31, one end of which is attached to the adjusting arm 30 and the other end to a holder fastened to the back beam 2, said spring action consequently biasing the cam follower 24 of arm 42 into operative engagement with its cam 23.

Thus the position of the regulating arm 42 relative to the adjusting arm 30, the angular position of the regulating shaft 22, the position of the needles relative to the presser edge and consequently the length of the loops being produced are determined by the position of the adjusting screw 46 during the couliering operation. Main and vernier adjusting devices are preferably provided for the screw 46 in order to facilitate the setting and adjusting of the regulating motion. A bracket 75 fixedly mounted on the regulating shaft 22, to the left of the loose course regulator, see Fig. 1, supports a stud 74 at its free end, which is adapted to engage the conventional presser lever 21. The presser lever 21 is of usual construction, and is provided with the usual presser cam follower 77, which is adapted to cooperate with the presser cam 76 mounted on the cam shaft 7. It is manifest that any movement imparted to the regulating shaft 22 by the functioning of the normal regulating mechanism 13 is transmitted to the bracket 75, thus affecting the position of the presser lever 21 which in turn adjusts the position of the needles relative to the sinker head, to control the normal loop length.

The present invention deals with mechanism for governing the positioning of the needles by the needle bar rocker arm assembly which positioning is normally controlled by the above described normal loop regulating mechanism. In the production of loose courses, it is necessary to reposition the needles relative to the presser edge before the thread guide begins to lay the yarn for the course. In other words, the varying of the needle position for controlling loop length occurs before the sinkers advance to form the loops in alternate spaces between the needles. This may be accomplished by mechanism capable of controlling the movement of the conventional regulating shaft over and above that which it ordinarily moves under the influence of the normal loop regulating mechanism 13, and in the present embodiment this is accomplished by means operating between the main cam shaft and the regulating shaft, and includes a lever 25 fixed to the conventional regulating shaft 22, see Fig. 3. Collars 26 and 27 are loosely mounted on regulating shaft 22 on either side of the hub of lever 25, for the purpose of supporting levers 28 and 29 respectively, which are joined together by a web portion 50, thereby effecting a unitary H-shaped structure. The free ends of these levers 28 and 29 journal a shaft 32, which in turn rigidly supports a cam follower 33 which is adapted to cooperate with a cam 34 on the main cam shaft 7 for repositioning the regulating shaft 22 through intermediate agencies, thus governing the length of loops. A spring 70, see Fig. 2, having one end connected to hook portion 78 of web 50, and the other end attached to the back beam 2, continually urges the cam follower 33 into engagement with the cam 34.

A variable positioning means capable of augmenting the action of cam 34 and follower 33 is adapted to be selectively moved into and out of cooperative position with an abutting means

mounted on the regulating shaft 22. In the present embodiment, the lever 25 is bifurcated at its free end, Fig. 5, one arm 35a of which has its top surface inclined to the horizontal as shown at 37 in Fig. 8, thus producing an angular surface with respect to the horizontal regulating shaft 22. This inclined surface 37 is longitudinally channeled to provide a guide bearing 38 for an adjustable abutting plate 35 adapted to cooperate with the variable positioning means above referred to. Integral with plate 35 and extending thru an opening in the other arm of bifurcated lever 25, is a screw 36 having an adjusting nut and a lock nut located on respective sides of the last mentioned arm of bifurcated lever 25, see Fig. 7.

It is apparent from this recited construction, that plate 35 can be minutely adjusted and thus vary the position of its abutting surface to thereby vary the effect upon the shaft 22 due to the outward movement of the variable positioning means consequently affecting the loop length control of this invention. As shown in Fig. 7, the plate 35 is provided with an elongated aperture 39 that is aligned with a threaded hole 40 in the arm 35a of the lever 25. A cap screw 41 passes through aperture 39 and is threaded into hole 40, thus providing an effective locking means to retain plate 35 in any adjusted position.

It was appreciated that means must be provided for augmenting the action of cam 34 and follower 33 so that their combined action would be versatile and capable of operating in a manner to supplement the action of the normal loop regulating mechanism 13 previously described. This may be accomplished by selectively shifting a variable positioning means between the levers 28, 29 supporting the follower 33 and the lever 25 mounted on the regulating shaft 22. In the present embodiment, a variable positioning means is employed in the form of a rotatable disc 53 (Fig. 6) which supports a plurality of varying height gaging elements 55 in a manner to be selectively positioned in cooperating relation with the abutting plate 35 upon shifting of the disc into operating position. This disc 53 is restrictively rotatable, and mounted on a headed pin 56 pressed into the hub 57 at the end of lever 47, see Fig. 6. The disc 53 is provided with a plurality of threaded apertures 54 arranged in a circle, which receive threaded elements 55 of varying height. The threaded stems of the elements 55 do not extend completely through the disc 53, thus providing pockets for the partial reception of a ball 58. The hub 57 has a hole extending partially therethrough and has positioned therein a spring 59. The ball 58 rests between the hub 57 and disc 53, thus serving as a spring pressed releasable holding means to maintain the disc 53 in adjusted position.

The disc 53 is provided with a toothed periphery of diameter corresponding to that of the hub portion 57 of the lever 47. The outline effected by mounting disc 53 upon the hub 57 corresponds to a plain circle circumscribing the toothed periphery of disc 53, see Fig. 3. This structure functions for a purpose to be hereinafter described. The shifting movement of the variable positioning means into and out of operating position is utilized to effect the selective operation of disc 53, to position the variable height gaging elements 55 in position to vary the length of loops in the loose course being produced. This is accomplished in this instance by a pawl 60 having a tip 60a for engaging the teeth on disc 53 to step such disc and pivotally urged toward effective position by a spring 63, and whose movement is controlled in accordance with the movement of lever 47. The spring 63, opposite ends of which are respectively attached to a pin 64 of lever 28 and to the hooked arm portion of pawl 60, biases pawl 60 in a counterclockwise direction, the maximum extent of which is limited by a lug portion on the lever 28 in the manner illustrated in Fig. 4. One means for accomplishing this desired result employs an extension 65 on pawl 60, which lies in the plane of the hub 57 and cooperates with the periphery thereof to engage the tip 60a with the toothed portion of the disc 53 to rotate the latter upon oscillation of lever 47 about its pivot 44. It will here be observed that the inclination of the plate 35 is such as to insure its being engaged by the operative button 55 upon movement of the latter into operating position. Two stops 66 and 67 are provided for limiting the maximum movement of lever 47 in either direction, and each comprises an adjusting screw 68 arranged in alignment with the path of travel of the hub 57. A handle 69 is mounted on the lever 47 for the purpose of manually controlling the loose course regulator.

The above described arrangement facilitates the cooperation of the ratchet mechanism and pawl 60 for ensuring its positive action when a selection is required. In order that this variable positioning means will accurately cooperate with the levers 28, 29, and abutting plate 35, abutting means is provided between levers 28 and 29 in the form of a bracket portion 51 of the web 50 (Fig. 5) against which lever 47 rests when shifted to its operating position.

For the proper functioning of the device, sufficient clearance must be provided between the abutting bracket 51 and the forward end of plate 35 for the reception of hub 57 and disc 53 when the same are shifted to operating position. Referring to Fig. 5, loose course cam 34, which controls the position of levers 28, 29 and consequently bracket 51, and the normal regulating cam 23, forming part of mechanism 13, which governs the normal position of the shaft 22 and lever 25 and consequently plate 35, are shown as embodying a low and a high portion, respectively, in coincidence throughout their respective portions extending from points (A) to (B) thereof. This extent of perimetral coincidence represents the period immediately following the functioning of the coulier mechanism, and it is possible because of this differential in cam heighths to shift the hub 57 of lever 47, with its associated variable positioning mechanism to an effective position at any place between these two points, since during this period the position of lever 25 is controlled by the normal regulating motion through means of the common regulating shaft, whereas the pattern mechanism including lever 47 and buttons 55 moves away from the lever 25 as the cam follower 33 follows the lower contour of its cam 34.

It often occurs that more than one loose course is desired to be formed in successive operations of this device throughout the knitting of a stocking. This will be accomplished by employing a low button on the pattern chain the height of which will swing a lever of this device a limited distance, insufficient to change the setting, but sufficient to cause the regulation of the loop length. Whenever it is desired to form a loose course embodying loops of different length from that previously formed, it is only necessary to

use a higher button on the main pattern chain which will give a greater movement to the lever, thus causing, by mechanism to be hereinafter described, a new setting of the loop governing mechanism.

The shifting of lever 47, and consequently that of the variable positioning means, may be effected by any pattern mechanism, however in the embodiment disclosed, the main pattern chain 71 is utilized. There are two positions of effectiveness for lever 47. One position is responsive to the movement imparted to the lever 47 by a low pattern chain button 84 which shifts this lever far enough so that an element 55 will govern the length of the loops in a loose course, but not far enough to cause stepping of the disc 53. The movement of lever 47 to the other position of effectiveness occurs when a high button 85 on the pattern chain coacts with the rod operating mechanism, inasmuch as the movement of rod 48, coincident with the operative positioning of a high button on chain 71, moves the lever 47 sufficiently far to cause stepping of the disc 53 and thereby cause a new element 55 to become operatively positioned which in turn governs the length of loops in the following course. This dual position of effectiveness of the loop governing mechanism is possible due to the width and inclination of plate 35, and the necessity of such a control becomes apparent when it is appreciated that it is often desirable to repeat loose courses of the same loop length.

The operation of the structure so far described is as follows: A series of elements 55, which vary in height in accordance with the loose courses desired in the knitting of the stocking, are mounted on the disc 53. Buttons are placed along the pattern chain 71 on those links corresponding to the courses within the stocking which are intended to be loose courses. Low or high buttons may be used, depending upon whether it is desired to produce loose courses of identical loop length upon the successive actuation of this new and improved device, or whether it is desired to rack the disc 53 for the selection of a different loop length governing button 55 upon the next successive actuation of the device. Upon the coaction of a button on the pattern chain 71 with a lever 72, which is adapted to pivot about a pin 73, a longitudinal pull on rod 48 is effected thus pivoting lever 47 about its pivot 44. The movement of rod 48 is transmitted to the lever 47 by a collar secured to the rod 48 which coacts with a forked extension 49 of the lever 47 in the manner illustrated in Figs. 2, 3 and 4. At this time, as was previously explained, the coulering has functioned and the relation of the normal regulating cam 23 and loose course cam 34 is as shown in Fig. 5, thus providing ample clearance between the elements 51 and 35 for the reception of the variable positioning mechanism. While an element 55 is aligned with plate 35, the continued rotation of cam 34 causes a forward thrust of levers 28, 29, and in turn causes lever 25, which is fixed to the regulating shaft 22, to move clockwise, as viewed in Fig. 5. This movement causes the bracket 75, supporting stud 74, to move clockwise thus affecting the position of lever 21, see Fig. 2. The lever 21 through its connection with levers 20 and 16, affects the position of the knitting needles 15 to bring them nearer to the presser bar during the period of the forward operation of the sinkers. Since the sinkers always move out between the needles a constant distance, this moving of the needles closer to the presser edge causes additional thread to be fed from the thread carriers which obviously increases the length of the loops, thus forming a loose course of specific loop length. Upon the specific loose course having been knitted, the button on the pattern chain moves from coactive relation with the lever 72, permitting spring 45 to return lever 47 to its ineffective position, and thus again rendering the normal loop regulating mechanism effective.

Figures 10, 11 and 12 show a modification of the invention, wherein the variable positioning mechanism comprises a pivotal lever 79 having integral therewith an arcuate extension 80. This arcuate extension 80 is adapted to pass between an abutting element 81, fixed to and extending between two levers 82 and 83, and the end of a screw 87. The arms 82 and 83 are loosely mounted on the conventional regulating shaft 22, and at their free ends support a shaft 88. Mounted for free rotation on the shaft 88, is a cam follower 89 having a boss 90 spacing the follower 89 between the levers 82 and 83. One end of a spring 92 is fastened to a hook 93 integral with the levers 82 and 83, while the other end is secured to the machine frame, thus maintaining the follower 89 in contact with a loose course regulating cam 91 similar to the cam 34.

A lever 94 is rigidly connected to the shaft 22 and serves to transmit the motion of the cam 91 to the lever 75 of Fig. 1. This lever 94 has screwed into its free end, an adjustable abutment screw 87 which is provided with a lock nut 95. The pivotal lever 79 is adapted to oscillate in accordance with the horizontal reciprocations of rod 48, and the action of a spring 96. A clearance is provided for the passage of the arcuate extension 80, with its associated elements 55, between the inner end of the abutting screw 87 and the plate 81, in a manner similarly described with respect to the clearance provided for the shifting of the hub 57 and disc 53, of the first species, into effective position, and as shown in Fig. 5. The series of elements 55 of varying height are mounted on the arcuate extension 80 and are adapted to govern the length of loops in various loose courses.

A stop device is integrally mounted on lever 82, and comprises a bracket 97 having an adjustable abutment in the form of a set screw 98. The purpose of the stop, of course, is to limit the outward travel of the lever 79 incident to the action of a spring 96. Manual shifting of the lever 79 is afforded by a handle 99.

The operation of the modification shown in Figs. 10 and 11 is as follows: A series of variable height elements 55 are arranged on the arcuate extension 80 of lever 79, in accordance with the size of loops required in the various loose courses in a stocking blank. A series of variable height pattern chain buttons 86 are positioned along the pattern chain 71 at those points where it is desired to knit a loose course. It is obvious that by arranging these loose course buttons on the main pattern chain, any combination of loose courses can be formed, by the selective operation of the new and improved device.

As one of the pattern chain buttons 86 coacts with lever 72, longitudinal movement of rod 48 is effected in a manner as explained in connection with the other modification of the invention. This movement occurs, of course, as previously explained, prior to the forward movement of the sinkers, at which time sufficient clearance is present between the abutting end of the screw 87 and the plate 81, to permit moving of the arcuate ex-

tension 80, and its associated elements, into effective positions. Inasmuch as the roller 89 is always in contact with loose course cam 91, the outward movement thereof, when transmitted through an element 55 and screw 87, causes a pivotal movement of the lever 94, and consequently of shaft 22, a distance greater than is ordinarily effected by the normal regulating mechanism 13. This movement of shaft 22 is imparted to bracket 75 and consequently to presser lever 21, to thereby vary the length of the loops for the specific loose course. Upon the next operative motion of the pattern chain, the pattern button 86 alluded to is moved out of operative engagement with the rod operating mechanism thus affecting rod 48, whereupon spring 96 returns the lever 79 to its ineffective position. At this point, the normal regulating mechanism 13 again operates to control the loop length of the subsequently formed normal loops until another pattern chain button 86 comes up to effect the introduction of another loose course. In this embodiment of the invention a proportionate relation must exist between the height of the pattern chain buttons 86 and the height of the elements 55 on the arcuate extension 80, in order to provide for the selective operation of the device.

From the foregoing, it is manifest that there has been produced a novel arrangement of parts which cooperate to produce a unitary construction facilitating the elimination of the use of a plurality of individual loose course regulating mechanisms. This novel arrangement of parts cooperates to lessen the weight normally applied to the regulating shaft. Further, there has been produced, new and improved mechanism that operates in conjunction with the normal loop regulating mechanism, but which renders said normal loop regulating mechanism ineffective upon the shifting of this device into an effective position. It is further apparent from the teaching of this invention that a novel single unit device has been provided that will enable the automatic controlling of an unlimited number of loose courses.

Of course, the improvements specifically shown and described, by which I obtain the above results, can be changed and modified in various ways without departing from the invention herein disclosed and hereinafter claimed.

I claim:

1. In a straight knitting machine, loop forming mechanism, means for selectively regulating the lengths of normal and loose loops formed by said loop forming mechanism, said means comprising a device for selectively determining different lengths of normal loops, and a unit for selectively determining different lengths of loose loops and imparting movement to an element of said loop forming mechanism.

2. In combination with the normal loop regulating mechanism of a multi-section straight knitting machine, a unitary device normally held in ineffective position and adapted to supplant the normal regulating mechanism for controlling a plurality of the machine sections when moved to effective position, said unitary device including means for positioning the machine needles and being provided with a plurality of positions of effectiveness respectively governing loops of different lengths, and pattern controlled means selectively moving said unitary device to any one of said positions of effectiveness.

3. A unitary mechanism for selectively affecting the position of the presser lever means of a plurality of the sections of a multi-section straight knitting machine for producing loose courses in a fabric being knitted independent of the normal loop regulating mechanism, comprising a pattern controlled shiftable device, said device including means for positioning the machine needles and having a plurality of positions of operative effectiveness, means for selectively shifting said device into one of said operative positions to control the length of loops of a desired course made by said machine, and means returning said device to ineffective position.

4. A mechanism for varying the action of a control mechanism in knitting machines comprising an oscillatory shaft, means to give said shaft a normal angular movement, and means to increase the angular movement of said shaft when desired comprising an arm fixed on said shaft, an actuator having a throw toward and away from said arm in synchronism with the normal movement of said shaft, but not contacting said arm, and means movable as desired between said actuator and said arm and adapted to transmit motion from the actuator to the arm to increase the angular movement of said shaft beyond the normal.

5. A means for varying the action of a control mechanism in knitting machines comprising an oscillatory shaft, means to give said shaft a normal angular movement, and means to increase the angular movement of said shaft when desired comprising an arm fixed on said shaft, an actuator having a throw toward and away from said arm in synchronism with the movement of said shaft, but not contacting said arm, and an element pivoted on an arm on the shaft to swing transversely of the plane of movement of said fixed arm to a position intermediate said actuator and fixed arm to thereby transmit motion between the two to increase the angular movement of said shaft.

6. A means for varying the action of a control mechanism in knitting machines comprising an oscillatory shaft, means to give said shaft a normal angular movement, and means to increase the angular movement of said shaft when desired comprising an arm fixed on said shaft, an actuator having a throw toward and away from said arm in synchronism with the movement of said shaft, but not contacting said arm, an element adapted to be moved between said actuator and said arm to transmit motion therebetween, a travelling pattern member, and means controlled by said pattern member for interposing said motion transmitting element between said actuator and said arm to thereby increase the angular movement of said shaft.

7. A means for varying the action of a control mechanism in kniting machines comprising an oscillatory shaft, means to give said shaft a normal angular movement, and means to increase the angular movement of said shaft when desired comprising an arm fixed on said shaft, an actuator having a throw toward and away from said arm in synchronism with the movement of said shaft, but not contacting said arm, a collar turnably mounted on said shaft, and a motion transmitting element pivoted on said collar to swing intermediate said actuator and said arm to transmit motion therebetween to thereby increase the angular movement of said shaft beyond the normal.

8. In a straight knitting machine, in combination, means acting to operate, and to determine the position of, the needles with respect to the presser edge and means for controlling said

means comprising an oscillatory shaft, an arm fixed on said shaft, an actuator turnably mounted on said shaft and having a throw toward and away from said arm, but not contacting the arm, a motion transmitting element adapted to be interposed between said actuator and arm to transmit motion therebetween, a travelling pattern member, and means whereby said pattern member causes said element to be interposed as desired between said actuator and said arm to oscillate said shaft.

9. In a straight knitting machine, in combination a mechanism for positioning the needles with respect to the presser edge, and means for controlling said mechanism comprising an oscillatory shaft, an arm fixed on said shaft, an actuator having a throw toward and away from said arm, but not contacting the arm, an element adapted to be interposed between said actuator and arm for transmitting motion therebetween, said element having buttons of different lengths mounted thereon at spaced intervals, a travelling pattern member, and means controlled by said pattern member for setting said element in different positions relative to said arm to thereby vary the movement of said shaft produced by one movement of said actuator as compared to another.

10. In a multi-section straight knitting machine including a cam shaft, presser lever means including cam follower means adapted to cooperate with presser cam means on said cam shaft, a regulating shaft, and a unit for controlling a plurality of the machine sections including adjustable means on said regulating shaft adapted to vary the movement of said presser lever means to control the length of loops of the average course, means for positioning the machine needles independently of said adjustable means including a fixed and a loose lever on said regulating shaft and provided with relatively adjustable abutment surfaces between said levers, of pattern controlled means adapted to be shifted between said surfaces for automatically affecting the presser lever means, whereby a plurality of individual loose courses of varying length loops can be produced with intervening courses of normal loops.

11. In a multi-section straight knitting machine, a cam shaft, a regulating shaft, presser lever means including cam follower means adapted to cooperate with presser cam means on said cam shaft, a normal course regulating mechanism operating between the cam shaft and regulating shaft effective to control the length of loops during normal knitting, a unitary loose course regulating mechanism for positioning the machine needles independently of said normal course regulating mechanism and adapted to vary the length of loops of a plurality of the machine sections during the formation of a plurality of individual loose courses, comprising pattern controlled shiftable means embodying a plurality of varying height projections adapted to be passed into and out of operative relation with other parts of the loop length varying mechanism mounted on said regulating shaft, and during predetermined cycles of operation of said machine.

12. In combination with a multi-section straight knitting machine, a cam shaft, a regulating shaft, presser lever means operative to affect the position of the knitting needles with respect to the presser bar means and cooperating with presser cam means on said cam shaft, loop regulating mechanism acting between the cam shaft and the regulating shaft for controlling the length of loops during normal knitting, of a unitary device for positioning the needles of a plurality of the machine sections and selectively producing complete loose courses independent of said loop regulating mechanism and comprising pattern controlled shiftable means, said means including a plurality of positions of operative effectiveness, and adapted to be selectively shifted into one of said operative positions for controlling the length of the loops of a course made by said machine, and means returning said device to ineffective position.

13. A unitary mechanism for selectively affecting the position of the presser lever of a straight knitting machine for producing loose courses in a fabric being knitted, comprising a pattern controlled shiftable device, said device including a plurality of interchangeable varying height elements mounted on an extension thereof, pattern means provided with varying height extensions adapted to shift a corresponding element on said device, into position to cause operation of the mechanism, and means returning said device to ineffective position upon the moving of said pattern extension to ineffective position.

14. In a straight knitting machine, a cam shaft, a presser cam on said cam shaft, a presser lever for cooperation therewith, a regulating shaft, loop regulating mechanism mounted on said regulating shaft and cooperating with a cam on said cam shaft, adapted to control the position of said presser lever and thereby control the length of the loops during normal knitting, unitary means mounted on said regulating shaft comprising a fixed lever and a loose lever also thereon and a device movable between said levers having a plurality of elements of varying height, said device capable of being moved to any one of a plurality of positions by automatic pattern control mechanism for effecting the shifting of any one of said elements between said loose and fixed lever on said regulating shaft, and a cam on said cam shaft cooperating with said loose lever to impart a predetermined movement to said regulating shaft in accordance with the height of element between said loose and fixed levers.

15. In a straight knitting machine, a cam shaft, a presser cam on said cam shaft, a presser lever for cooperation therewith, a regulating shaft, loop regulating mechanism mounted on said regulating shaft and cooperating with a cam on said cam shaft, adapted to control the position of said presser lever and thereby control the length of the loops during normal knitting, additional unitary loop regulating means mounted on said regulating shaft for lengthening the loops of desired courses and including a series of varying height elements arranged in a manner to become aligned with contact surfaces of said unitary means upon the shifting of said elements into effective position, pattern control mechanism including a number of varying height surfaces adapted to selectively control the shifting of said elements during desired cycles of operation of said machine, and means effective to return said shiftable elements to ineffective position after the formation of a given lengthened course of loops by said machine.

16. In a straight knitting machine, a cam shaft, a regulating shaft, a loose course regulating device including a loose lever and a fixed lever on said regulating shaft and loop varying control mechanism between said levers providing aligned

cooperating contact surfaces on said levers, respectively, said loose lever being provided with a roller cooperating with a cam on said cam shaft, mechanism acting between said cam shaft and said regulating shaft for controlling the length of the loops during normal knitting, said normal loop control mechanism including a lever fixed to said regulating shaft and a lever turnably mounted on said regulating shaft provided with a roller cooperating with a cam on said cam shaft, said cams being so arranged that low and high portions thereof are in coincidence, thereby periodically providing clearance between said first two named levers of said loose course regulating device for permitting the passage of portions of said loose course loop varying control mechanism therebetween.

17. In a straight knitting machine, the combination with regulating mechanism adapted to control the length of loops during normal knitting, of unitary mechanism adapted to control the length of loose course loops throughout a plurality of selected points in the stocking being knitted, comprising a pivotal lever provided with a rotatable disc including a plurality of varying height elements and adapted to be shifted into effective position, pattern controlled means selectively effective to cause said shifting and adapted to simultaneously change the setting of said disc on said lever, and to cause the shifting of the rotatable disc into effective position without changing the setting thereof.

18. In a straight knitting machine, the combination with regulating mechanism adapted to control the length of loops during normal knitting, of unitary mechanism adapted to control the length of loose course loops throughout a plurality of selected points in the stocking being knitted, comprising a pivotally mounted arm one end of which supports a ratchetable disc including varying height means for cooperating with an adjustable contact element in said unitary mechanism, means normally holding said pivotal arm in ineffective position, and pattern control means adapted to move said pivotally mounted arm to a plurality of positions of effectivness, and tooth means adapted to change the rotative position of said disc when said arm is moved to one of said positions of effectiveness.

19. A unitary mechanism for selectively affecting the position of the presser lever of a straight knitting machine for producing a plurality of loose courses of varying loop length, comprising a pattern controlled shiftable device including a ratchetable disc provided with varying height elements and adapted to be shifted into any one of a plurality of positions of effectiveness, means returning said device to ineffective position upon the completion of a desired course of sinker loops, and means for stepping said ratchetable disc as it approaches one of its positions of effectiveness.

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