

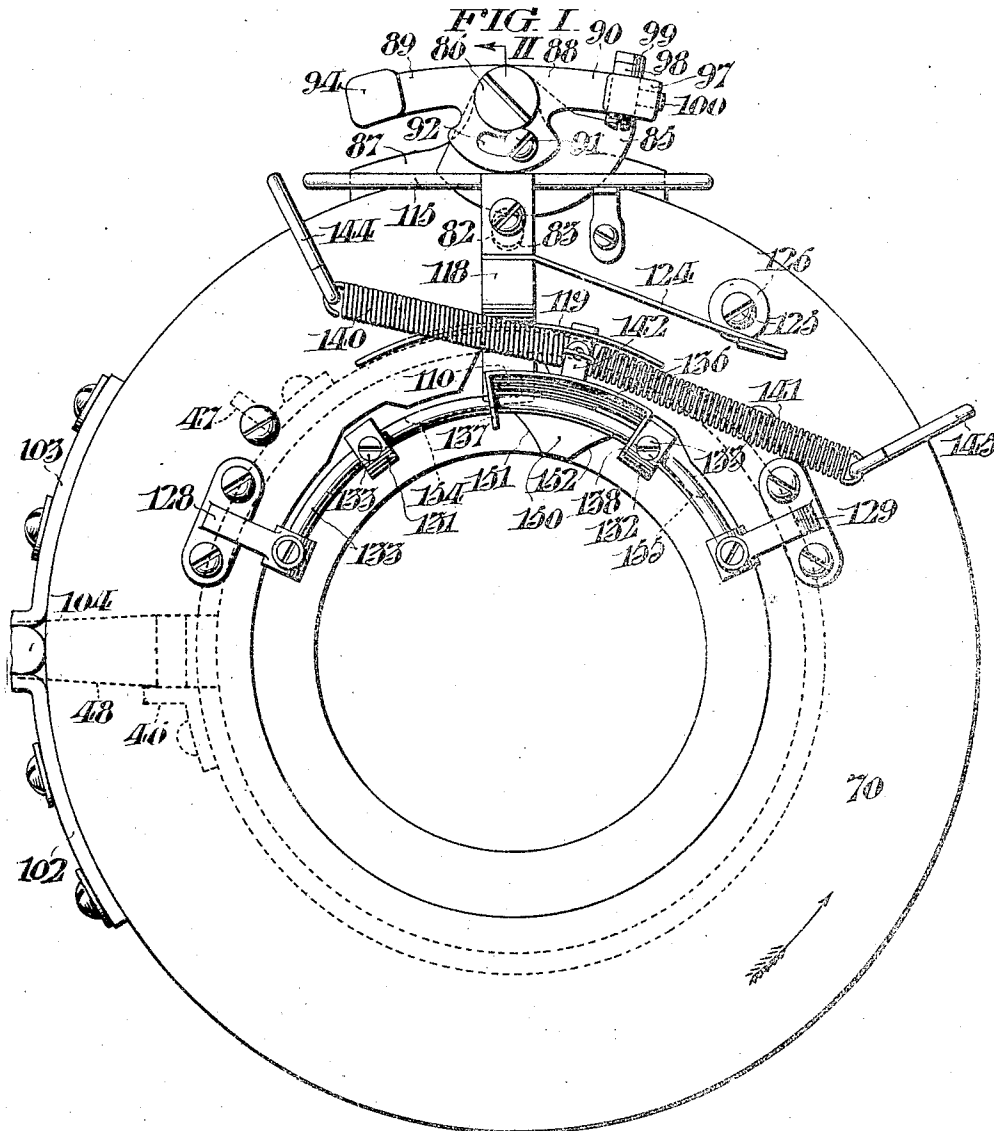
A. M. PIGEON.  
KNITTING MACHINE.

APPLICATION FILED SEPT. 19, 1908.

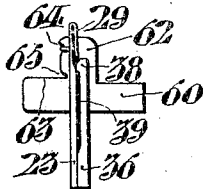
Patented Dec. 14, 1909.

5 SHEETS—SHEET 1.

943,230.



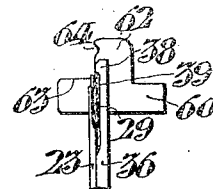
**FIG. VII.**



WITNESSES:

*John C. Bergner*  
*Wm. J. Spier*

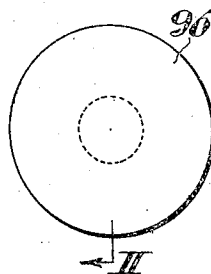
**FIG. VIII.**



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*by his Attorneys*  
*Tracy & Paul*



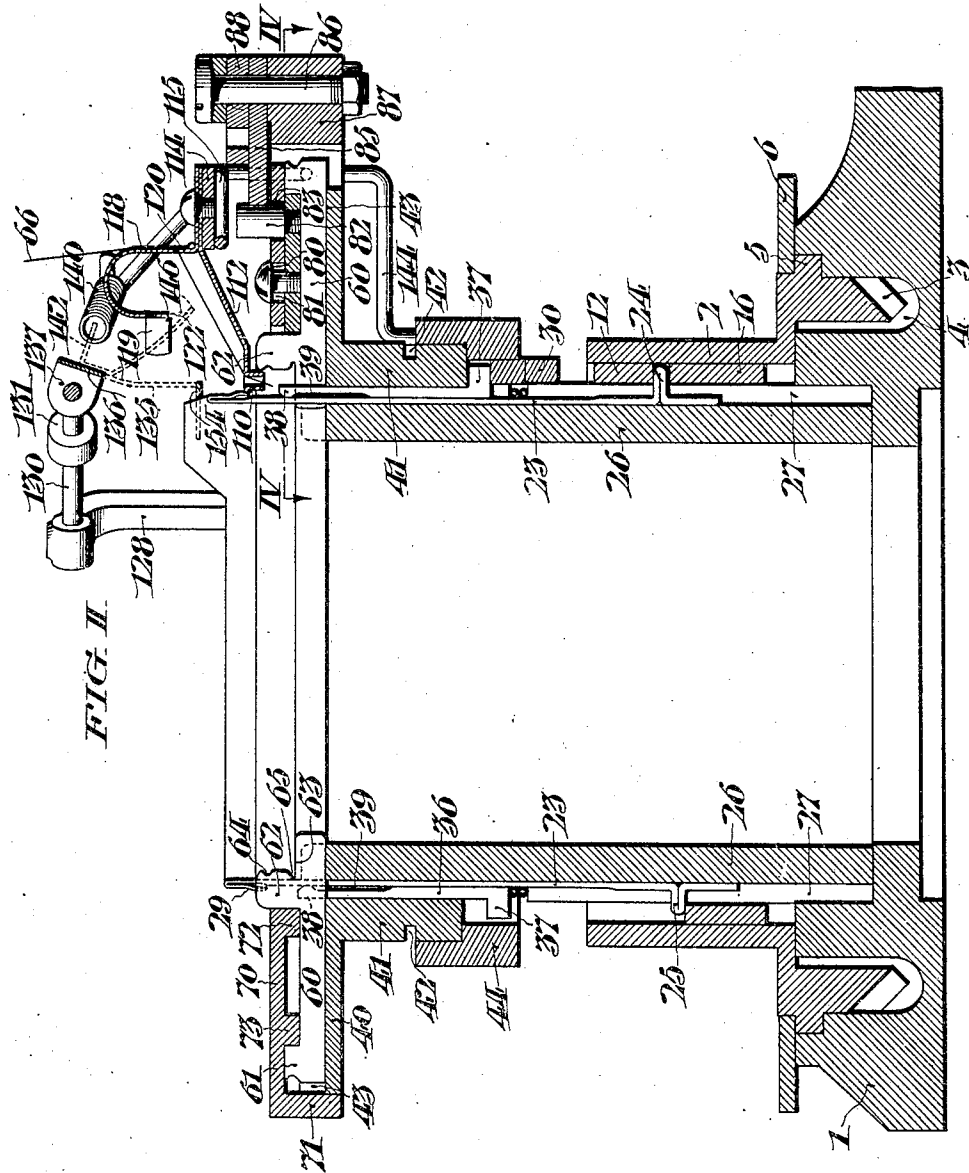
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5 SHEETS—SHEET 2.

943,230.



WITNESSES:

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943,230.

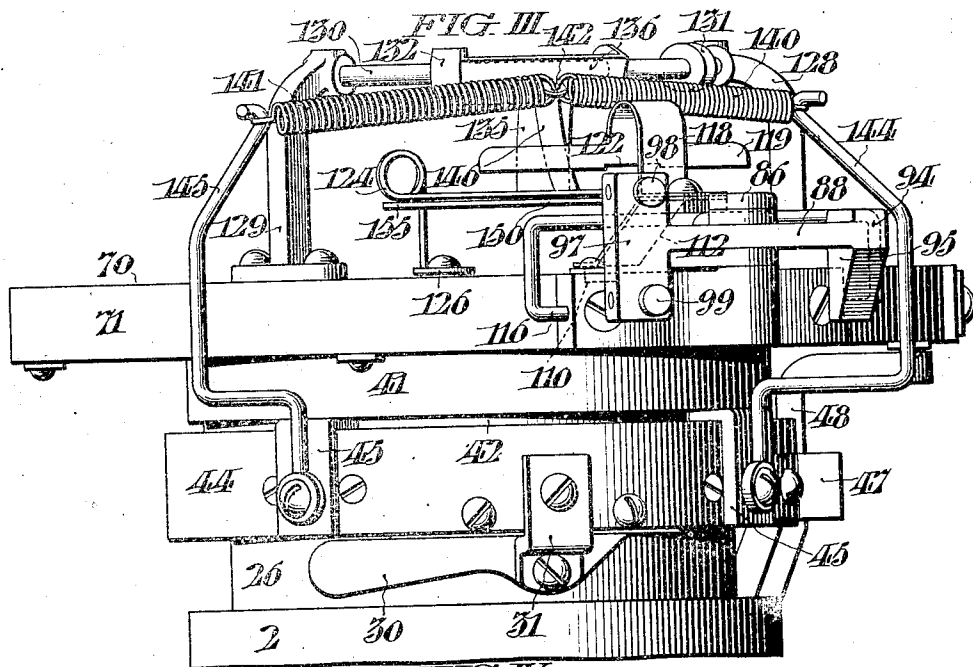


FIG. IV

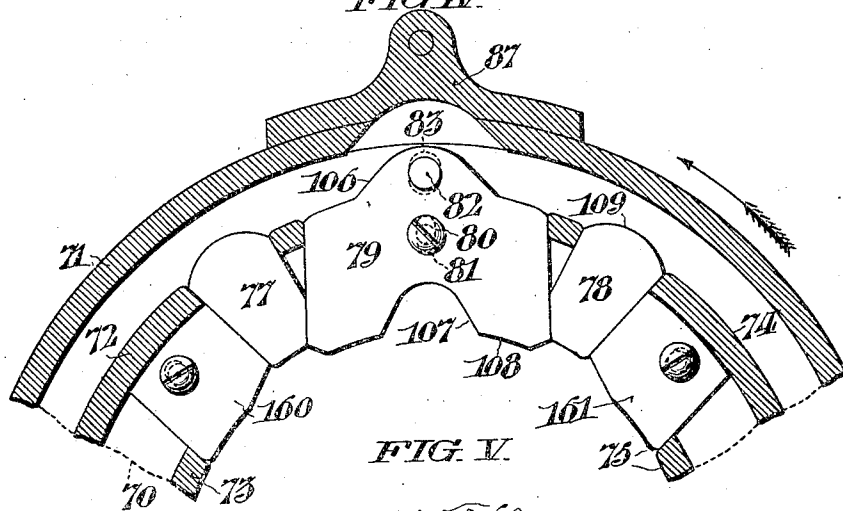
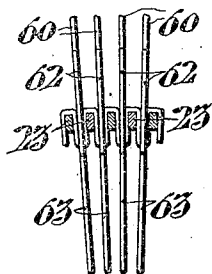


FIG. V



WITNESSES:

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*Wm. J. Spierl*

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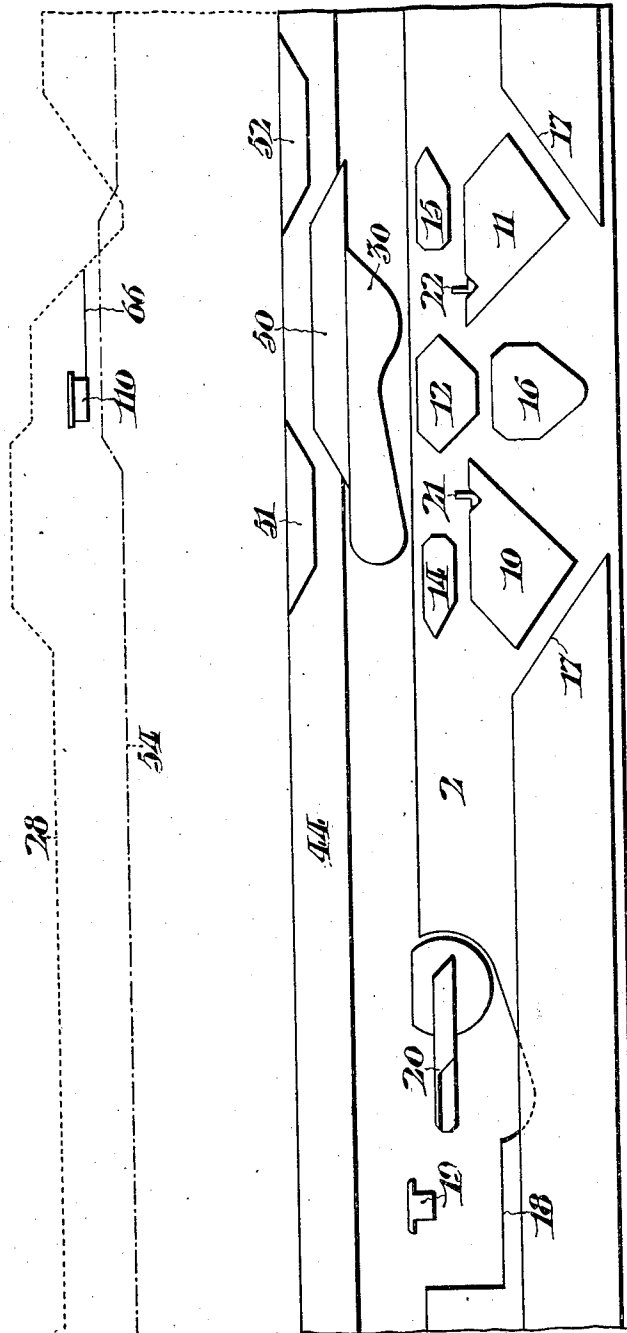
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5 SHEETS—SHEET 4.

943,230.

FIG. 11.



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5 SHEETS—SHEET 5.

FIG. IX.

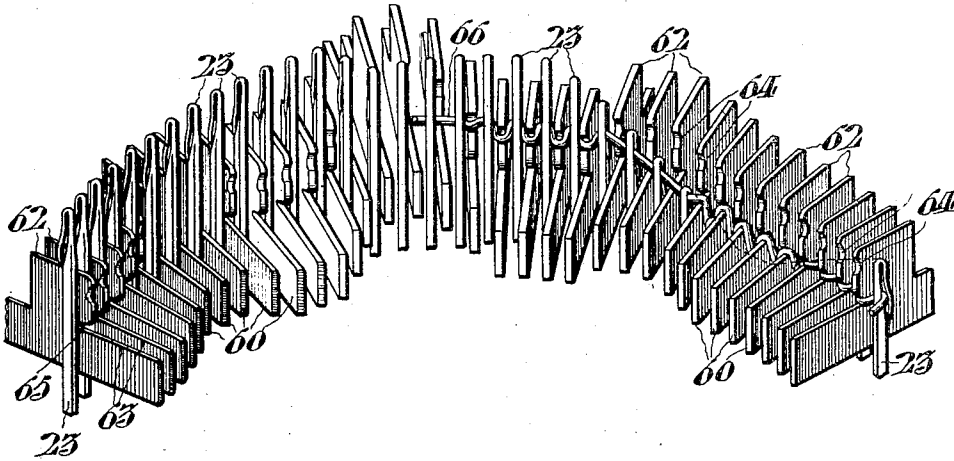
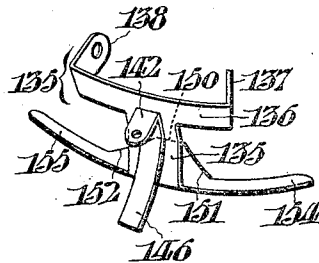


FIG. X.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

ALBERT M. PIGEON, OF PHILADELPHIA, PENNSYLVANIA.

## KNITTING-MACHINE.

943,230.

Specification of Letters Patent.

Patented Dec. 12, 1909.

Application filed September 19, 1903. Serial No. 453,774.

*To all whom it may concern:*

Be it known that I, ALBERT M. PIGEON, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Knitting Machines, whereof the following is a specification, reference being had to the accompanying drawings.

My invention relates to knitting machines employing independently movable spring beard needles.

The object of my invention is to provide a knitting machine capable of the various adaptations and functions now usually found in latch needle machines, but capable of doing finer work.

If independently movable latch needles are reduced in width below a certain standard, weakness develops at the pivot, so that by employing spring beard needles finer work may be accomplished than with latch needles.

A machine organized as I will describe it, and employing spring beard needles is capable of performing all the functions of the ordinary latch needle machine, but can produce work of a greater degree of fineness.

I have shown and will describe my invention as applied to a stocking knitter, which apart from the particular parts which I will describe may be organized as is the ordinary American stocking knitter employing latch needles, and for this reason I have shown in the drawings only those parts which relate to my invention because the other parts of the knitting machine may be of standard construction, but it will be understood that my invention is not thus limited to stocking knitters, nor to any particular type of knitting machine.

My invention comprises a complete stocking knitter, and accordingly in this specification I will describe the entire mechanism in order that the operation of the parts may be understood, but in the present case the claims relate more particularly to the vertically movable beard pressers cooperating with the spring beard needles, together with the operative mechanism for said beard pressers, whereby I obtain a more effective formation of the knitting loops under all the conditions involved in the fabrication of a knit stocking than is secured by other mechanisms.

Specific claims relating to the sinkers and their operative mechanism and also to the

thread feeding mechanism, and means for controlling the same, have been removed from this case by virtue of a requirement for division.

In the accompanying drawings, Figure I, is a plan view of the upper portion of the machine. Fig. II, is a vertical section taken on the line II, II, of Fig. I. Fig. III, is a side elevation looking from the upper right hand corner of Fig. I. Fig. IV, is a horizontal section taken on the line IV, IV, of Fig. II. Fig. V, is a fragmentary sectional view showing the thread as drawn against the needles previous to the formation of the stitches. Fig. VI, is a development of the needle cam cylinder and presser cam ring. Fig. VII, is a fragmentary side elevation showing the relative positions of the needle, beard presser and thread sinker when the beard of the needle is closed. Fig. VIII, is a similar view showing the relative positions of the same parts after the thread has been taken by the needle and the loop drawn. Fig. IX, is a perspective view illustrating the relative movements of the needles and sinkers together with the thread which they engage, illustrating their method of loop formation. Fig. X, is a detail view of the guide frame which controls the operation of the thread eye.

So far as concerns the primary parts of the machine, which it possesses in common with all similar knitting machines, they comprise the bed plate 1, which affords a bearing for the lower end of a cam cylinder 2, having a depending annular bevel gear 3, arranged to move within an annular groove 4, formed in the upper face of said bed plate. Said gear is adapted to be driven by a bevel pinion in any well known manner. A ledge 5, is formed on the outer periphery of the gear 3, and co-acts with an annular plate 6, secured to the upper horizontal surface of said bed plate 1, whereby the cam cylinder 2, is rotatably maintained in its proper location.

The spring beard needles 23, are of the usual construction and provided with long and short butts 24, and 25.

Mounted upon the inner periphery of the cam cylinder 2, are the stitch cams 10, 11, upper center cam 12, guard cams 14, 15, lower center cam 16, and needle elevating cams 17, 17'. Operating through a recess 18, in the wall of the cam cylinder 2, are a drop-picker 19, and a raising and lowering cam 20.

which may be of well known construction, and operating in a well known manner. The lifting pickers 21, and 22, are also of well known construction. One-half of the series of needles in the presence instance, are provided with long butts 24, and the other half with short butts 25, and said needles slide in grooves 27, in the stationary needle cylinder 26. The dotted line 28, in Fig. VI, indicates the positions assumed by the upper ends of the needles under the influence of the cams 10, 11, 12, and 17. The upper end of each needle is formed with a spring beard 29, arranged to be moved by a presser to bring the lower end of the beard into contact with the shank of the needle, thus forming a closed thread eye. A guard cam 30, is secured to an angle plate 31, which in turn depends from the periphery of a rotary cam ring 44, said guard cam being provided to prevent any needle butts from engaging the beard presser operating cams.

I will next describe in order, first, the beard pressers and their operative mechanism, whereby they cooperate with the spring beard needles to close their beards when their loops are to be cast off. Second, the sinkers with their operating mechanism, and, third, the thread feeding mechanism and its controlling means.

(1) *The beard pressers and their operative mechanism.*—For the reciprocation of the beard pressers which move vertically in the same grooves which receive the needles, the needle grooves are cut deeper into the needle cylinder than would otherwise be the case, so that the needle bars project a considerable distance above the outer face of the shank of the needles, the butts of the needles being correspondingly elongated. Within the space thus provided and within the needle grooves beyond the outer faces of the needle shanks a beard presser 36, is inserted in correspondence to each needle. The beard presser is of the same width as the needle groove and is adapted to bear and slide against the shank of the needle with which it cooperates. The beard presser is provided with a laterally extending butt 37, at its lower end and a beard pressing nib 38, at its upper end. Below said nib 38, is a recess 39.

Secured to the upper end of the needle cylinder 26, is an annular plate 40, having a depending annular flange 41, provided with a circumferential groove 42. Fitting around the lower end of the flange 41, is a shouldered cam ring 44, to which are attached four angle plates 45, having their horizontal portions slidably fitting the groove 42, thereby maintaining said ring 44, in proper rotative relation with said flange 41.

Adjustably secured to the outer periphery of the ring 44, are two angle lugs 46, 47, arranged to be engaged by the upwardly

extending arm 48, which is secured to the base of the cam cylinder 2, whereby the ring 44, may be rotated, or oscillated by a lost motion connection, depending upon the motion of the cam cylinder 2. This lost motion connection is utilized during reciprocal knitting, as during the formation of the heel and toe pockets of a stocking, and affords a means for placing the beard presser cams in proper relation with the center of the needle cams at each successive oscillation.

Mounted upon the inner periphery of the ring 44, are the center cam 50, and side cams 51, and 52, arranged to cooperate with the butts 37, on the beard pressers to control their operations. The dot and dash line 54, indicates the positions assumed by the upper ends of the beard pressers 36, under the influence of the cams 50, 51, and 52, while the dotted line 28, shows the corresponding position of the upper ends of the needles under the influence of the needle cams when the machine is rotating in the direction indicated in the drawings.

As a result of the cooperation of the knitting cams and the presser cams with the needles and beard pressers respectively, the needles, as the machine rotates, successively rise to take the thread and descend to draw the stitch in the manner well known in knitting while the beard pressers rise under the influence of the center cam 50, somewhat before the needles reach the lowermost limit of their motion and are maintained in an elevated position until the needle begins to ascend again when they are restored to the normal level. The result of the cooperation thus occasioned between the needles and the beard pressers results in pressure being imposed by the nibs of the pressers upon the beard of the needle as it descends to cast off its old loop, this pressure maintaining the point of the beard in closed position, during practically all of the final descent of the needle, so that not only is the old loop slid up over the point of the beard, but the beard is prevented from springing back until the loop goes over the top of the needle thus preventing the beard from springing open and unduly distending the loop as it is cast off.

(2) *The sinkers and their operating mechanism.*—The sinkers according to my invention, perform the double function of sinking the yarn between the needles and of acting as a loop holder to hold down the web. The sinkers are located in radial relation to each other in grooves 43, in the annular plate 40, and also in the upper end of the needle cylinder 26, the grooves being so spaced that a sinker is interposed between each pair of needles. Each sinker 60, comprises in addition to its body portion, two upward projections 61, and 62. Its inner

end also projects beyond the portion 62, to form the nose 63, which supports the web and feeds it forward as the sinker is moved horizontally back and forth as will be explained. The inner edge of the projection 62, is provided with two notches 64, and 65. The notch 64, is for engaging the thread 66, when the bit 60, is moved inwardly to sink the loop and draw the thread around the shanks of the adjacent needles, as shown in Fig. V. The notch 65, is for holding the web after the stitch is formed, so that the needle may be withdrawn therefrom without drawing the loop with it.

Rotatably mounted upon the upper side of the grooved plate 40, is an annular cam plate 70, having a depending peripheral flange 71, and also two concentric ridges 72, and 73, depending from its under side. The outer vertical surface 74, of the ridge 73, and the inner vertical surface 75, of the ridge 73, are adapted to act as cam surfaces for engaging the lateral projections 61, and 62, respectively of the sinkers 60, to maintain them in proper position during the greater part of the rotation.

Secured to the under side of plate 70, are the stationary cams 77, and 78, also the adjustable retracting cams 160, and 161. An adjustable center cam 79, is slidably suspended on the under side of plate 70, by means of a screw 80, passing through an elongated slot 81, in said plate and resting the under side of its head upon the upper surface of said plate. Projecting upwardly from the cam 79, is a stud 82, which projects through an elongated slot 83, in the plate 70; said stud 82, is arranged to bear against the edge of a cam 85, which is mounted about bolt 86, pivotally supported by a bracket 87, secured to the outer periphery of the flange 71.

A rocker arm 88, having two lateral extensions 89, and 90, is adjustably secured to the cam 85, by means of a screw 91, passing through a curved slot 92, in the central portion of said arm. It will be noted by reference to Fig. I, that the curvature of the edge of the cam 85, is of gradually increasing radius from left to right, and by adjusting the relative positions of said cam and said rocker arm, the extent to which the cam 79, will be moved by the contact of its stud 82, with the edge of cam 85, may be varied. By thus varying the position of the cam 79, the extent of movement of the sinkers 60, is varied, and consequently the amount to which the thread 66, is distended by the projection 62. In this manner the length of the stitch formed by the needles may be varied, and consequently the degree of tightness of the resulting fabric will be correspondingly varied.

The extension 89, of the rocker arm 88, has a lug 94, formed on its outer end, said

lug having a depending tapering portion 95, which is adapted to be engaged under certain conditions by the disk cam 96. Said disk cam may be raised and lowered by any suitable mechanism which may be controlled, for example, by a pattern mechanism, such as is well known in machines of this general class.

The extension 90, has a lug 97, on its outer end provided with adjustable projections 98, and 99, which may be formed of screws and retained in their adjusted positions by means of set screws 100. Said projections may also be engaged by the disk cam 96, when it is raised to their respective levels, thereby turning the rocker arm 88, and with it the cam 85, thereby varying the extent to which the cam 79, is moved inwardly, and consequently varying the length of stitch accordingly.

Secured to the outer periphery of the flange 71, are two angle plates 102, and 103, having their inner ends spaced apart sufficiently to receive therebetween the post 104, on the upper end of the arm 48. By means of this arrangement the plate 70, and the cam cylinder 2, are rotated in unison.

As a result of the sinker cams which have been described, and their actuation by the above recited mechanism, the circle of sinkers which normally rest with their noses projecting over the inner edge of the needle cylinder are given three successive motions of withdrawal in the form of three successive waves corresponding to the inner edges of the cams 77, 79, and 78, successively. Of these three wave like motions, the central one is the greatest in extent. The one first occurring is without effect in the operation of the machine being useful only upon reverse motion during reciprocation. Upon referring to Fig. IX, the precise relation of these sinker movements to those of the needles and the feeding of the yarn will be observed. The main withdrawal of the sinker corresponding to the notch 107, of cam 79, occurs as the needles begin to descend. It is during this withdrawal that the thread is fed against the shanks of the needles being led by the thread eye 110, against the shank at a point below the beard and directly opposite the notch 64, of the sinker. Immediately upon the return of the sinker to its normal position it catches the yarn within its notch and sinks it between the needles thus firmly holding the incipient loop against the shank of each needle just below the beard, as seen in the central part of Fig. IX. While thus held the needles begin the second part of their descent under the influence of the following stitch cam 11, by which the loop is passed under the point of the beard because of the descent of the needle while the loop is held in position by the notches 64. 130

Shortly thereafter the sinkers are again withdrawn by cam 78, so that the needles in their further descent, pull the yarn which is now freed from the notches 64, down to the lower level of the tops of the noses of the sinkers, whereupon, the sinkers again go forward by which motion the yarn between the loops is engaged with the notches 65, which, during the entire remainder of the rotation of the cylinder, operate to hold the loops down, a function which continues until after the needles have been advanced over the top of the leading stitch cam 10. It will therefore be seen that during each rotation of the cylinder each sinker operates, first, as a loop sinker properly so-called, and engaging the yarn within its notch 64, and sinking it between the needles and then after a temporary withdrawal operates as a web holder engaging the loops beneath the notch 65, at the same time, as usual in sinkers of this general construction, the noses of the sinkers by their wave like motion are continuously operating to feed the web forward.

(3) *The thread feeding mechanism and its controlling means.*—The thread 66, may be fed from any suitable bobbin, (not shown). A thread eye 110, is provided at the extremity of a swinging arm 112, which is supported by a plate 114, attached to a wire frame 115. The ends of the wire frame are bent to form trunnions 116, which are journaled in holes formed in the bracket 87. As shown in Fig. II, the thread eye 110, is normally in close proximity to the line of travel of the beards of the needles in order to properly feed the thread to said needles.

Mounted to overhang the arm 112, and adapted to move therewith, is a hooked arm 118, having a cross arm 119, at its free extremity. A thread eye 120, is provided in the arm 118, through which the thread 66, passes on the way to the thread eye 110. A notch 122, is formed on the under side of the cross arm 119, for a purpose to be explained. A spring 124, is mounted upon the plate 70, by means of a screw 125, and washer 126, and has its free end bearing against the upper side of the base of the arm 118, thus tending to maintain said arm 118, and the arm 112, in the position shown in Fig. II.

Mounted upon the upper side of the plate 70, are two brackets 128 and 129, which support the ends of a wire 130, which is bent in the arc of a circle. Adjustably mounted upon said wire are two collars 131, and 132; said collars may be retained in adjusted position by means of set screws 133. Slidably mounted upon the wire 130, is a guide frame 135, having a cross bar 136, provided with ears 137, and 138, at its ends. Said ears slide over the wire 130, and are limited in their travel by the collars 131, and 132, respectively. In order to move said frame

135, along said wire, I provide two springs 140, and 141, connected at their inner ends to the eye lug 142, on the cross bar 136. Their outer ends are connected to the wire arms 144, and 145, respectively, which in turn are mounted upon angle plates 45, on the ring 44. An arm 146, extends laterally from the frame 135, and is adapted to ride in the notch 122, under predetermined conditions to control the relative movement of frame 135, and thread eye 110.

At the lower end of the frame 135, and at substantially right angles thereto is a plate 150, having its central portion formed with two beveled edges 151, and 152, which are adapted to come in contact with the end needles of the series that are raised during the knitting of the heel and toe pockets of a stocking. Said plate 150, has two curved wings 154, and 155, which act as guides.

During circular knitting when all the needles are in action, the plate 150, is above the level of their tops and therefore maintained in the same position. When rotating as indicated by the arrow in Fig. I, the wing 154, bears against the outer faces of the needle shanks, which are raised to the highest position shown in dotted line 28, of Fig. VI, thereby keeping the plate 150, from swinging in too far under the influence of the springs 140, and 141. When rotating in the opposite direction the wing 155, performs the same function.

During the narrowing and widening process in the knitting of heel and toe pockets, the beveled edges 151, and 152, come in contact with the end needles of the raised series, whereupon the frame 135, is swung backward and with it the arms 118, and 112, are raised, thereby withdrawing the thread eye 110, from its proximity to the needles, thus preventing the thread from being fed to the needles which are being thrown out of or into action in the narrowing and widening operation.

During reciprocatory knitting, as when heel and toe pockets are knit, the action of the active needles, beard pressers and sinkers is the same as explained above, except that they are operated alternately, by one side and then the other of the cams described. During such knitting the long butt needles are raised to the idle level, as is well known. During the narrowing operation a needle is thrown up at alternate ends of the idle series at each oscillation and during the widening operation a needle is pulled down at alternate ends during each oscillation. When the machine is rotating in the direction indicated by the arrow in Fig. I, the beveled edge 151, encounters the shank of the end needle of the raised series, whereby the frame 135, is tilted so that the arm 146, strikes the cross arm 119, thereby tilting arms 118, and 112,

and raising the thread eye 110, to draw the thread away from the feeding position for the needles. The frame 133, slides over wire 130, until the ear 138, encounters the collar 132, whereupon said collar acts to positively drive the frame 135. The arms 144, and 145, remain stationary when the direction of oscillation is reversed, until the lost motion between the arms 48, and plates 46, and 47, is taken up. During the time that the arm 48, is passing from plate 47, to plate 46, the spring 141, is put under tension and so remains until the direction of oscillation is reversed. Upon such reversal the spring 140, is placed under tension and the arm 146, is drawn into the notch 122, whereby the plate 150, and thread eye 110, are maintained in correct relative position so that the thread will be fed to the needles at the right moment as the beveled surface 151, recedes past the last idle needle. The notch 122, is elongated in order that the arm 146, may move an equal distance on each side of the center when the direction of rotation of the cam cylinder is changed, in order that the thread eye 110, may be lowered into feeding position at the proper moment as determined by the beveled plate 150.

By this construction it will be seen that the thread is properly fed to and withdrawn from the constantly changing series of needles. It will be understood that this sequence of operations will take place alternately at each end of the series.

Having thus described my invention, I claim:—

1. In a knitting machine, fitted with a series of spring beard needles, a series of individually reciprocating beard pressers, each beard presser being adapted to reciprocate in a line parallel to the axis of the needle with which it is associated.

2. In a knitting machine, a grooved needle cylinder; a series of spring beard needles reciprocating within said grooves; and a similar series of individual beard pressers, corresponding to said needles, and reciprocating within said grooves.

3. In a knitting machine, a needle cylinder provided with grooves; a spring beard needle in each groove; a beard presser also inserted in each groove and overlying the shank of the needle; and means for simultaneously but independently imparting a

motion of reciprocation to the needles and to the beard pressers.

4. In a knitting machine, the combination of a spring beard needle; a beard presser in contact with the outer face of the shank of the needle; a bit upon the upper end of the beard presser; and means for imparting reciprocation to the beard presser parallel to the needle whereby the point of the beard is closed as the needle sinks within each old loop to cast it off.

5. In a knitting machine, the combination of vertical spring beard needles; a beard presser in contact with the outer face of the shank of each needle; a bit upon the upper end of the beard presser; means for imparting vertical reciprocation to the beard pressers, whereby the point of each beard is closed as the needle sinks within each old loop to cast it off, such closure continuing after the point of the beard has passed down within the old loop.

6. In a knitting machine, the combination of a grooved cylinder containing needles in its grooves; a series of beard pressers in said grooves overlying the needles; butts upon such beard pressers; and a circular groove with interposed cams for the reception of said butts whereby reciprocating motion is imparted to the beard pressers.

7. In a knitting machine, the combination of spring beard needles; a beard presser alongside of each needle; sinkers between the needles; and means for imparting independent motion to needles, beard pressers and sinkers, the motion of the needles and beard pressers being parallel with each other.

8. In a knitting machine, the combination of spring beard needles and beard pressers; means for imparting an independent but parallel reciprocatory motion to both needles and beard pressers; and sinkers interposed between the needles and provided with loop sinking notches and web holding notches below the loop sinking notches.

In testimony whereof, I have hereunto signed my name, at Providence, county of Providence, State of Rhode Island this 15th day of September, 1908.

ALBERT M. PIGEON.

Witnesses:

JOSEPH A. PIGEON,  
A. MANCHESTER HUSSEY.