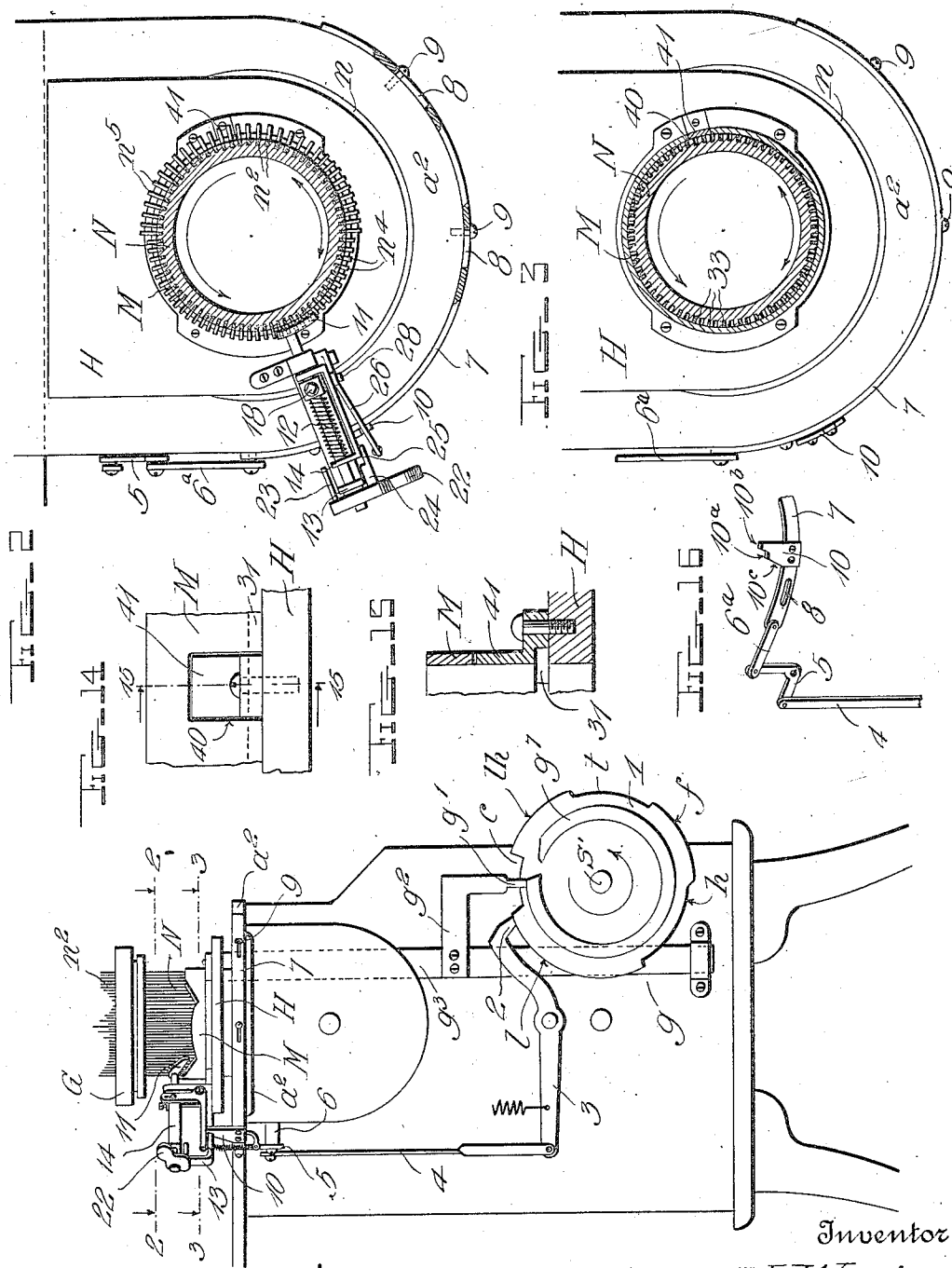


H. H. WEST.
 NEEDLE ACTUATING MECHANISM FOR KNITTING MACHINES.
 APPLICATION FILED JAN. 4, 1912.

1,045,651.

Patented Nov. 26, 1912.

5 SHEETS—SHEET 1.



Witnesses.

E. J. Coleman
 S. M. W. Cole,

Harry H. West

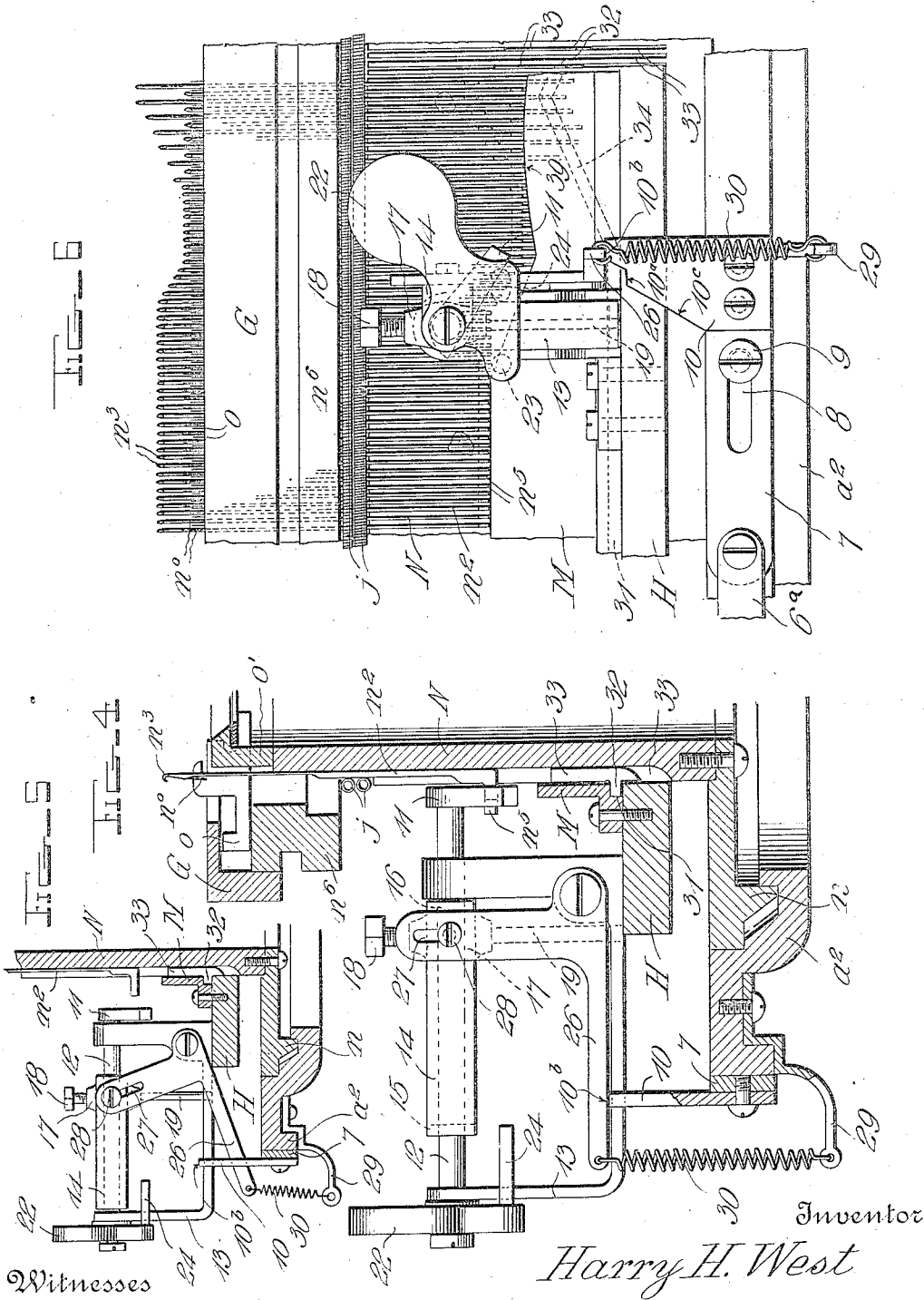
By *A. B. Wilson & Co.*
 Attorneys

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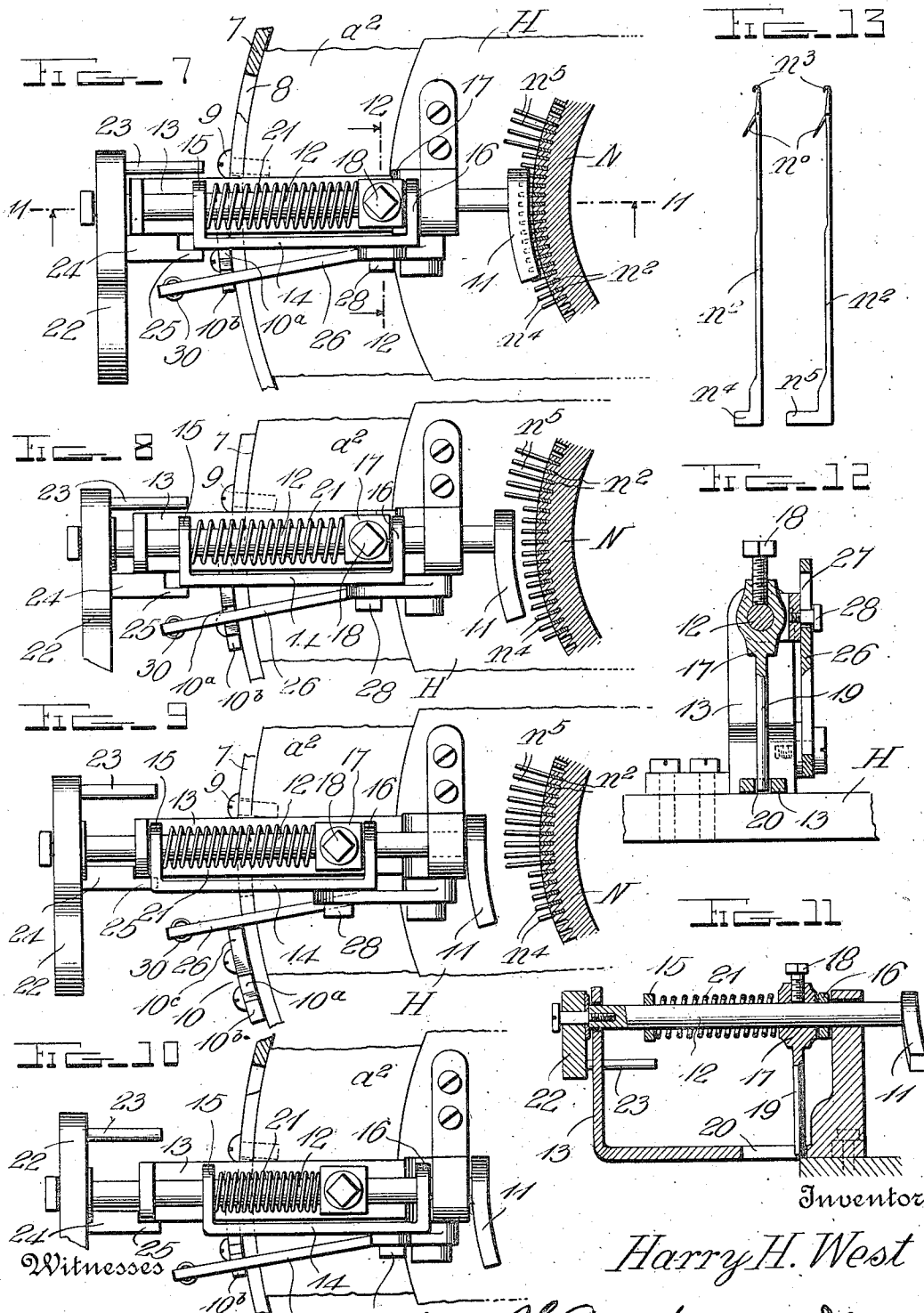


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5 SHEETS—SHEET 3.



Witnesses

E. E. E. E. E.
 J. M. M. C. C.

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Attorneys

Harry H. West

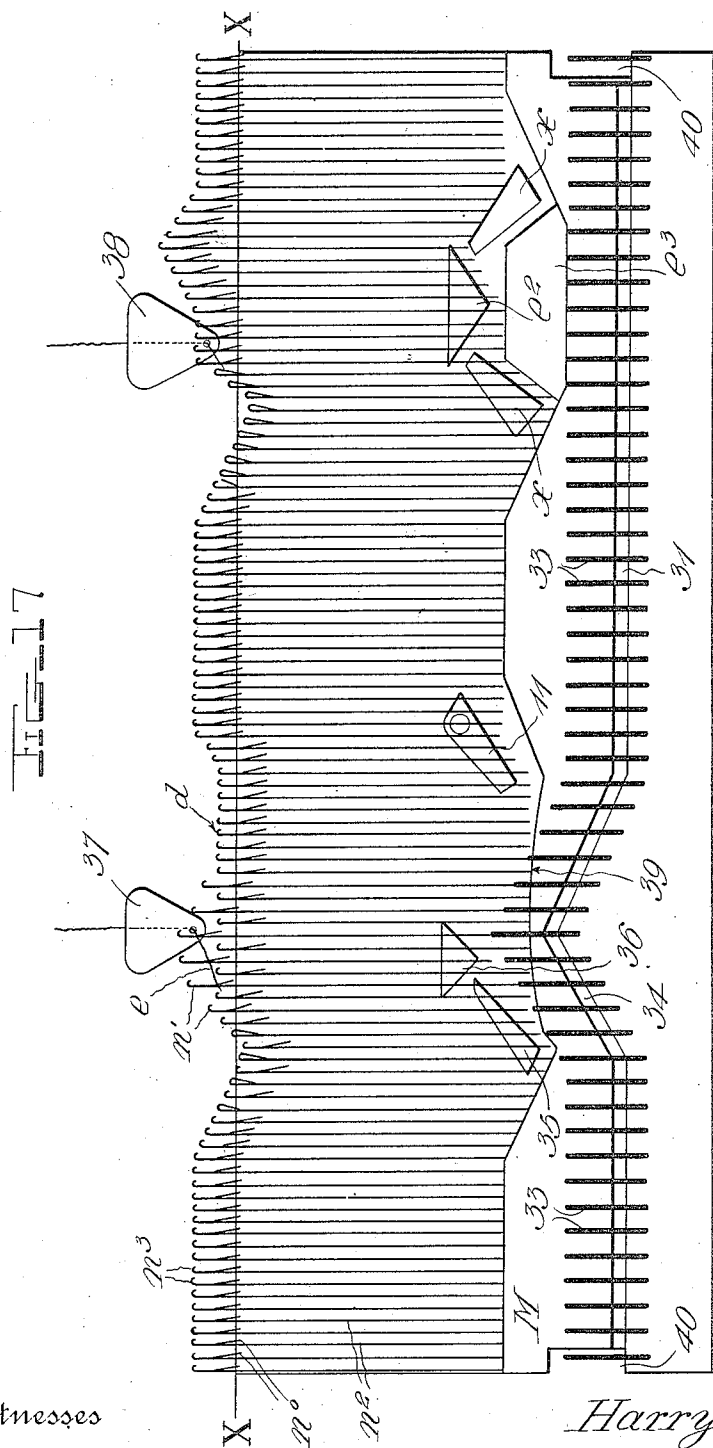
Inventor

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5 SHEETS—SHEET 4.



Witnesses

E. C. Cramer
L. W. M. Coll.

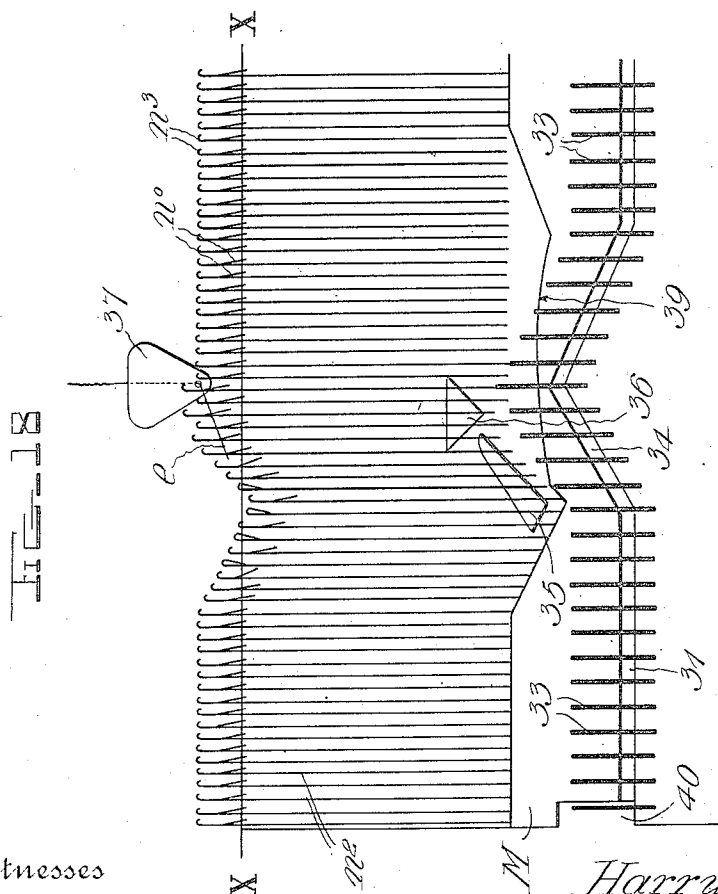
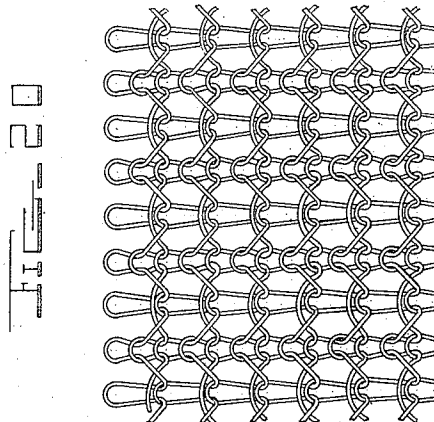
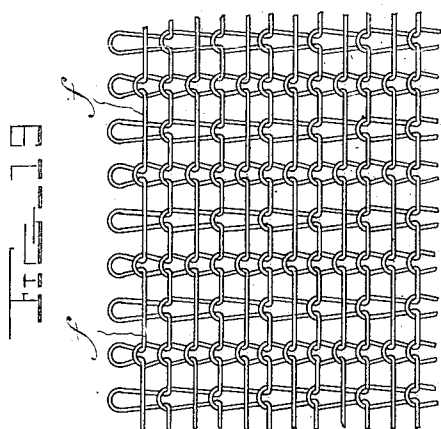
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1,045,651.

5 SHEETS--SHEET 5.



E. Green, Jr.
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UNITED STATES PATENT OFFICE.

HARRY H. WEST, OF PLYMOUTH, PENNSYLVANIA.

NEEDLE-ACTUATING MECHANISM FOR KNITTING-MACHINES.

1.045,651.

Specification of Letters Patent.

Patented Nov. 26, 1912.

Application filed January 4, 1912. Serial No. 669,395.

To all whom it may concern:

Be it known that I, HARRY H. WEST, a citizen of the United States, residing at Plymouth, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Needle-Actuating Mechanism for Knitting-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in circular knitting machines such as are employed in knitting seamless stockings and half hose and relates especially to needle actuating appliances for producing various designs of knit fabric composed of longitudinal rows of regular meshes separated by similar rows of tuck stitch meshes, the leg and foot being shown formed of two threads or yarns to produce what is known as "plated" work.

For convenience in illustration, the invention is shown applied to what is known to the trade as the "Banner machine", the general structure of which is shown in U. S. Patent 933,443 to J. D. Hemphill, dated Sept. 7, 1909, although obviously, the essential features of the invention are applicable to other machines of similar character by the proper modifications in details of construction of the appliances to cause them to cooperate properly with the mechanism of the machines to which they are applied. The machine shown in the patent above referred to is of the class known as the "full automatic" machine, in which the knitting is performed by a circular series of needles which are moved up and down in vertical grooves in the needle cylinder under the action of the knitting cams on the cam cylinder, which encircles the needle cylinder, the knitting of the tubular portion of the work forming the leg and foot being performed in continuous circular courses by all the needles under a continuous rotary motion of the needle cylinder in the direction of the single headed arrow of Figs. 2 and 3 and the pouch knitting or "fashioning" for the formation of the heel and toe being performed in arc shaped courses by part of the needles under the reciprocatory motion of the needle cylinder, as indicated by the double headed arrow of said figures. Such parts only of the machine as may be necessary to show the con-

nection of the draw stitch cam attachment are illustrated herein. The requisite changes in operation of the knitting instrumentalities are produced by controlling cams on a change cam shaft which is advanced intermittently at the proper times and by suitable mechanism controls the driving mechanism and needle operating instrumentalities in the machine, effecting the changes in movement of the knitting cams from circular to reciprocatory knitting and the reverse at the proper times, and also the changes in the knitting cams and special needle operating devices concerned in the narrowing and widening operations at the proper times, and causing the machine to be automatically stopped or disconnected from the driving power when a stocking is completed.

One object of the invention is to provide an improved needle bit or jack and an adjustable draw cam for cooperation therewith, adapted to be thrown out of operation for producing different patterns.

Another object of the invention is to provide automatically operated means for controlling said cam to bring it into proper operative position during the various knitting steps.

With these and other objects in view, the invention consists of certain novel features of construction and the combination and arrangement of parts as will be more particularly described and claimed.

In the accompanying drawings: Figure 1 represents a side elevation of a knitting machine with this improvement applied, parts being omitted for convenience in illustration; Fig. 2 is a horizontal section taken substantially on the line 2-2 of Fig. 1; Fig. 3 is a similar view taken on the line 3-3 of Fig. 1; Fig. 4 is a vertical transverse section through one side of the needle cylinder and its connected parts, showing this improved cam and its actuating mechanism in side elevation and in position for engagement with the butts of all the needles; Fig. 5 is a similar view of a portion of the cylinder with the cam shown in retracted inoperative position; Fig. 6 is a front elevation of a portion of the needle cylinder, showing this improved cam attachment applied; Fig. 7 is an enlarged detail plan view of the cam attachment showing the cam in position for engagement with the butts of all the needles, a portion of the

needle cylinder being shown in horizontal section; Fig. 8 is a similar view with the cam in position to engage the long butt needles only; Fig. 9 is a similar view with the cam in retracted position out of the path of the butts of all the needles; Fig. 10 is a similar view with the cam in retracted position and the parts ready to throw the cam into operation at the will of the operator; Fig. 11 is a longitudinal vertical section taken on the line 11—11 of Fig. 7; Fig. 12 is a transverse vertical section taken on the line 12—12 of Fig. 7; Fig. 13 represents side elevations respectively of the short and long butt needles employed in a machine of this character; Fig. 14 is an enlarged detail front elevation of a portion of the cam ring showing an opening provided with a closure to permit the insertion and removal of the needle actuating jacks; Fig. 15 is a vertical section taken on the line 15—15 of Fig. 14; Fig. 16 is a detail perspective view of a portion of the operating mechanism for the adjustable needle pulling down cam, herein termed the "draw cam;" Fig. 17 is a diagram of the inside of the cam cylinder showing the needles in position for forming the draw stitch fabric shown in Fig. 19; Fig. 18 is a similar view showing the needles in position for forming the tuck stitch fabric shown in Fig. 20; Fig. 19 is an enlarged fragmentary view of the fabric formed by the cooperation of the jacks and adjustable pulling down cam shown in Fig. 17; Fig. 20 is a similar view of the fabric formed when the jacks only are employed when the pulling down cam is in inoperative position.

The drawings show the main instrumentalities of a knitting machine to which the present invention may be applied, as comprising a tubular rotary needle cylinder N having a horizontal beveled gear n secured to its lower end, with which a driving gear (not shown) is adapted to mesh. The mechanism for driving said gear n is clearly shown in Figs. 3 and 4 of the patent above referred to. The cylinder N is provided in its peripheral or barrel portion with uniformly spaced longitudinal grooves to receive a circular series of independent needles n^2 of different forms, distinguished one from the others by the difference in length of their lateral studs or butts, whereby they may be actuated by different needle switch mechanisms for different purposes. Needles of this class each have a hook n^3 at the upper end thereof, and as shown the lateral projections or butts are formed at the lower end of the needle, but it is to be understood that these butts may be formed near the lower end if desired. These needles are also provided at their outer ends with latches n^4 . About one half of the total number of the needles have long butts

as n^5 , and the remainder have short butts n^4 . These needles are held in the grooves of the cylinder by the usual spring bands j . This cylinder N is supported in a flat table or bed plate a^2 , rigidly secured to the top of the machine frame. This bed plate a^2 also supports the several cams and other devices arranged to cooperate with the needles for automatically throwing the latter into and out of action at predetermined intervals during the rotation of the cylinder. A non-revoluble but vertically movable cam plate H is bored to receive the revoluble needle cylinder, and is located above and contiguous to said gear n , and carries the main knitting or needle operating cams and carrying picks which are brought into action during the knitting of the stocking. A non-revoluble annular needle supporting cam M practically surrounds the lower part of the needle cylinder and is secured to and vertically movable with said cam plate H, and is adapted to support the inactive needles at the normal lower level while circular knitting is being produced. To the top of the cylinder N is secured an inner ring member o' having radial grooves alternating with said needle supporting grooves formed in the cylinder N. The outer edge of the ring projects above but does not extend laterally beyond the bottom of said cylinder grooves. A laterally extending sinker ring n^6 encircles the upper outer part of and extends a short distance above the cylinder barrel and is provided with radial grooves which register with those of the ring o' and in which are seated and supported the thin horizontally movable sinkers o . The function of these sinkers is in general substantially the same as that of sinkers usually employed. The sinker carrying ring portion of the revoluble cylinder is surmounted by a recessed stationary cap ring G, the latter being supported by said sinker ring.

The means shown for effecting the comparatively short vertical movement of the cam plate H and the devices carried by it, comprise a cam wheel g secured to one end of the cam shaft s' and having a cam g^7 on one face thereof, with which a pin g^8 on an arm g^2 is adapted to cooperate. This arm g^2 is secured to a vertical bar g^3 , connected with the cam plate H. This cam plate operating device is shown and described clearly in the patent above referred to, and further description thereof is not here deemed necessary. From said patent it will be obvious that this cam plate H and the several devices carried by it are dropped to lowest position, together with the needles, at predetermined periods when the last knitted stocking is to be run off or stripped from the needles.

A cam wheel 1 is fixed to the cam shaft s'

to turn therewith, and is provided on its periphery with a plurality of cams *l*, *f*, and *h*, having recesses *h*, *i*, and *c*, with which the toe or finger 2 of a lever 3 is adapted to cooperate for a purpose to be described. This lever 3 is fulcrumed intermediately of its ends to the machine frame and the end opposite the toe 2 is connected by a pitman 4 to one arm of a bell crank 5 fulcrumed on a stud 6 which extends laterally from the frame of the machine. The other arm of this bell crank 5 is connected by a link 6^a with a band 7, which is mounted to slide longitudinally on the curved peripheral edge of the bed plate *a*², as is shown clearly in Figs. 1, 2, and 3, the band as shown being provided with slots 8 which engage headed studs 9 projecting laterally from the curved edge of the bed plate, and which form stops for limiting the movement of said band in opposite directions. A step-shaped cam lug 10 is fixed to said band 7 at a suitable point for cooperation with the draw stitch cam actuating lever to be described.

A draw-stitch cam 11 is mounted on the cam ring H at one side of the needle cylinder, and is adjustable toward and away from said cylinder in a plane at right angles thereto, and is adapted to be held in its adjusted position by suitable means to be described. As shown, this cam is secured to one end of a rod 12, which is slidably and rotatably mounted in the free ends of a substantially U-shaped bracket 13, secured at one end to the cam plate H and projecting laterally therefrom, as is shown clearly in Figs. 4 and 5. A slide 14 is mounted on the rod 12, and as shown comprises a bar having laterally extending apertured ends 15 and 16, through which the rod 12 passes. Fixed to said rod between the ends of said slide is an adjustable member 17 held in position by a set screw 18 and having a pin 19 depending therefrom with its free end projecting into a longitudinally disposed slot 20 formed in the crossbar of the U-shaped bracket 13 to hold said rod 12 against turning. A coiled spring 21 encircles said rod 12 between the outer end 15 of the slide 14 and said member 17, and the tension of said spring may be varied by moving said member 17 toward or away from the outer end of the slide 14. A gravity pawl 22 is pivotally mounted on the outer end of the rod 12 outside the bracket 13, and is provided on its inner face with laterally projecting spaced stops 23 and 24 which straddle and are adapted to engage the opposite sides of the outer leg of the bracket 13 for limiting the pivotal movement of said pawl in opposite directions. The stop 24 is cut out at the inner edge of its free end to form a catch 25 for engaging the outer face of the upright end of the bracket 13 to lock the pawl in retracted position against the

tension of the spring 21, as is shown clearly in Fig. 10. A bell crank lever 26 is fulcrumed to the inner end of the bracket 13, as is shown clearly in Figs. 4 and 5, and one arm thereof is pivotally and slidably connected with the inner end of the slide 14, said arm having a longitudinal slot 27 therein, which is slidably engaged with a headed stud 28 projecting laterally from said slide 14. The free end of the other arm of said bell crank 26 is resiliently connected with a bracket 29 on the bed plate *a*² by means of a coiled spring 30, see Fig. 4.

The step cam 10 secured to the band 7 has a notch or step 10^a on which the spring pressed end or arm of the bell crank 26 is designed to rest when the arm 12 is partially retracted to dispose the cam 11 in position to engage the butts of the long butt needles only as hereinafter described, and as shown clearly in Fig. 8, said arm resting on the extreme upper end 10^b when the rod is moved inwardly to its full extent to position the cam 11 for engagement with the butts of all the needles as is shown clearly in Figs. 4 and 7. This cam 10 is also provided with an inclined face 10^c on which said bell crank lever arm is designed to ride when the cam is moved under or away from said lever, as will be more fully described hereinafter.

It will be obvious that the slot 27 in the arm of the bell crank 26 which engages the headed stud 28 will permit said bell crank to swing up and down into the position shown in Figs. 4 and 5, the spring 30 tending to draw said bell crank downward and to hold it yieldably in engagement with the cam 10 when said cam is positioned thereunder, thereby preventing accidental disengagement of the bell crank from said cam when the machine is in operation.

Between the cam ring M and the cam plate H at the inner face thereof is formed a cam track 31 in which the lateral studs or lugs 32 of needle jacks or bits 33 are designed to travel, as shown clearly in Figs. 4, 5, 17 and 18. This cam track 31 is arranged in the same horizontal plane throughout the greater portion of its length being upwardly deflected as shown at 34 in Figs. 17 and 18 for a purpose to be described. This deflected portion 34 is preferably of inverted V-shape as shown, the sides thereof forming an obtuse angle and in which the lugs 32 of the needle jacks 33 travel and are guided. These jacks 32, any desired number of which may be employed, are slidably mounted in the needle grooves of the cylinder N below the needles and are operable by the deflected portion 34 of the cam track for setting the needles in proper position to take the yarn, as will be hereinafter more fully described. These jacks are especially adapted to coact with the draw cam 11, shown in Fig. 17, as

will be presently described. The butts of the needles are supported and guided on the upper edge of the cam ring M, and the usual knitting cams w , x , e^2 , e^3 , are employed for raising and lowering the needles n^2 , as is clearly described and shown in the Hemphill Patent 933,443, above described. Cams 35 and 36 are also arranged for pulling down all the needles which have been elevated by the jacks passing through the elevated portion 34 of the cam track 31, as will be more fully described hereinafter.

The jacks 33 above referred to for setting the needles, consist merely of small metal slides which are shown clearly in Figs. 4 and 5, of such size and form as to fit in the needle grooves of the cylinder below the ends of the needles, and as above described, are provided with lateral lugs or studs 32 which travel in the cam track 31. The lower ends of these jacks are preferably cut away at their lower inner ends and curved to adapt them to move downwardly when the cam ring H is dropped, without engagement with the needle cylinder, and fit snugly in the space between the outer face of the cylinder and the inner face of the cam ring H, as is shown clearly at 33' in Figs. 4 and 5, the outer face of the cylinder being curved at this point also. The needles and jacks are free to slide in the grooves independently of each other except when the upper ends of the jacks strike against the inner ends of the needles when said jacks ride upward in the elevated portion 34 of the cam track, as is shown clearly in Figs. 17 and 18. In the drawings, a jack is shown disposed in every other needle groove, but it is to be understood that they may be varied and placed as desired, according to the pattern of the fabric which it is desired to knit. Two yarn feeding devices 37 and 38 of ordinary or any desired construction are herein shown for feeding two threads to the machine for knitting the tubular fabric for the leg and foot, the feeder 38 being herein designated as the black yarn feeder, and the feeder 37 as the white yarn feeder, for convenience in description.

In the diagram shown in Fig. 17, the draw cam 11 is used in connection with the jacks 33 for forming the well known draw stitch fabric shown in Fig. 19, said draw stitch being a variety of the tuck stitch. All of the needles take the black yarn from the feeder 38 in the usual manner, and travel on the normal needle level until they reach the cam 11, which engages the butts of all the needles when it is in its innermost position and draws down their hooks below the line of yarn feed as shown at d in Fig. 17, to prevent them from taking the thread fed in by the feeder 37. The jacks 33 engaged by the elevated portion 34 of the cam track which is beneath the yarn feeder 37, force up the

needles located in the same grooves of the needle cylinder into position to take the thread e fed by the feeder 37. These jacks thus act as selectors, selecting certain needles, alternate or otherwise, and push them up into position to take the thread from the yarn feeder 37 while the needles in the grooves between those having the jacks pass said yarn feeder with hooks below the plane of yarn taking, and consequently do not take the thread e , and thus the straight unsecured thread f shown in the fabric of Fig. 19 is produced. After the elevated needles n' have taken the thread e , the cam 35 draws all of them down in the ordinary manner to form the stitches. It will be observed that the edge of the cam ring M is cut out as shown at 39 to permit the needles to gradually engage the edge of the cam ring when drawn down by the cam 11, to prevent injury to the ends of said needles during the rapid revolution of the cylinder. From said diagram 17, it will be obvious that the needles n' when elevated above the cast off line indicated by the line X—X, will cause the loops contained thereon and which were formed by the threads supplied from the feeder 38, to pass below the free ends of the latches of said elevated needles onto the shanks thereof and when said needles are drawn down by the cam 35, the loop referred to will be cast off the needle, retaining thread e in the hook thereof.

From the above description it will be obvious that the draw cam 11 when in its extreme inward position, shown in Fig. 7, will engage both the long and short butts of the needles during the circular knitting. This draw cam will be held in this extreme inward position during the circular knitting by the engagement of the upper end 10^b of the cam 10, with the spring pulled arm of the bell crank 26, said cam 10 being held in this position by the engagement of the toe 2 of the lever 3 with the cam l of the cam wheel g , on the cam shaft s' , as shown in Fig. 1, said toe 2 remaining on said cam l during the knitting of the leg of the stocking. When the leg has been completed and the mechanism of the machine shifts to form the heel, the cam wheel g will have turned on the shaft s' sufficiently to cause the toe 2 to drop into the recess or cut out portion h of said wheel g . This dropping of the toe 2 of the lever 3 will cause the band 7 to be shifted sufficiently to move the cam 10 laterally under the arm of the bell crank 26 to bring its step 10^a under said arm. The spring 30 pulls the arm of said bell crank downward onto said step 10^a and moves the rod 12 outward a sufficient distance to withdraw the cam 11 out of the path of the short butt needles, as shown in Fig. 8, said cam 11 being in position then to engage the long butt

needles only, which occurs during the reciprocatory action of the cylinder for the knitting of the heel. After the heel has been formed, and the mechanism of the machine shifted into position for circular knitting to form the foot, the elevated cam portion *f* of the wheel *g*, will be brought under the toe 2 of the lever 3 and thus elevate said toe and force said draw stitch cam 11 inward into the position shown in Fig. 7 for engaging the butts of all the needles during the circular knitting for the formation of the foot. This inward movement of the cam 11 is caused by the shifting of the band 7 to bring the extreme upper end 10^b of the cam 10 again under the spring pulled arm of the bell crank 26. After the foot has been formed and the mechanism of the machine has been shifted for reciprocatory knitting to form the toe of the stocking, the toe 2 of the lever 3 will drop into the recess *t* of the wheel *g*, thereby moving the band 7 sufficiently to cause the cam 10 to be shifted from under the arm of the bell crank 26 a sufficient distance to position the step 10^a of said cam under said arm and the spring 30 pulling said arm down onto said step causes the rod 12 to be moved outwardly under the action of the bell crank 26 into the position shown in Fig. 8, for engaging the long butt needles during the reciprocatory action of the cylinder for the knitting of the toe of the stocking. After the toe of the stocking has been completed and the mechanism of the machine shifted to form the "loopers hold", the cam wheel *g* is turned sufficiently to bring the projection 7^b under the toe 2 of the lever 3, whereby the cam shifting band 7 is moved to bring the upper end 10^b of said cam 10 under the bell crank arm and thereby forces the rod 12 and the cam 11 at the end thereof inwardly into the position shown in Fig. 7 for engagement with the butts of all the needles during the circular knitting. After the loopers holds have been formed and the mechanism of the machine shifted to cause the stud *g'* of the arm *g*² fixed to the vertical sliding bar *g*³ to move off the end of the cam *g*⁷ and drop into the recess thereof whereby the cam plate H is dropped, as is clearly described in the Hemphill patent above referred to, the toe of the lever 2 drops into the recess C of the cam ring *g*, whereby the cam shifting band 7 is shifted sufficiently to move the cam 10 out of the path of the arm of the bell crank 27, and said arm is drawn down by the spring 30 into the position shown in Fig. 9, whereby the cam 11 is moved outward to its extreme position out of engagement with the butts of all the needles. The cam remains in this position until the mechanism of the machine is again shifted into position for beginning another stocking, when the toe 2

will ride up onto the cam *l* of the wheel *g*, and thereby cause the band 7 to be shifted to bring the upper end 10^b of the cam 10 under the arm of the bell crank 26, whereby the slide 14 is moved inward into the position shown in Fig. 10, thereby compressing the spring 21 and the cam 11 is thus held under tension in position ready to be thrown into operation at the will of the operator by moving the gravity pawl 22 upward a sufficient distance to disengage the notch 25 of the member 24 from the outer end of the bracket 13. It will thus be obvious that this cam 11 may be thrown into operation and used as above described, or it may be held in retracted position as shown in Fig. 10 when it is not desired for use.

In the diagram shown in Fig. 18, the knitting of the fabric shown in Fig. 20 is performed without the use of the cam 11, said cam being disposed out of the way in the position shown in Fig. 10, during this operation. In this diagram, all of the needles which have received the yarn from the feeder 38 receive also the yarn *e* from the feeder 37, certain of said needles being elevated by the jacks 33 in the elevated portion 34 of the cam race or track 31, a sufficient distance to cause their latches to pass above the normal cast off line and thus permit the loops formed by the thread supplied by the feeder 38 to pass onto the shanks of the needles below said latches, and when said needles are pulled down by the cam 35, the loop so formed is cast off and the fabric shown in Fig. 20 produced.

It will thus be obvious that the jacks 33 may be employed either in connection with the cam 11 as shown in Fig. 17, or without it, as shown in Fig. 18, the differences in the fabric produced being shown in Figs. 19 and 20, as above described.

The cams 35 and 36 are fastened to a cam block similar to the block on which the cams *x*, *e*², *e*³ are mounted and may be operated either by hand or automatically to throw them into or out of working position. When in working position they are placed against the cylinder and when not they are drawn outwardly a sufficient distance to escape the butts of the needles.

To provide for the convenient insertion and removal of the jacks 33, an opening 40 is formed in the cam ring M and provided with a closure 41 secured in operative position by any suitable means, a screw being herein shown, (see Figs. 14 and 15.)

I claim as my invention:—

1. In combination with a grooved needle cylinder having needles slidable in the grooves thereof, a yarn feeder, a needle lowering cam positioned to lower all of the needles at a predetermined point into inoperative position, means for automatically retracting and projecting said cam into and

out of the path of the needles, said means being controlled by the shifting of the knitting mechanism, selectors for selecting certain of said inoperative needles and pushing 5 them into position to take the threads carried by said yarn feeder, and means for actuating said selectors as they pass beneath the yarn feeder.

2. In combination with a grooved needle 10 cylinder having long and short butt needles slidable in the grooves thereof, a yarn feeder, a needle lowering cam adapted to be positioned to lower all of the needles at a predetermined point into inoperative position, means for automatically retracting said 15 cam to position it out of the path of the short butt needles, selectors for selecting certain of said inoperative needles and pushing them into position to take the thread carried by said yarn feeder, and to cause the 20 free ends of the open latches of the elevated needles to pass beyond the normal cast off line, and means for actuating said selectors when they pass beneath the yarn feeder.

3. In combination with a grooved needle 25 cylinder having needles slidable in the grooves thereof, a plurality of spaced yarn feeders for supplying yarn to said cylinder, a needle lowering cam arranged between said 30 yarn feeders in position to engage and lower all of the needles into inoperative position before they reach one of said yarn feeders to prevent the lowered needles from taking the thread from said last mentioned feeder, selectors for selecting certain of said cam 35 lowered inoperative needles and pushing them up into position to take the thread supplied by said last mentioned yarn feeder, and means for actuating said selectors when they 40 pass beneath said yarn feeder.

4. An adjustable needle lowering cam attachment for knitting machines comprising a U-shaped supporting bracket having apertures in the free ends of its arms and a slot 45 in its cross bar, a rod slidable in said apertured arms and having a cam fixed to its inner end, a slide mounted on said rod and comprising a bar having laterally extending apertured ends through which said rod 50 passes, an adjustable member fixed to said rod between the ends of said slide and having a point depending therefrom and projecting into the slot of said bracket, a coiled 55 spring encircling said rod between the outer end of said slide and said adjustable member, a gravity pawl pivotally mounted on the outer end of said rod outside of said U-

shaped bracket and provided on its inner face with laterally projecting spaced lugs which straddle and are adapted to engage 60 the opposite sides of the outer leg of said bracket for limiting the pivotal movement of said pawl in opposite directions, one of said stops having a catch for engaging one arm of said bracket to lock the pawl in retracted position against the tension of the 65 coiled spring on the rod, and means controlled by the shifting of the knitting mechanism for retracting said rod against the tension of the spring. 70

5. An adjustable needle lowering cam attachment for knitting machines comprising a U-shaped supporting bracket having apertures in the free ends of its arms and a slot 75 in its cross bar, a rod slidable in said apertured arms and having a cam fixed to its inner end, a slide mounted on said rod and comprising a bar having laterally extending apertured ends through which said rod passes, an adjustable member fixed to said 80 rod between the ends of said slide and having a point depending therefrom and projecting into the slot of said bracket, a coiled spring encircling said rod between the outer end of said slide and said adjustable member, a gravity pawl pivotally mounted on 85 the outer end of said rod outside of said U-shaped bracket and provided on its inner face with laterally projecting spaced lugs which straddle and are adapted to engage 90 the opposite sides of the outer leg of said bracket for limiting the pivotal movement of said pawl in opposite directions, one of said stops having a catch for engaging one arm of said bracket to lock the pawl in retracted position against the tension of the 95 coiled spring on the rod, a bell crank lever fulcrumed on the inner end of said U-shaped bracket and having one arm thereof pivotally and slidably connected with the inner 100 end of said slide, resilient means connected with the free end of the other arm of said bell crank, and means controlled by the shifting of the knitting mechanism for controlling said resiliently connected arm of the 105 bell crank.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HARRY H. WEST.

Witnesses:

ROBT. D. HAMILTON,
DAVID J. WILLIAMS.