J. LAWSON.

CIRCULAR GLOVE KNITTING MACHINE.

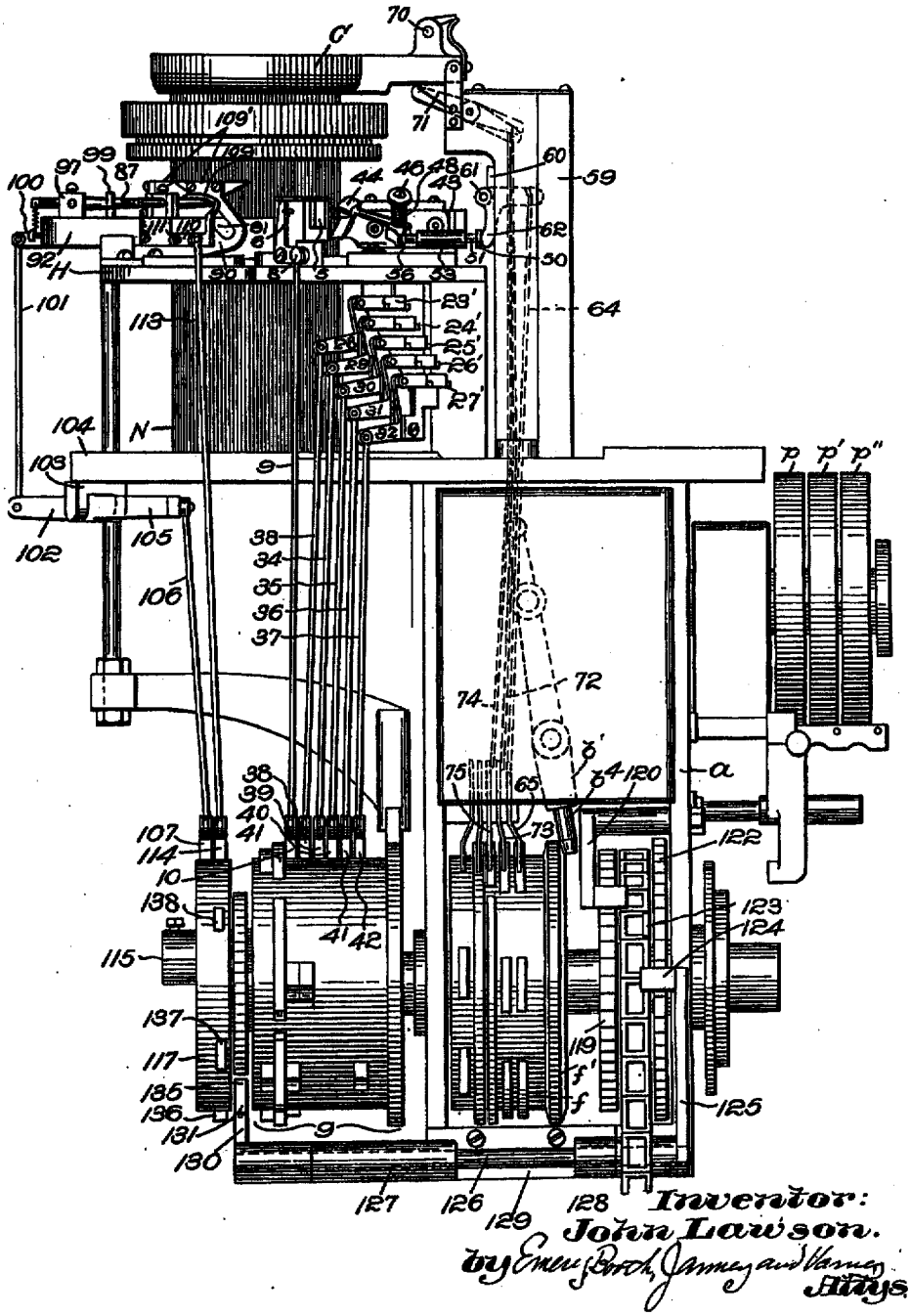
APPLICATION FILED DEC. 12, 1918.

1,401,712.

Patented Dec. 27, 1921.

6 SHEETS—SHEET 1.

Fig. 1.



Inventor:
John Lawson.
by Emery Booth, Janney and Varney
Attys.

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6 SHEETS—SHEET 2.

Fig. 2.

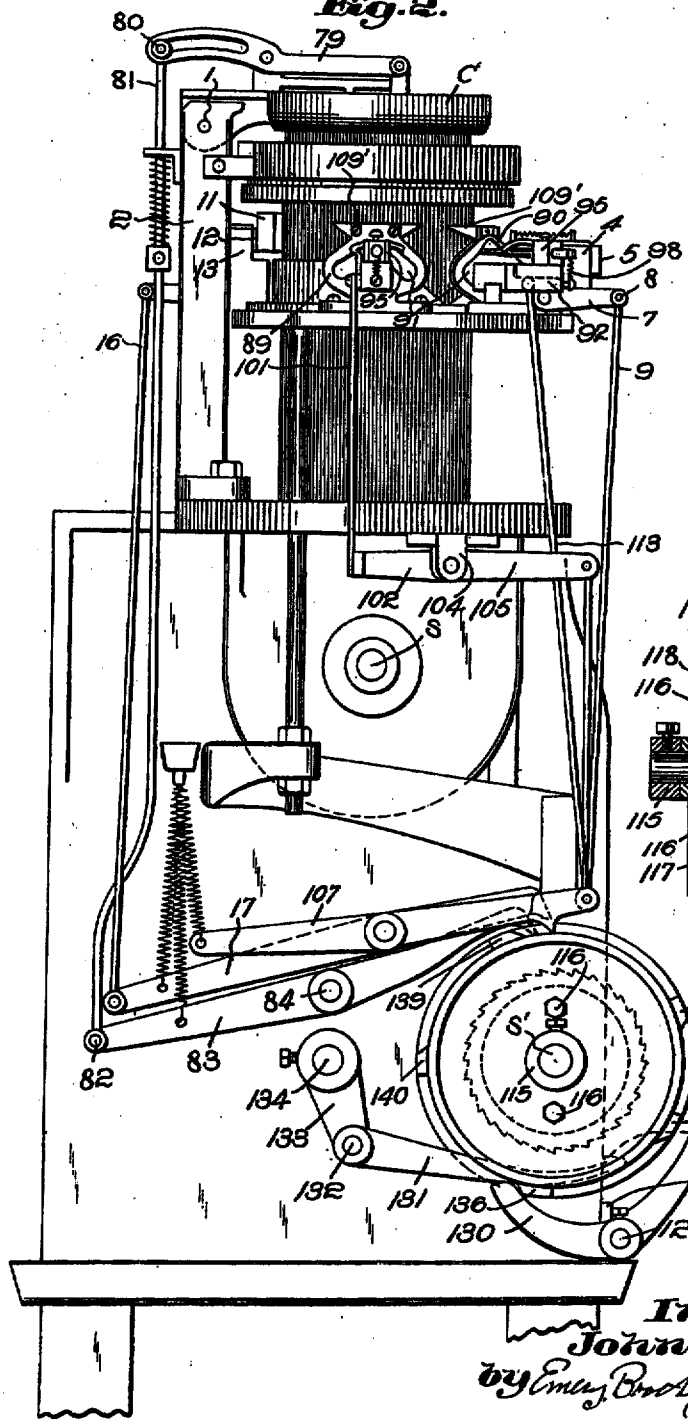


Fig. 4.

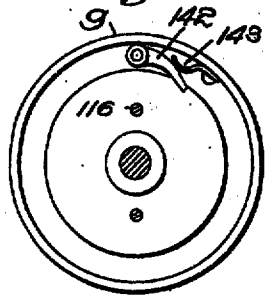
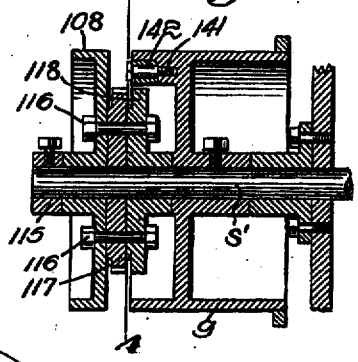


Fig. 3.



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by Emery, Booth, Janney and Varney,
Attys.

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6 SHEETS—SHEET 3.

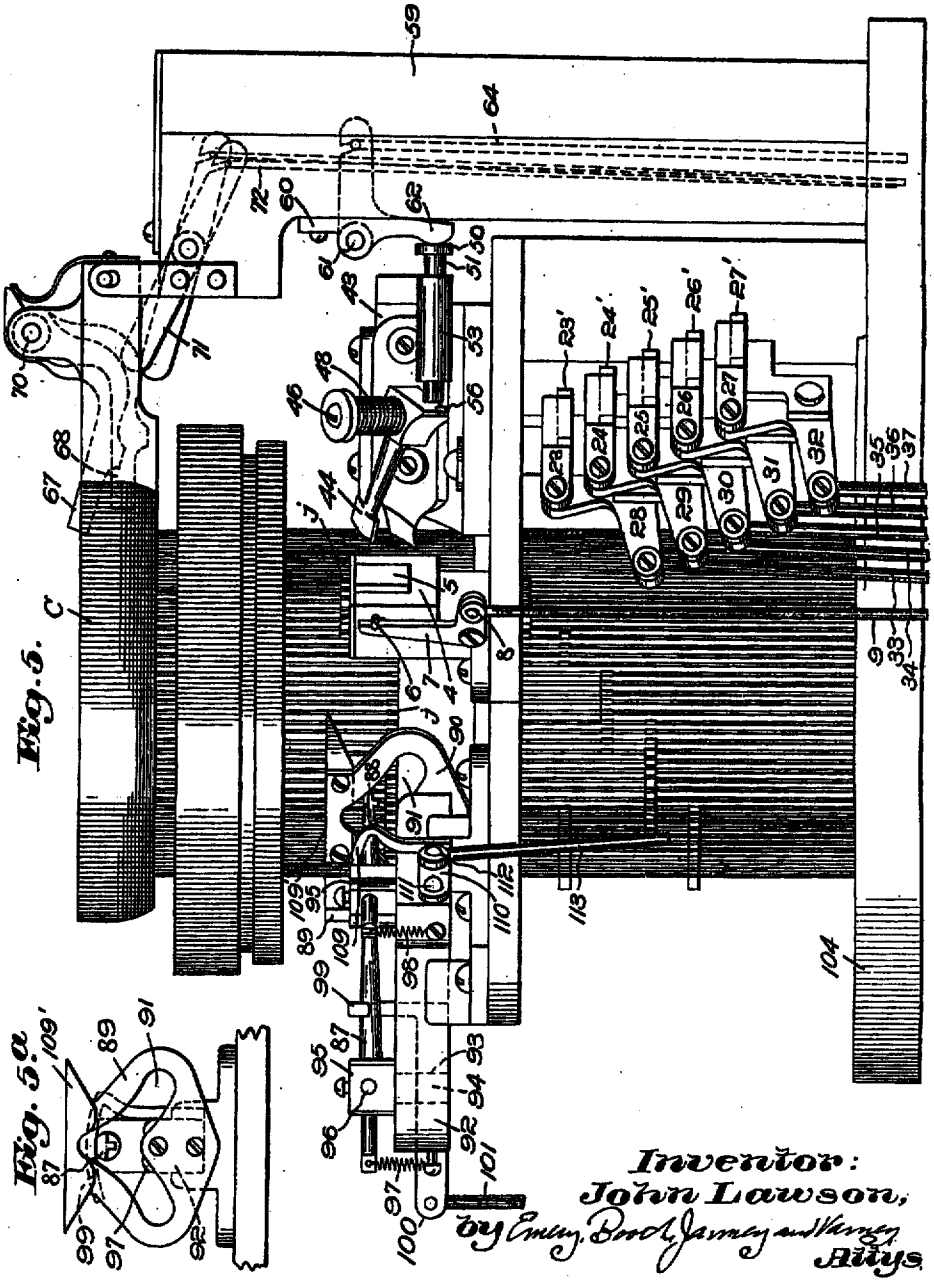

Fig. 5.

Fig. 5a.

Inventor:
John Lawson,
by Emery, Booth, Janney and Varney
Attys.

J. LAWSON.

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6 SHEETS—SHEET 4.

Fig. 6.

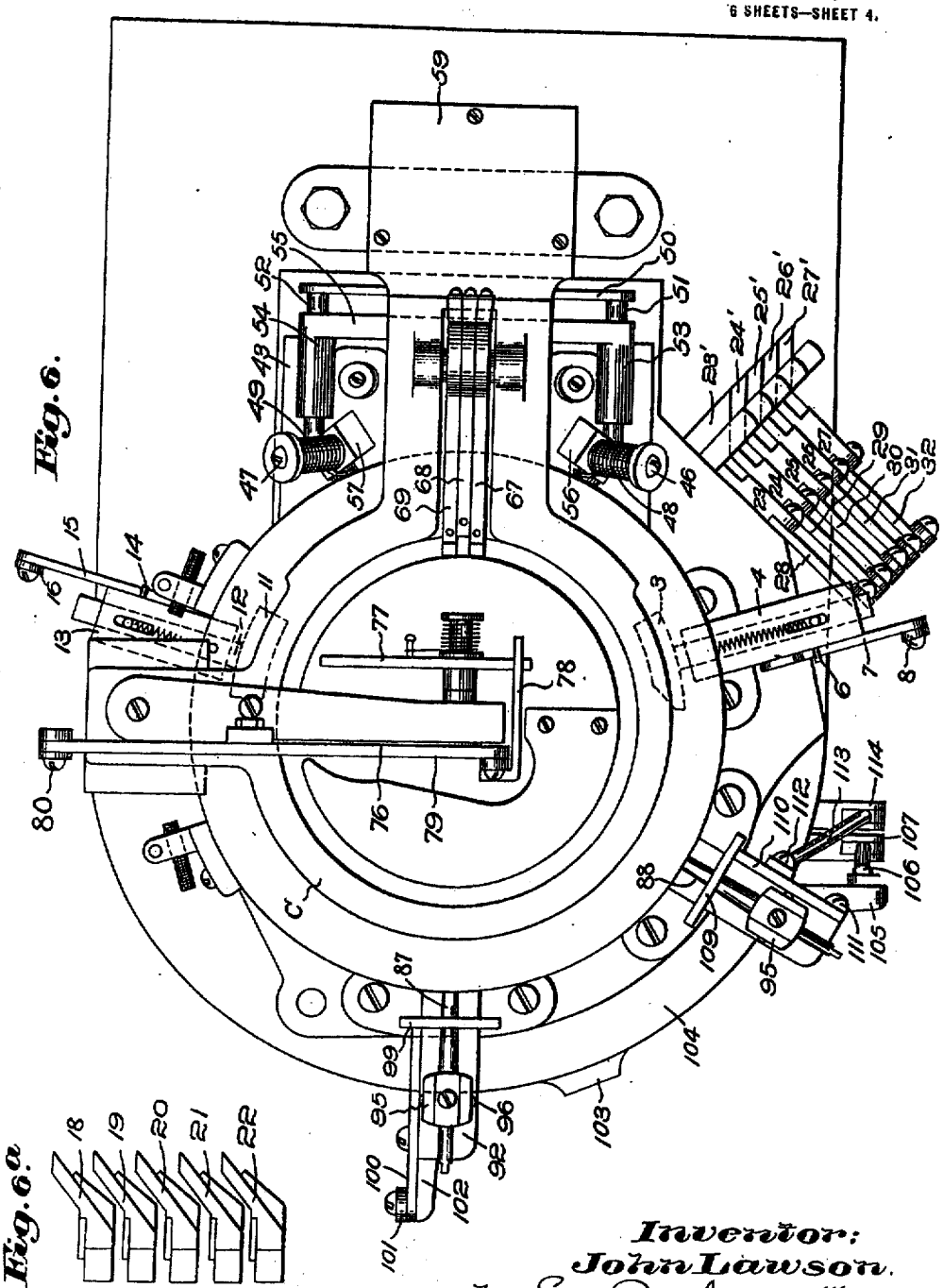

Fig. 6a.

Inventor:
John Lawson.
by Emery, Booth, Jamieson & Warner
Attys.

J. LAWSON.

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6 SHEETS—SHEET 5.

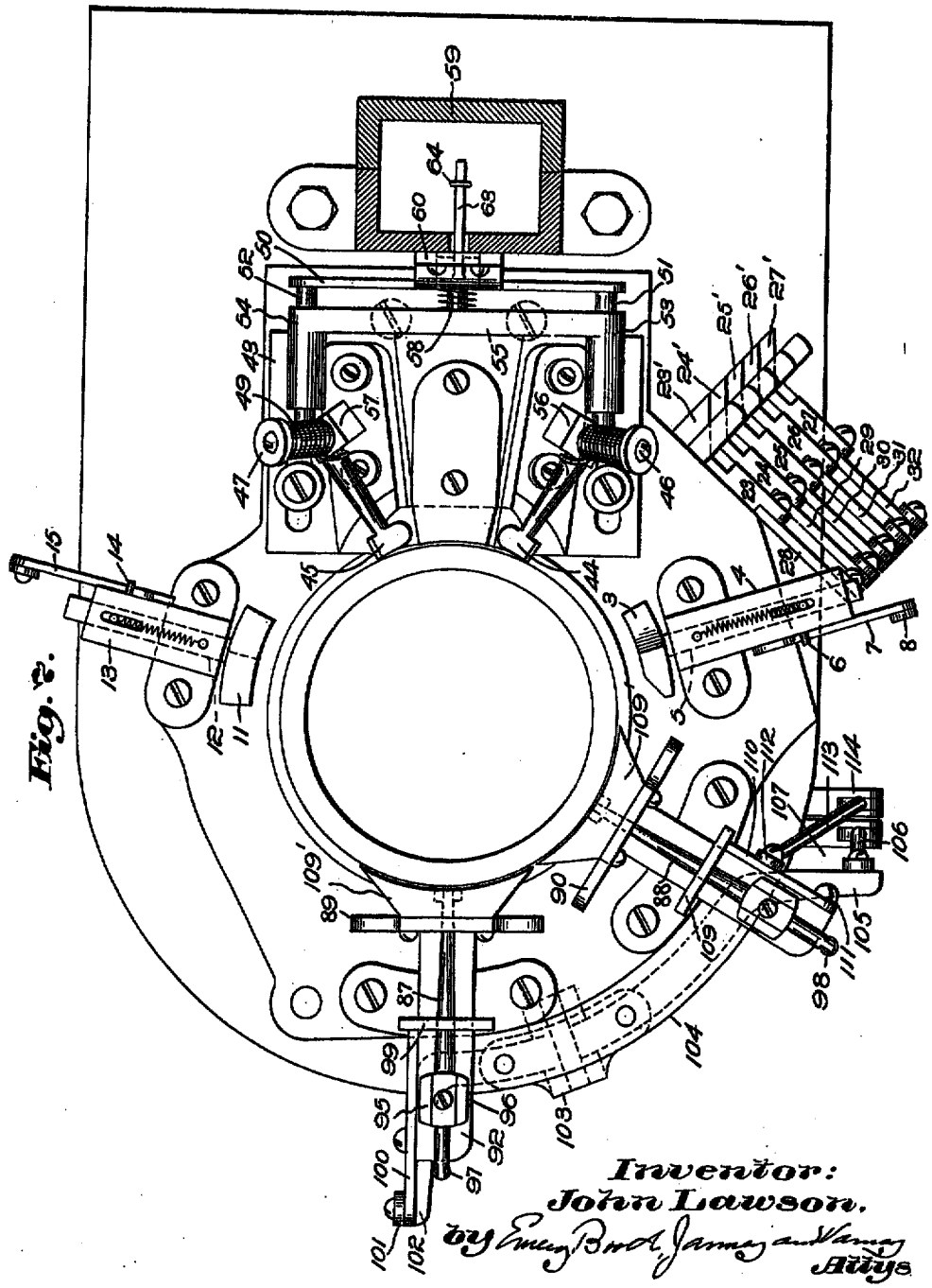

Fig. 2.

Inventor:
John Lawson.
by Emery Booth, Janney & Vance
Attys

J. LAWSON.

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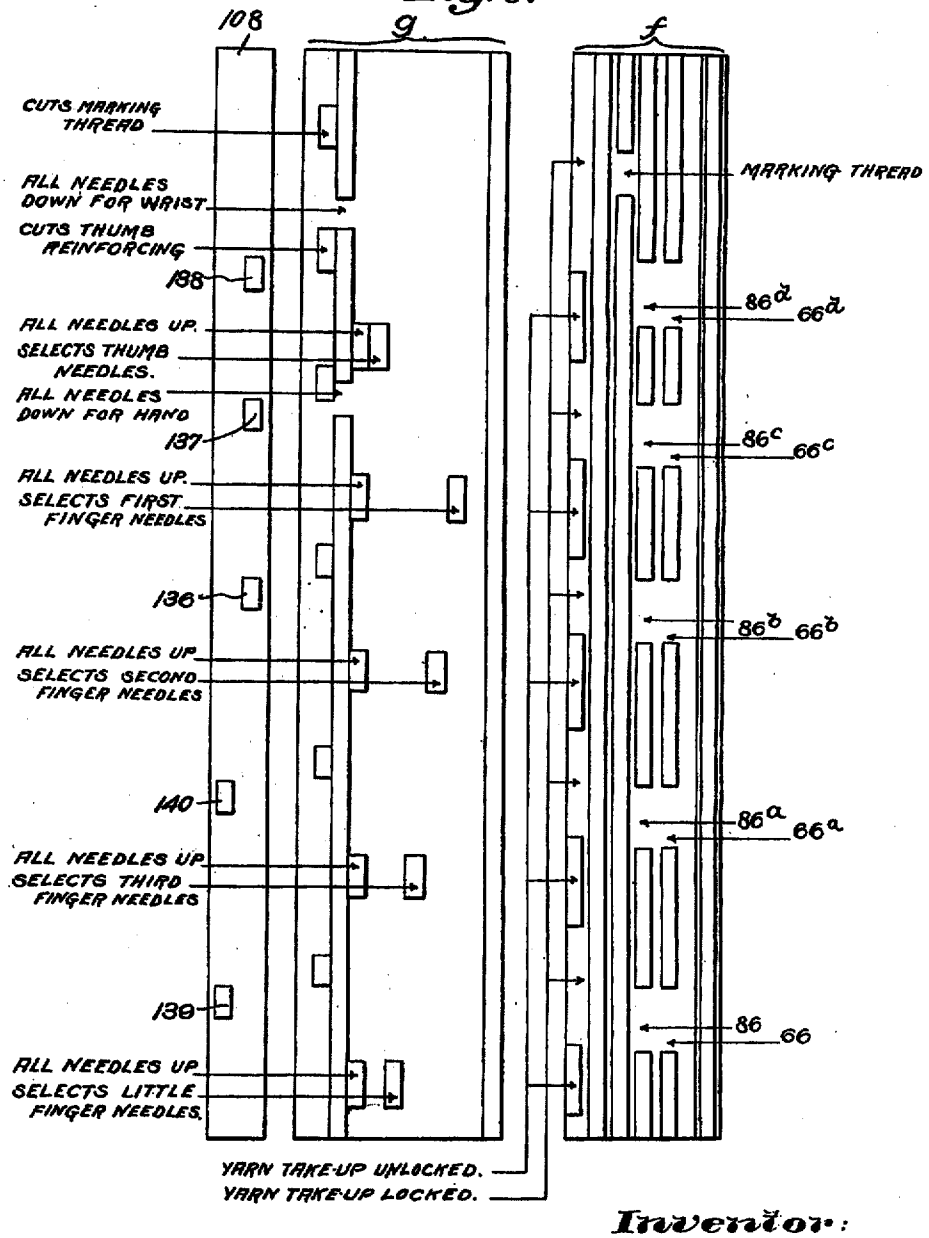
6 SHEETS—SHEET 6.

Fig. 8.



Inventor:
John Lawson,
by Emery, Booth, Janney and Varney,
Attys.

UNITED STATES PATENT OFFICE.

JOHN LAWSON, OF CENTRAL FALLS, RHODE ISLAND, ASSIGNOR TO HEMPHILL COMPANY, OF CENTRAL FALLS, RHODE ISLAND, A CORPORATION OF MASSACHUSETTS.

CIRCULAR GLOVE-KNITTING MACHINE.

1,401,712. Specification of Letters Patent. Patented Dec. 27, 1921.

Application filed December 12, 1918. Serial No. 266,481.

To all whom it may concern:

Be it known that I, JOHN LAWSON, a citizen of the United States, and a resident of Central Falls, in the county of Providence and State of Rhode Island, have invented an Improvement in Circular Glove-Knitting Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to knitting machines and more particularly to machines for knitting gloves or like hand coverings, the particular embodiment of machine for the purpose illustrated herein being a circular knitting machine, the needle cylinder and cam ring whereof are relatively reciprocated for forming the hand, thumb and fingers.

In the co-pending application of George P. Bosworth, Serial No. 252,965, filed September 6, 1918, and Patent 1,385,963, dated July 26, 1921, there are disclosed and claimed knitted gloves, the tips of the thumb and fingers of which are fashioned by narrowing and widening in the knitting operation, and in said applications a method of knitting involving such fashioning operation for the thumb and finger tips is claimed.

In my co-pending application, Serial No. 256,233, filed September 30, 1918, I have disclosed a knitted glove wherein the thumb and finger tips are reënforced, as by the introduction of an additional thread, and wherein also the said thumb and finger tips are fashioned by narrowing and widening, such fashioned glove and the method of forming the same being claimed in said application.

In the present application I disclose and claim broadly mechanism for fashioning the thumb and finger tips of knitted gloves. I also herein disclose means for reinforcing said thumb and finger tips, such means being, if desired, employed in conjunction with said fashioning means and claimed in combination therewith and as hereinafter set forth.

While I have herein illustrated a machine for producing a knitted glove which is like that fully described and claimed in the said co-pending application of George P. Bosworth, Serial No. 253,205, I desire it to be understood that my invention is not limited in use to the fashioning of thumb and finger tips on the type of glove disclosed in said application, since my invention is of general application to the extent that the thumb and finger tips of any glove or like hand covering, as, for example, mittens or glove-mittens, may be fashioned in the knitting operation, and preferably by narrowing and widening. By a glove-mitten I mean a hand covering having a digital pocket to inclose less than all the fingers, but more than one.

In order that the principle of my invention may be readily understood, I have disclosed a single embodiment thereof in the accompanying drawings, wherein—

Figure 1 is a front elevation of a circular knitting machine embodying my invention;

Fig. 2 is an end elevation thereof;

Fig. 3 is a detail in vertical transverse section of the cam drums of the machine;

Fig. 4 is a vertical section upon the line 4—4 of Fig. 3;

Fig. 5 is a front elevation of the upper part of the knitting machine;

Fig. 5ª is a detail in elevation and partially in section of a portion of a widening picker mechanism that may be employed in the practice of my invention;

Fig. 6 is a plan view of the machine;

Fig. 6ª is a diagram indicating the cams for selecting the needles that are to form the thumb and the fingers respectively;

Fig. 7 is a horizontal section taken through Fig. 5; and

Fig. 8 is a diagram indicating the cams upon the three cam drums of the machine.

While my invention may be employed in knitting articles other than glove blanks or units, or a connected sequence thereof, it is preferably employed in the manufacture of such blanks or units, and preferably the blank or units are formed by relatively reciprocating the needle cylinder and cam ring (herein by reciprocating the needle cylinder), so that in starting (as preferably I do) at the lower end of the wrist, either at the front or the back of the hand, I may knit by reciprocating knitting a strip or blank of the width of the hand, the digits being preferably all knitted integrally with the hand strip. The thumb may be separately knitted and afterward applied to the hand in any suitable way. I shall, however, describe the preferred embodiment of my invention wherein upon a circular machine

having independent needles, I begin at the base of the wrist at the back thereof and after knitting the wrist and hand, by reciprocating knitting, I knit the fingers in any desired sequence, as, for example, the little finger, the second, the third and the first fingers, after which I knit the palm of the hand down to the thumb, then knit the thumb, then the lower part of the hand, and finally the wrist.

Preferably the entire knitting operation is performed by reciprocating knitting, but my invention, as before stated, is not limited thereto. If desired, the wrist, both at front and back, may be fashioned in the knitting operation, which may be done by commencing the knitting upon a lesser number of needles than used in knitting the hand proper and gradually increasing the number until the full width is reached, reversing this operation in completing the front or other half of the wrist.

While, as stated, the knitting of the wrist may be begun upon a lesser number of needles than used in knitting the hand and such is within the scope of my invention, I will assume for the purposes of this description that the wrist is knitted upon the same number of needles that are employed in knitting the hand.

The machine herein shown is one peculiarly adapted for the knitting of a right hand glove, but the principle of my invention will of course be similarly carried out in a machine for knitting a left hand glove.

In knitting the thumb and fingers, I may at the proper points simply retain in action the desired needles while rendering the remaining needles inactive, but permitting them to retain their loops. Preferably, however, when I have reached the point where a change in the number of needles in action is to be effected, as, for example, at the commencement of the little finger, I, in most cases, elevate all the needles just in action, while permitting them to retain their loops and then immediately bring down again into action those needles that are next to be employed. I shall in the ensuing description refer to the preferred mode of action, but it is to be understood that I am not limited thereto.

My invention and particularly the features thereof relating to the fashioning of the thumb and finger tips and also to the reinforcing thereof, may be applied, among other types of knitting machines, to that shown in the co-pending application of George P. Bosworth, Serial No. 263,284, wherein in order that the proper needles may be acted upon by the knitting cams for the formation of each digit section or strip, means are provided for centering for the time being with reference to the knitting cams and the yarn guide, that group of needles operative in the knitting of a digit strip, this being accomplished in said application by angularly shifting the needle cylinder with relation to its actuating connection.

While, as already stated, my invention may be embodied in knitting machines of various types including straight knitting machines, I have herein shown my invention as applied to that general class of circular knitting machines disclosed in the patent to Hemphill, No. 933,443, dated September 7, 1909, for circular automatic stocking machines. My invention is in no wise restricted to use in connection with that general type of machine, which is merely selected for convenient illustration, and which obviously is modified in important particulars to effect the knitting of a glove or like blank.

I preferably employ a single knitting cam or set of knitting cams, though I am not limited to such number. In addition to the knitting cam or cams, I provide means for selecting the needles that are to be employed in the formation of the several digit strips, and while within the scope of my invention any suitable means may be employed for this purpose, I preferably provide other cams which I designate generally as the non-knitting cams, and which in the disclosed embodiment of my invention comprise one cam for elevating the needles out of action, one cam for restoring needles to action, and five cams for selecting the needles for the five digit strips.

The said selecting cams may be caused to operate upon the needles in any suitable way, but preferably for this purpose I provide the needles with elongated stems or else below the knitting butts of the needles I provide jacks and preferably jacks of five different lengths, one length being provided for the thumb and the other lengths for the four fingers respectively. In this or in any other suitable manner, the selecting cams will select and present to the knitting cam or cams the proper group of needles for the knitting of each digit strip. As disclosed in the said applications, it is desirable to provide certain gusset needles at the base of the digit strips, and preferably I provide means whereby the said selecting cams may select certain needles from adjacent groups to act in forming the gusset portions of the digit strips. This I preferably do by providing the proper needle jacks with two selecting butts, all as more fully described in the said machine application of George P. Bosworth, and hence not necessary herein more specifically to refer to.

Inasmuch as certain general parts of the mechanism herein shown may be and preferably are the same as those shown in the said patent to Hemphill, No. 933,443, I have

designated such parts by the same reference characters that are employed in the same patent. Thus the machine frame is marked *a*, the rotatable needle cylinder is marked N, and the non-rotatable cam carrier is marked H. The pulleys for the driving band are marked respectively *p*, *p'*, *p²*, in Fig. 1, (quick speed, slow speed and loose), and as *s* in Fig. 2 is indicated the main shaft on which said pulleys are mounted. The pattern shaft is indicated in Figs. 1 and 2 as *s'*, *f* and *g*, being the pattern or cam drums or barrels upon the said pattern shaft *s'*, and *f'* is the pattern ring on the drum or barrel *f*, which engages with the member *b⁴*, carried by the clutch shifting lever *b'* for the purpose of controlling the said lever, and, in the disclosed embodiment of the invention, for maintaining said lever in the position to produce reciprocating knitting throughout. The details of the mechanism controlled by the pattern ring *f'* through which the needle cylinder is reciprocated forward and backward for flat or reciprocating knitting may be and preferably are the same as in the said Hemphill Patent No. 933,443, and are unnecessary to be shown herein.

Although I shall describe in detail that embodiment of my invention wherein the needle cylinder reciprocates, and the cam ring is stationary, it is obvious that the reverse mode of operation may be employed within the scope and purpose of my invention.

The latch ring C is pivoted at one side at 1 upon the upright 2, as in the usual Hemphill or so-called Banner machine, and preferably substantially 90° therefrom, it is received upon an upright post or standard, as in the said Hemphill patent.

The needles which preferably are of the latch needle type are not herein shown. They are arranged in a circular series, but less than the entire number of needles may be and preferably are used in the entire knitting operation. A suitable number of needles are used in knitting the front and the back of the hand, and preferably a number of needles in excess thereof are used in knitting the four finger strips, since, preferably in knitting each of said finger strips, I employ, as stated, gusset needles normally used in knitting the adjoining finger strips.

Assuming the knitting to begin at the bottom of the wrist and for example at the back thereof, and assuming merely for simplicity of description that the wrist is of the full width of the hand (though as above stated, it may be fashioned by narrowing and widening in the knitting operation) it will be understood that in commencing the knitting all of the needles that are used in knitting the hand at front or back are in action and the knitting proceeds upon the usual knitting cams, such, for example, as those shown in the said Hemphill Patent No. 933,443, for the formation by reciprocating knitting of a preferably straight strip selvaged at opposite edges to constitute the back of the hand. Having reached the bases of the fingers, I next proceed to knit, preferably one at a time, the several finger strips and shall herein describe the said strips as knitted in order beginning with the little finger. Obviously, however, the finger strips may be knitted in any desired order or sequence, and by using a plurality of knitting cams, a plurality of digit strips may be knitted simultaneously.

In order to knit the little or any other finger or thumb strip, I preferably throw out of action all the needles and then return to action the needles that are to be employed in knitting such strip. For this purpose, I may provide any suitable means, and I will now briefly refer to the means for throwing up out of action needles at the desired time.

As shown most clearly in Figs. 6 and 7, I provide a needle throw-up cam 3, generally similar it may be in mode of operation to the cam 19 in the said application of George P. Bosworth, Serial No. 263,284, and not necessary to describe in entire detail. The said cam 3 is slidably mounted in a suitable support 4 and has a stem 5 which is operatively connected to or acted upon by, as through a pin 6, a bell crank lever 7 pivoted at 8 and pivotally connected as shown in Fig. 1 with an upright rod 9, the lower end of which is pivotally connected to a lever 10 that is operatively associated with the pattern or cam drum *g*, being controlled by suitable cams thereon as indicated in the diagram Fig. 8.

After the completion of the four finger strips as hereinafter stated, I provide means for throwing down into action all the needles that are to be employed in knitting the front or it may be the back of the hand. While for this purpose I may employ any suitable means, I preferably provide a needle throw-down cam 11, shown most clearly in Figs. 6 and 7, and preferably operated in a manner similar to the corresponding or like cam in the said Bosworth application, Serial No. 263,284. As herein shown the said cam 11 is provided with stem 12 slidingly mounted in a support 13 and having a pin 14 upon which acts a bell crank lever 15, which is itself pivotally connected to an upright rod 16 shown most clearly in Fig. 2 and connected at its lower end to a lever 17 which at its opposite end extends into proximity with the pattern or cam drum *g*, so as to be controlled by the proper cams thereon in a manner not necessary more fully to describe.

In order to select the needles to form the several digit strips, I provide herein five

cams indicated somewhat diagrammatically in Fig. 6ª at 19, 20, 21, 22 and 18 the said cams selecting preferably through the described butts upon the needle jacks the needles that are to be employed in knitting respectively the little finger, and then in succession the third, the second and the first fingers and then the thumb. The said cams may be controlled and operated in any suitable way and preferably by means substantially as shown in Fig. 13 and elsewhere of the said application of George P. Bosworth, Serial No. 263,284. To that end I provide five slides numbered respectively 23, 24, 25, 26, 27, having wedge shaped heads 23′, 24′, 25′, 26′, 27′. Said slides are respectively connected pivotally to bell crank levers 28, 29, 30, 31, 32, which as indicated most clearly in Figs. 1 and 5, are connected pivotally to upright rods 33, 34, 35, 36, 37, extending downwardly to and pivotally connected to levers 38, 39, 40, 41, 42, which extend into operative proximity to the cam or pattern drum g and are suitably controlled by cams thereon as indicated in the diagram Fig. 8.

The knitting cams are not herein shown in detail, but preferably they comprise four cams in a single group, such, for example, as one of the groups of knitting cams in the said application of Bosworth, Serial No. 263,284. In Fig. 7, I have indicated in plan a portion of said cams, and have represented them as mounted upon a cam block 43 of any suitable type, and herein carried or supported in a manner generally similar to that shown in the said Hemphill Patent No. 933,443. Preferably the said cam block is not mounted for radial movement, though such movement may be provided therefor if desired.

In the manner described or in any other suitable way, I provide means for bringing into action or for maintaining in action the desired needles for knitting the first digit strip which for convenience of description may be referred to as the little finger strip. The knitting now proceeds reciprocatingly upon the selected number of needles, so as to knit a flat strip selvaged at opposite edges, and of sufficient width to form the back of the little finger.

In accordance with my invention which I desire to claim broadly herein, I provide means to fashion in and by the knitting operation each of the digit strips and especially at the tips thereof, and preferably to that end I provide means effective at the suitable time as, for example, when the knitting has progressed about to the bottom of the nail of the little finger, whereby I elevate or remove from action at the end of each movement of reciprocation a single needle while permitting it to retain its loop so that it may thereafter be restored in the widening operation.

To this end, I have herein represented two narrowing pickers 44, 45 indicated most clearly in Figs. 5 and 7, and which may be mounted at any suitable part of the mechanism, but are herein shown as pivotally mounted upon inclined posts 46, 47, upon the cam block 43, coil springs 48, 49 being provided tending to throw said pickers down into action. Said pickers may be of any suitable construction and may be, for example, of the general type of narrowing pickers shown in the said Hemphill Patent 933,443. Said pickers are normally held out of action, being as stated permitted to act only in fashioning the tips of the thumb and fingers. While any suitable means may be provided to control their action, I have herein for the purpose represented a strip or bar 50 horizontally positioned in the rear of the cam block 43 and having plunger like members 51, 52 extending inward therefrom at right angles through suitable sockets 53, 54 in a frame 55. At their inner ends, the said members 52, 53 take against the body or pivotal portions 56, 57 of said pickers so as to swing them upwardly into the inactive position indicated in Fig. 5. A spring 58, shown most clearly in Fig. 7, tends to move said strip or bar 50 outward toward the supporting post 59, projecting upward from the frame of the machine. Thus, when the plunger-like members 51, 52 are moved outward or toward the post 59, the narrowing pickers 44, 45 are brought into action.

The said narrowing pickers having been brought into action, they operate in a manner not herein necessary more fully to describe to throw up out of action while retaining its loop, preferably a single needle at each end of a movement of reciprocation of the needle cylinder or reciprocating part. This action automatically continues until the narrowing has been effected to the desired extent. Obviously the narrowing may be of any suitable character and extent and may occur upon consecutive reciprocations or movements of the needle cylinder, or, if desired, it may occur only upon certain selected reciprocations. If, as preferably desired, a picker acts to throw up a needle at each end of a movement of reciprocation of the needle cylinder, I may, if, for example, in a fine gage machine, provide as many as forty-six needles for the widest digit strip, say, the thumb strip, and continue the narrowing until fifteen needles are thrown up on each side, thus leaving in action sixteen needles for the tip of that digit strip. These numbers are given for illustration merely, and may widely vary in different strips and with different gages of machine.

I may provide any suitable means for acting upon and causing to operate the said means for rendering the narrowing pickers active. For that purpose, I have herein rep-

resented the post 59 as having secured thereto a bracket 60 upon which is pivoted at 61 a suitable bell crank lever, one arm 62 of which takes against the outer side of the bar or strip 50. The said bell crank lever is provided with a second arm 63, which as shown most clearly in Figs. 1 and 5, is suitably connected to an upright rod 64 to the lower end whereof is suitably connected a lever 65 extending into operative relation to the cam or pattern drum *f*, so as to be controlled by suitable cams thereon and which are indicated in the diagram, Fig. 8, by the vertical row of cams 66, etc.

It will be noted, viewing Fig. 8, that the cam drum *f* is provided with a suitable series of cams vertically in line with the cam 66 and indicated at 66^a, 66^b, 66^c, 66^d, for similarly throwing in the narrowing pickers to effect the narrowing operation respectively for the tip of the third finger, the second finger, the first finger and the thumb. So far as I am aware, I am the first to provide means constituting part of a knitting organization for effecting the fashioning in the knitting operation of digit strips, and claim the same broadly, whether or not such digit strips or any of them are reinforced in whole or in part in any suitable manner, as by throwing in a thickening thread or by substituting a thicker thread for the usual knitting thread at some suitable part in the knitting of such digit strip or strips. Preferably, however, I provide means for reinforcing the digit strips at the tips of the thumb and fingers, and also preferably I make such reinforcement co-extensive with the fashioning of such thumb and finger strips, though obviously I am not limited thereto. I shall, however, proceed to describe the reinforcing as extending in one direction to the bottom of the nails of the thumb and fingers, and in the opposite direction to a corresponding point on the inside of the thumb and finger.

For this general purpose I may, as indicated in Fig. 6, employ three or any suitable number of thread guides or levers 67, 68, 69, which are pivotally mounted upon a transverse pivot 70 in the latch ring C in a manner not necessary more fully to describe and controlled by suitable levers, one of which is indicated at 71 in a manner more fully described in the said Hemphill Patent 933,443. The thread guide 68 may be employed for the usual knitting thread, the thread guide 67 being employed for the reinforcing thread and the thread guide 69 being, if desired, employed for a marking thread that may be thrown momentarily into action at the end of the knitting of a glove blank and serving as a marker in the subsequent severing of the entire blank into units.

It is unnecessary to describe in detail the means for controlling the threads, it being, however, noted that the thread guide 67 for the reinforcing thread is preferably controlled by an upright rod 72 shown in Fig. 1 operatively connected to said thread guide in any suitable manner and connected at its other end to a lever 73 extending into operative relation to suitable cams upon the cam drum *f*. Similarly the lever 69 for the marking thread is suitably connected to an upright rod 74, which is pivotally connected at its lower end to a lever 75 also controlled by suitable cams upon the cam drum *f*.

The reinforcing thread as well as the marking thread, if employed, are preferably severed when withdrawn from action, though within the scope and purpose of my invention they may be floated without being severed. In order to sever such threads, I preferably provide a suitable cutter indicated at 76 in Fig. 6, and I also provide a suitable binder 77 for the severed thread, the same being operated in a manner not herein necessary more fully to describe, as, for example, by a presser 78 carried by a lever 79, which at its outer end is pivotally connected at 80 to an upright rod 81, which at its lower end is pivotally connected at 82 to a lever 83 pivoted at 84 and having an arm 85 extending into operative relation to the cam drum *f*, being controlled by suitable cams thereon.

I have stated that the reinforcing for the thumb and fingers is preferably, though not necessarily, co-extensive with the fashioning thereof. In Fig. 8, I have diagrammatically indicated cam means whereby the reinforcing begins at the back of each of the finger and thumb strips at the same time that the narrowing thereof begins. For this purpose, I have in diagram in Fig. 8 indicated at the left of the vertical row of cams 66, 66^a, etc., a vertical row wherein the spaces 86, 86^a, 86^b, 86^c and 86^d effect the throwing-in of the reinforcing thread. It will be noted that these spaces begin in each case substantially in horizontal line with the lower border of the cam which renders the narrowing pickers active. The cam elevations between said spaces provide means whereby the said reinforcing thread is thrown out of action. Inasmuch as the reinforcing is preferably carried over the tip of the fingers and thumb down onto the front thereof, the said reinforcing thread is, of course, maintained in action after the narrowing pickers have been rendered ineffective, all as will be readily understood.

I have described one form or embodiment of means whereby the thumb and finger strips may be and are narrowed in the knitting operation, and whereby if desired a reinforcing thread may be introduced or substituted so as to reinforce the tips of the thumb and fingers. I will now proceed to describe one form of means whereby I com-

plete the fashioning of the thumb and finger strips by correspondingly widening the said thumb and finger strips. This I preferably effect by providing picker means, although I am not limited to the employment of such means and may be provide any suitable means or instrumentalities. Preferably, however, I provide picker means and to that end I may provide a single widening picker to control the return to action of the needles that have been removed from action.

In the disclosed embodiment of the invention, however, I have represented two pickers, one of which controls the widening for certain of the digit strips, and the other of which controls the widening for the remaining digit strips.

These pickers (or picker, if a single one be employed) may be operated in any suitable manner, as, for example, from the cam drum *f*, or the cam drum *g*, but preferably I provide a separate means for controlling such picking means, and in the disclosed embodiment of the invention, I have provided a separate pattern or cam drum which, however, I preferably mount upon the same shaft that carries the pattern or cam drums *f* and *g*.

While I am not limited to the employment of the type of means herein described, it is desirable in this embodiment of my invention to employ separate means for controlling the widening pickers since the cam drum *f* controls the reinforcing thread, and if, therefore, a further movement of rotation be imparted to the cam drum *f* in order to bring into action the widening pickers, it would tend to interfere with the proper timing of the means for introducing the reinforcing thread.

It is obvious that in different types or embodiments of my invention, other means quite distinct from those herein described may be employed for controlling the widening picker or pickers. It is also obvious that in those types of my invention wherein a reinforcing thread is not supplied, I may operate the widening picker or pickers directly from the pattern drums *f* or *g*.

Referring, however, to that specific embodiment of means herein represented, I have in Figs. 1, 2, 5, 5ª and 8, represented two widening pickers 87, 88, the first being herein employed for effecting the widening of the tips of the little finger and the third finger, and the other being employed for effecting the widening of the tips of the second and first fingers and the thumb. These pickers are of any suitable character and their inner or active end portions are guided by suitable guides 89, 90. These guides are suitably recessed as indicated at 91 in Fig. 5ª, so that the picker may operate in either direction of reciprocation of the needle cylinder or reciprocating element, so as to throw a needle or needles down from the inactive series, that is, to restore to action the needles which have been elevated in the narrowing operation. The needle butts are properly presented to the widening pickers by cams 109′.

While the said widening pickers may be of any suitable construction, preferably their inner ends are of such size and shape that they may depress or bring into action two needles at a time. Preferably I bring into action two needles at a time, since preferably I retain the narrowing pickers in action during the widening operation, and inasmuch as the narrowing pickers continue to elevate a needle at the end of each reciprocation, I so construct the widening pickers as to throw down two needles at the end of each reciprocation with the net result that the fabric is widened to the extent of one needle at the end of each reciprocation.

As shown most clearly in Fig. 5, upon a suitable support 92, I provide a socket 93 wherein is mounted the pivotal stud 94 of a block 95 wherein is mounted the horizontal pivot 96 of the widening picker 87. A similar supporting means is provided for the widening picker 88. Suitable springs, 97, 98 are provided tending to elevate the inner or active ends of the widening pickers, and said ends are guided downward against the stress of said springs owing to the conformation of the recesses 91.

When said widening pickers are in inactive position their inner or active ends are or may be positioned between the horizontal rows of the knitting butts, that is, between the butts of the active and inactive needles. In order to render said pickers active, they are elevated or are permitted to rise into engagement with the upper row of the knitting butts. To that end I provide means normally holding said pickers in the described inactive position but permitting them to be elevated under the stress of the springs 97, 98. While for this purpose any suitable means may be provided, I have herein represented for the picker 87 an arch or hook-like member 99 indicated in Figs. 1 and 5, which is operatively connected to a bell crank lever 100, itself pivotally connected to an upright rod 101 that in turn is pivotally connected at its lower end to an arm 102 of a lever pivoted in a forked bearing 103 secured to the part 104 of the machine frame. The opposite arm 105 of said lever has pivotally connected thereto an upright rod 106 that at its lower end is pivoted to a lever 107, extending into operative relation to suitable cams upon a drum 108 shown most clearly in Figs. 1 and 3.

Similarly the picker 88 is controlled by an arch or hook-like member 109 mounted upon a lever 110 pivoted at 111, to which is pivotally connected at 112 an upright rod 113

that at its lower end is pivotally connected to the lever 114 extending into operative relation to the said cam drum 108.

I have stated that the widening pickers are in this embodiment of the invention controlled from the cam drum 108. Any suitable means may be employed to move said drum at proper intervals and any other suitable means may be substituted for said cam drum to control the movements of the widening picker or pickers. Herein I have represented the said cam drum 108 as loose upon the shaft s', being held in position thereon between the cam drum g and a collar 115 fast on the said shaft s'. Bolted to one side of the cam drum 108 by bolts 116 is a ratchet wheel 117 herein provided with thirty-six teeth. At one side of the ratchet wheel 117 and secured thereto and to the cam drum 108 by the bolts 116 is a ratchet wheel 118 which in this embodiment of my invention is provided with one tooth as clearly indicated in Fig. 4. The said ratchets 117 and 118 are of course loosely mounted upon the shaft s'.

As most clearly shown in Fig. 1, the shaft s' has fast thereon the usual ratchet wheel 119, herein provided with thirty-six teeth. This ratchet wheel is driven by pawl mechanism not herein illustrated and preferably the same as in the well-known Banner machine and substantially the same as shown in said Hemphill Patent, No. 933,443. The driving pawl for the ratchet 119 is controlled in its movement by a pivoted pawl-like member 120 suitably mounted and the movements of which are controlled by the usual pattern chain 121 in a manner not herein necessary more fully to describe. The pattern chain 121 is controlled in its movement by the usual ratchet wheel 122 loose upon the said shaft s', the said ratchet wheel being driven in any usual manner not herein necessary more fully to describe, it being preferably the means employed on the said Banner machine.

Upon the pattern chain 121, I provide a special lug or formation 123 adapted periodically to take under the end 124 of a pawl 125, which, as shown most clearly in Fig. 1, has an elongated shaft 126 mounted in bearings 127, 128 in a bracket 129 supported upon the framing of the machine. At its end opposite the pawl 125 the shaft 126 is provided with a lug or arm 130 fast thereon and adapted periodically to be swung upward against a pawl 131 pivoted at 132 upon a lever arm 133 itself fast upon the usual quadrant shaft 134 for imparting movements of reciprocation to the needle cylinder. The tooth 135 of the pawl 131 is adapted to be lifted periodically by the lug or arm 130 so as to engage the teeth of the ratchet 117. When the lug or arm 130 is not elevated the pawl 131 reciprocates idly and no movement is imparted to the ratchet 117 or to the cam drum 108 thereby. At the proper intervals, that is, when it is desired to bring the widening pickers into action, the pawl 131 is elevated momentarily and a slight movement of partial rotation is imparted to the cam drum 108, which as shown in the diagram, Fig. 8 is provided with cams 136, 137, 138, 139 and 140 which cause the widening pickers at the proper time to become active as previously stated.

Inasmuch as the cam drum 108 is loose upon the shaft s', it is evident that means must be provided to preserve the same in its proper circumferential relation with respect to the cam drum f and g. While any suitable means may be provided for this purpose, I have herein shown means whereby the cam drum g, when given a movement of partial rotation correspondingly moves the cam drum 108, but in such a manner as to permit said cam drum to be itself moved ahead independently thereof through the ratchet wheel 117 and the pawl 131. For this purpose, the cam drum g has pivoted to the face thereof next the ratchet wheel 118, at 141, a pawl 142 normally pressed by spring 143 into meshing relation with the ratchet 118 so as to engage the single tooth 144 thereon.

It will be obvious that through the described construction, the pattern or cam drum g will impart to the cam drum 108 all its own movements of partial rotation and that the said cam drum 108 may be moved incrementally forward at the proper time so as to bring the proper cam into operative relation with the widening picker mechanism.

In the diagram Fig. 8, I have shown upon the pattern or cam drum g the cams for controlling the movements of the non-knitting cams as well as the cams for cutting the marking and the reinforcing threads. These cams are marked upon said figure for identification and need not be more particularly described.

The fashioning, which is preferably of the tip portions of the thumb and fingers, may be of any desired length, and if desired may occur at intervals or otherwise throughout the greater part of the thumb and fingers, and even to the base thereof. The reinforcing, whether it occurs by the introduction of an additional thread or the substitution of a thicker thread, or otherwise, need not be co-extensive with the fashioning. Either of these features may be more prolonged in action than the other, and within the scope of my invention, the reinforcing may be applied to parts of the glove other than the thumb and fingers.

Preferably and as herein disclosed the means for controlling the introduction of the reinforcing thread is such that the rein-

forcing thread while in action is knitted with the main thread from selvage to selvage of the parts where introduced, as, for example, in the thumb and finger strips, and especially at the tips thereof.

If desired, the fashioning, as by narrowing and widening, may be greater at one side of a digit strip than at the other side, as, for example, at the outside of the first and little fingers; that is, the fashioning in such or any other desired cases may commence at a point lower down on the finger at one side than the other. Within the scope of my invention, I may knit a glove, the front and back of which are structurally separate and are afterward seamed together. In such case, the front of the glove would preferably have the front of the thumb and finger strips formed integrally therewith, and likewise the back of the glove would have the back of the thumb and finger strips knitted integrally thereon. In such case, the tip portions of the strips, both for the front and for the back of the thumb and fingers, are fashioned preferably by merely a narrowing operation. Such an operation is within the scope and purpose of my invention and within the scope and meaning of the claims. Such a form of glove is disclosed in the patent to George P. Bosworth, 1,339,592, dated May 11, 1920. Obviously by varying the number of needles employed, I can knit any size glove or hand covering, since the number of needles used are less than all the needles.

Having thus described one illustrative embodiment of my invention, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims:

1. Knitting mechanism comprising in combination, a needle carrier and a cam carrier to knit the hand and fingers of a glove, and picker means to fashion the tips of the fingers during and by the knitting operation.

2. Knitting mechanism comprising in combination, a needle cylinder and cam ring for knitting hand coverings and picker means for fashioning in the knitting operation the tip of a digital member or members thereof.

3. Knitting mechanism comprising in combination, means for knitting hand coverings and mechanically acting means to manipulate the needles while retaining the loops to effect fashioning, in the knitting operation, of the tips of the digital members by a narrowing and widening operation.

4. Knitting mechanism comprising in combination, a needle cylinder and cam ring to knit the hand and fingers of a glove and picker means to fashion the tips of the fingers during and by the knitting operation.

5. Knitting mechanism comprising in combination, means to knit the hand, thumb and fingers of a glove, and picker means to fashion the tips of the thumb and fingers during and by the knitting operation.

6. Knitting mechanism comprising in combination, a circular knitting machine having a needle cylinder and a cam ring, means to impart a relative movement thereto thereby to knit the hand and digital members of a glove, and picker means to fashion the tips of the digital members in and by the knitting operation.

7. Knitting mechanism comprising in combination, a circular knitting machine having a needle cylinder and a cam ring, means to impart a relative movement thereto thereby, to knit the hand, thumb and fingers of a glove, and picker means to fashion the tips of the thumb and fingers by a narrowing and widening action in and by the knitting operation.

8. Knitting mechanism comprising in combination, means to knit a body portion of a hand covering, means to knit a relatively narrow extension strip as an integral prolongation thereof, and which strip is parallel sided throughout the major portion thereof and picker means to fashion said extension strip in and by the knitting operation.

9. Knitting mechanism comprising in combination, means to knit a flat body portion of a hand covering selvaged along opposite edges, means to knit a relatively narrow, oppositely selvaged strip as an integral prolongation thereof, and mechanically acting means to manipulate the needles while retaining the loops, to effect fashioning, in a knitting operation, of the said selvaged strip, by a narrowing and widening operation.

10. Knitting mechanism comprising in combination, a needle cylinder, a cam ring, means to impart movement of relative reciprocation thereto to produce the hand portion and the digital portions of a glove, and picker means periodically operative to fashion said digital portions by a narrowing and widening operation.

11. Knitting mechanism comprising in combination, a needle cylinder, a cam ring, means to impart movement of relative reciprocation thereto, to produce the hand portion and the digital portions of a glove, narrowing and widening picker mechanism, and means to render said mechanism operative for fashioning the said digital portions.

12. Knitting mechanism comprising in combination, a needle cylinder, a cam ring, means to impart movement of relative reciprocation thereto, to produce the hand portion and the digital portions of a glove, nar-

rowing and widening picker mechanism, and means to render said mechanism operative only during the formation of the "tips" of said digital portions, thereby to fashion said tip portions.

13. Knitting mechanism comprising in combination, a needle cylinder, a cam ring, means to impart movements of relative reciprocation thereto, to produce the hand portion and the digital portions of a glove, a pair of narrowing pickers, and one or more widening pickers, and means to render said pickers operative during the formation of the "tips" of the digital portions, thereby to fashion the same.

14. Knitting mechanism comprising in combination, a needle cylinder, a casing, means to impart movements of relative reciprocation thereto, to produce the hand portion and the digital portions of a glove, a pair of narrowing pickers, a pair of widening pickers, and means to render said pickers operative only during the formation of the tips of the thumb and fingers, thereby to fashion the same.

15. Knitting mechanism comprising in combination, a needle cylinder, a cam ring, means to impart movements of relative reciprocation thereto to produce a flat selvaged strip constituting the hand portion of a glove with integral selvaged continuations constituting the thumb and fingers, narrowing and widening pickers, and means to render said pickers operative during the formation of the "tips" of the thumb and fingers, thereby to fashion the same.

16. Knitting mechanism comprising in combination, a needle carrier and a cam carrier to knit the hand and fingers of a glove and mechanically acting means to manipulate the needles while retaining the loops to effect the fashioning, in the knitting operation, of the tip or tips of the digital member or members during the knitting operation.

17. Knitting mechanism comprising in combination, a needle cylinder and a cam ring to knit the hand and fingers of a glove and mechanically acting means to manipulate the needles while retaining the loops to effect the fashioning, in the knitting operation, of the tip or tips of the digital member or members during the knitting operation.

18. Knitting mechanism comprising in combination, means for knitting the hand and digital portions of a glove, picker means to fashion the tips of said digital portions, and means to reinforce parts of said digital portions including the "tips" thereof.

19. Knitting mechanism comprising in combination, means for knitting the hand, thumb and fingers of a glove as an integral unit, means to introduce a reinforcing thread for portions of said thumb and fingers including the tips thereof, means to sever the reinforcing thread, and coöperating narrowing and widening picker means to fashion said reinforced tips.

20. Knitting mechanism comprising in combination, means for knitting the hand, thumb and fingers of a glove as an integral unit, means to introduce a reinforcing thread for portions of said thumb and fingers including the tips thereof, narrowing and widening pickers to fashion said tips, cam means to control the reinforcing thread and said pickers, and means to maintain the proper relation of said cam means.

21. Knitting mechanism comprising in combination, means for knitting the hand, thumb and fingers of a glove as an integral unit, means to introduce a reinforcing thread for portions of said thumb and fingers including the tips thereof, narrowing and widening pickers to fashion said tips, separate cam means to control the reinforcing thread and said pickers, and means to throw into operation the widening picker without disturbing the means for controlling the reinforcing thread.

22. Knitting mechanism comprising in combination, means for knitting the hand, thumb and fingers of a glove as an integral unit, means to introduce a reinforcing thread for portions of said thumb and fingers including the tips thereof, narrowing and widening pickers to fashion said tips, separate cam means to control the reinforcing thread and said pickers, and means to bring the widening pickers into operation without withdrawal of the narrowing pickers and without disturbing the cam means for controlling the reinforcing thread.

23. Knitting mechanism comprising in combination, a needle cylinder, a cam ring, means to impart movement of relative reciprocation thereto to produce the hand portion and the digital portions of a glove, a pair of narrowing pickers, means to operate the same only during the formation of the tips of the thumb and fingers, to narrow the same, a pair of widening pickers, means to operate one of said widening pickers only during the formation of the tips of the thumb, first and second fingers, to widen the same, and means to operate the other of said widening pickers only during the formation of the third and little fingers, thereby to widen the same.

24. Knitting mechanism comprising in combination, a needle cylinder, a cam ring, means to impart movement of relative reciprocation thereto to produce the hand portion and the digital portions of a glove, a pair of narrowing pickers, means to operate the same only during the formation of the tips of the thumb and fingers, to narrow the same, a pair of widening pickers, means to

operate one of said widening pickers only during the formation of the tips of the thumb, first and second fingers, to widen the same, means to operate the other of said widening pickers only during the formation of the third and little fingers, thereby to widen the same, and coöperating means to reinforce the tips of the thumb and fingers.

25. In a knitting machine, a needle cylinder, a cam ring, means to reciprocate the needle cylinder to knit the front and the back of a glove, selecting cams to select groups of needles for the formation of the thumb and fingers of the glove, means to knit reciprocatingly upon the selected needles to form the thumb and fingers, and means to fashion by the knitting operation the tips of the thumb and fingers.

26. In a knitting machine, a needle cylinder, a cam ring, means to reciprocate the needle cylinder to knit the front and the back of a glove, selecting cams to select groups of needles for the formation of the thumb and fingers of the glove, means to knit reciprocatingly upon the selected needles to form the thumb and fingers, means to introduce a reinforcing thread from selvage to selvage of the thumb and finger tips to reinforce the same, and picker means to fashion said thumb and finger tips.

27. Knitting mechanism comprising in combination, a needle cylinder, a cam ring, means to impart movement of relative reciprocation thereto to produce the hand covering, and the digital portions of a glove as an integral fabric, and mechanically acting means to manipulate the needles while retaining the loops to narrow and widen the digital portions to constitute finger tips.

28. Knitting mechanism comprising in combination, a needle cylinder, a cam ring, means to impart movement of relative reciprocation thereto to produce as an integral fabric the hand portion of a glove and the finger extensions thereof, picker means to narrow and widen each of said finger portions at the tip thereof, and means to reinforce said tip portions.

In testimony whereof, I have signed my name to this specification.

JOHN LAWSON.