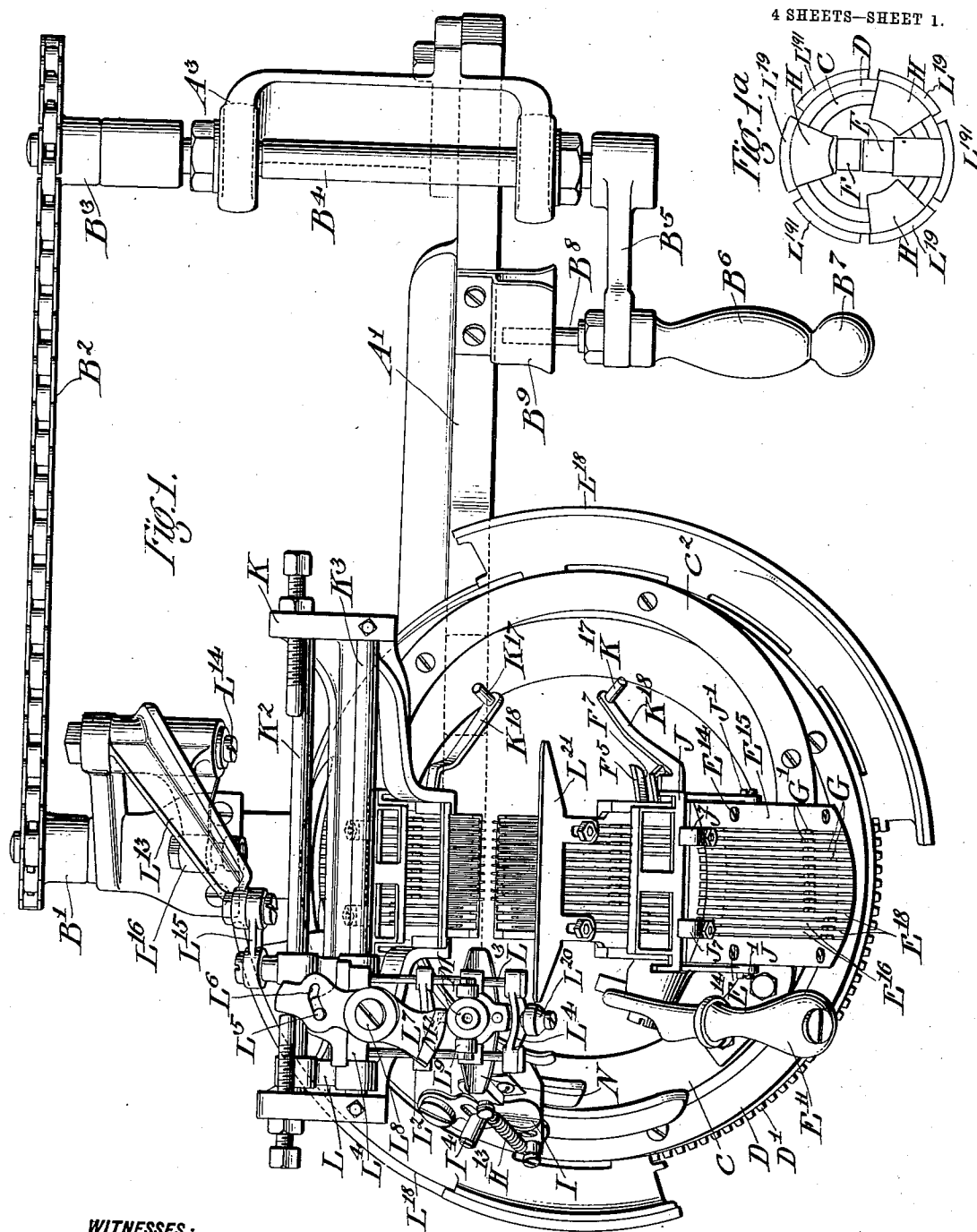


1,018,144.

4 SHEETS—SHEET 1.



WITNESSES:

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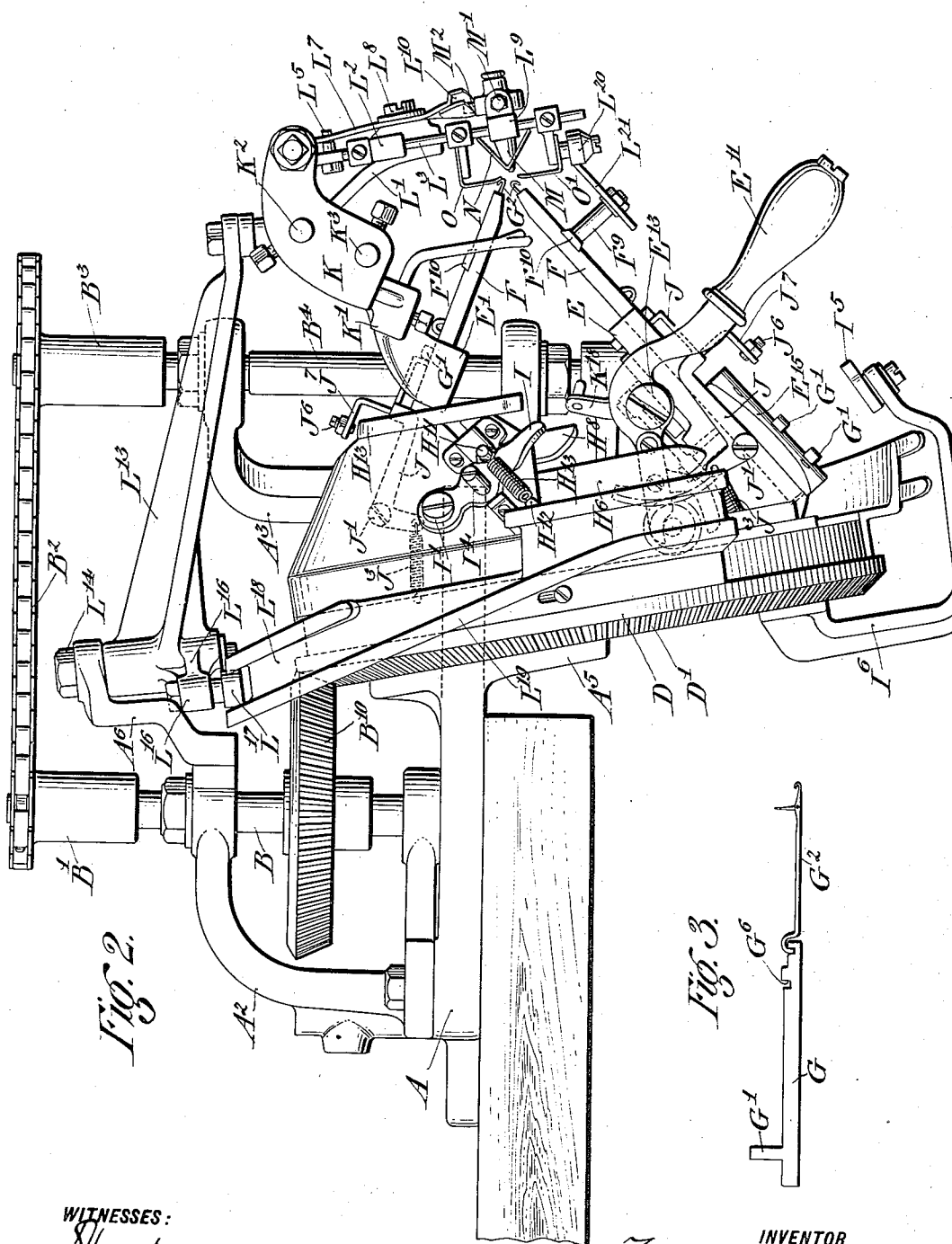
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KNITTING MACHINE.
APPLICATION FILED DEC. 20, 1907.

1,018,144.

Patented Feb. 20, 1912.

4 SHEETS—SHEET 2.

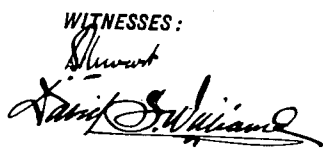


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4 SHEETS—SHEET 3.



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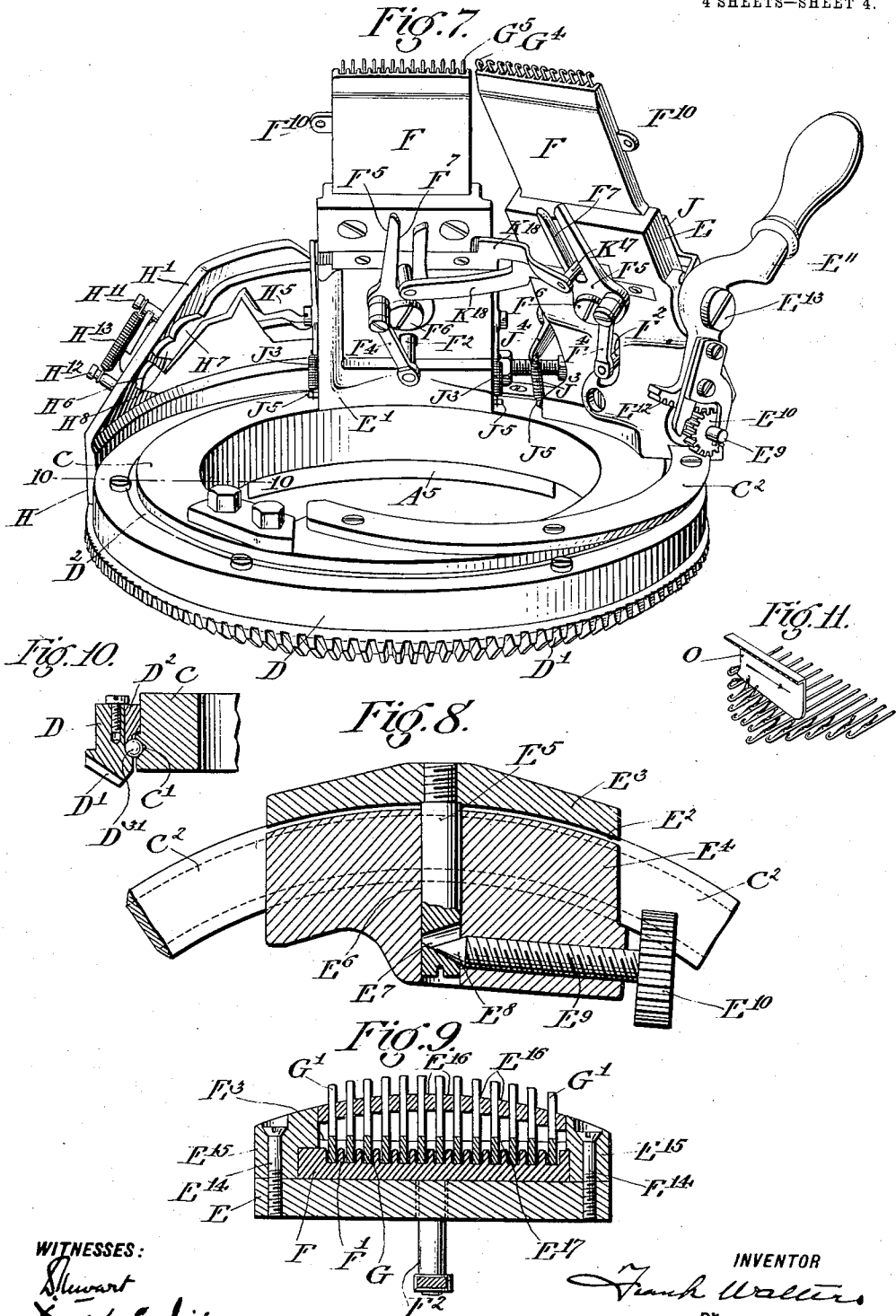
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1,018,144.

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UNITED STATES PATENT OFFICE.

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KNITTING-MACHINE.

1,018,144.

Specification of Letters Patent.

Patented Feb. 20, 1912.

Application filed December 20, 1907. Serial No. 407,362.

To all whom it may concern:

Be it known that I, FRANK WALTERS, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Knitting-Machines, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My present invention relates to knitting machines, and particularly to the so-called flat knitting machine of the type in which there are two sets of needles, the needles in each set being parallel to each other and in one plane which meets the plane of the other set of needles at an angle so that the ends of the two sets of needles when retracted are arranged in two parallel rows.

The object of my invention is to make improvements in knitting machines of this type whereby with simple and effectively disposed mechanical parts the speed of operation may be increased.

More specifically one object of my invention is to provide a knitting machine of this character in which the two sets of needles may be brought into such relation that the needle hooks all point in the same general direction in order to facilitate the hooking on of the work and another important object of the invention is to provide an arrangement in a flat knitting machine of the type described in which the needles may be operated by one or more continuously rotating cams or locks which operate first the needles of one set and then those of the other.

Further objects of the invention have to do with improvements in the means for guiding the yarn to needles and with means for insuring that the finished loops are cast off at the proper times and with numerous features of construction and arrangement whereby the construction and operation of the machine are made highly satisfactory.

The various features of novelty which characterize my invention I have aimed to point out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention however, and the advantages possessed by it, reference may be had to the ac-

companying drawings in which I have illustrated and described one of the forms in which my invention may be embodied.

Of the drawings, Figure 1 is a front elevation of the knitting machine. Fig. 1^a is a diagrammatic view of a modification. Fig. 2 is a side elevation. Fig. 3 is a side elevation of one needle and its jack. Fig. 4 is a plan view. Fig. 5 is a plane development of the needle actuating cams. Fig. 6 is a perspective view of the stationary cam and cam carrier employed in controlling the length of the stitch formed. Fig. 7 is a perspective view of a portion of the knitting machine showing the parts in the position in which the two flat needle faces are brought into substantial parallelism to permit the work to be hooked on. Fig. 8 is a sectional elevation through the movable needle plate support, taken parallel to the plane of the guide on which it is mounted. Fig. 9 is a section through one of the needle plate holders, needle plate and needles carried thereby, taken transversely to the length of the needles. Fig. 10 is a section on the line 10—10 of Fig. 7, and Fig. 11 is a perspective view showing the operation of a latch turning plate.

In the drawings, A represents the main supporting casting or frame which may be mounted on any suitable stand or table. It is provided with a yoke A² and a yoke A³, the latter being mounted on an extension or arm A'. In the yoke A² is journaled a shaft B carrying a sprocket wheel B' at its upper end, which is connected by a chain B² to a sprocket wheel B³ mounted on the upper end of the shaft B⁴ journaled in the yoke A³. When, as shown, the machine is intended to be operated manually the shaft B⁴, and thereby the shaft B, is rotated by means of a crank B⁵ secured to the lower end of the shaft B⁴ and provided with a handle B⁶. A bolt B⁸ slidingly received in the handle B⁶ and carrying the ball B' at its lower end is fitted to lock the parts in the position shown in Figs. 1 and 2 by being moved into the pocket member B⁹ secured to the arm A'.

A projection A⁵ from the base member A has connected to it an annular body shown best in Fig. 7. On the annular body C, which forms the support for most of the operating parts of the machine and through which

the finished portion of the work of the machine is passed, is rotatably mounted another annular body D which is the main cam carrier of the machine, and is provided with teeth D' which mesh with the teeth of the driving gear B¹⁰ carried by the shaft B. As shown, the member D is made in two parts to facilitate assembling; an annular portion D² being provided which is detachably connected to the member D proper. A runway for antifriction balls D³¹ is formed by the groove C' in the member C and the adjacent inclined surfaces of members D and D². The two needle plate or guide supporting members or holders E and E' are mounted on the annular body C, the member E' being formed integral with or rigidly secured to the member C, and the member E being mounted on an arc shaped guide C² bolted or otherwise secured to the face of the member C. The member E has its lower end divided by a kerf E² (see Fig. 8) to form two clamping jaws E³ and E⁴ between which the guide C² may be gripped. The means shown for locking the member E in fixed relation with the member C comprises a bolt E⁵ secured to the jaw E³ and received in the passage E⁶ formed in the jaw E⁴ and provided with a conical recess E⁷ into which enters the conical end E⁸ of a screw E⁹ threaded into the jaw E⁴ and provided at its outer end with a spur gear E¹⁰ which meshes with the gear segment E¹² carried by the hand lever E¹¹ which is journaled on the screw E¹³ carried by the member E. The hand lever E¹¹ in addition to forming a convenient device for clamping and releasing the needle plate holder E to the rib C² is a handle for moving the holder along the rib C² from the position of Fig. 1 to that of Fig. 7. Each of these members has slidably mounted in it a needle guide or plate F provided with guideways F⁷ for the corresponding needles G² and needle jacks G. Each needle plate is held in place by a bridge piece E¹⁵ in the form of a rectangular open frame secured to the corresponding member E or E' by bolts E¹⁴. Guide ways for the cam engaging projections or lugs G' of the needle jacks are formed by bars E¹⁶, see Figs. 1 and 9, which are secured at their ends to the end portions E¹⁷ of the corresponding bridge E¹⁵, the bars E¹⁶ being spaced apart by suitable space blocks E¹⁸. The bars E¹⁶, blocks E¹⁸ and bridge E¹⁵ proper may be secured together by solder or the like. The needles G², which are secured to the jacks as shown in Fig. 3, are held in place in the needle plates by cross bars F¹⁰.

To the under side of each needle plate F is secured a stud F² connected by a link F⁴ to a lever F⁵ fulcrumed on a bolt F⁶ carried by the corresponding member E, E'. Each lever F⁵ is formed with an open ended cam

slot F⁷ and when the needle plate supported by holder E is moved from the normal operating position in which it is directly opposed to the other needle plate, as shown in Fig. 1, into the position in which the needle plates are alongside of each other as shown in Fig. 7, the cam slot F⁷ of the lever F⁵, carried by each of the members E and E', is entered by a cam pin K¹⁷ carried by arm K¹⁸ rigidly secured to the other one of the members E and E'. The result of this arrangement is that when the members E and E' are in the position of Fig. 7 and each pin K¹⁷ enters the slot F⁷ of the lever F⁵ on the other member and causes the lever to be oscillated, so that through the links F⁴, the needle plates F are then drawn back in the members E and E', thus exposing more of the needles and thereby facilitating the hooking of the work on the needles. When the member E is swung back to its normal position, as shown best in Figs. 1 and 2, pins K¹⁷ in leaving the slots F⁷ return the needle plates to their normal position and the friction of the parts is such that the needle plates are retained in any position into which they are moved except when positively forced out of such position. Moreover each lever F⁵ and link F⁴ may be arranged as shown, so that in the normal positions of the parts, the axis of each bolt F⁶ is between the centers of the pivotal connections between the corresponding link F⁴ and the corresponding lever F⁵ and needle plate F; so that this placing of each link F⁴ on a dead center, so as to speak, assists in normally maintaining the corresponding needle plate holder stationary. The rib C², which, in the form shown, is detachably connected to the member C' is so curved and arranged that as the plate E is swung from the normal operating position into the work attaching position of Fig. 7, the forward edges of the needle plates F move relatively to each other as do the end edges of the leaves of a book in opening and the distance between the hook ends of the needles marked G⁴ and G⁵ in Fig. 7 remains approximately constant, this distance being of course the normal distance between the two lines of rows into which the ends of the two sets of inclined needles extend when the parts are in the position shown in Figs. 1 and 2; and this distance is of course approximately equal to or at least does not differ greatly from the gage or distance between each adjacent pair of needles of the same set supported in one needle plate. In consequence, the work, which may be quickly hooked on to the needles when in the position shown in Fig. 7 is not injured in any way as the plate E is returned to the normal operative position. I may here state that the particular machine disclosed is particularly adapted for knitting the tubular fingers on to a flat

glove blank which is afterward seamed up at the side.

The needles are reciprocated at the proper time by the action of rotating cam surfaces.

5 In the form shown these cam surfaces are formed on a stitch cam member H which is adjustably secured to the rotating member C. This member H is provided with a conical portion H' which extends down over
10 or overhangs the needle butts or jacks G, and is provided on its inner side with a cam way H². In the form shown the cam way H² is formed by securing to the underside of the member H, suitably shaped plate like members H³, H⁴, H⁵, H⁶, H⁷ and H⁸.
15 All of these members, except H⁷, are rigidly connected to the portion H' of the member H. The stitch cam member H is provided with guide pins H⁹ passing through a slot H¹⁰ in the member H, and is also provided with an operating stud H¹¹ passing through the slot H¹⁰ and spring held against a lever I journaled on a screw I' screwed into the portion H' of the member H. A spring
20 washer I² normally holds the lever I in any position into which it may be moved. The spring H¹³ which holds the stud H¹¹ against the lever I has one end connected to the stud H¹¹ and the other to an abutment H¹² adjustably secured to member H. A stud I⁴ carried by the lever I is adapted to be engaged by a cam plate I⁵ (see Figs. 2 and 6) adjustably secured on a yoke I⁶ attached to the stationary ring C. As the
35 ring D is revolved the stitch cam member H is revolved about the two sets of needles, and the cam engaging projections G' of first one set and then the other set of needle jacks or butts engaged by the side walls
40 of the cam slot H². This causes the needles to be advanced and retracted in the proper order. It should be remarked that to obtain the proper engagement between the cam and the lugs G' the latter are made of different lengths so that their outer ends
45 all touch a circle concentric with the axis of the member D when the needles are in their normal position.

It will be observed from Fig. 4 that the
50 position of the cam plate member H' regulates the extent to which each needle is retracted, and consequently regulates the length of the loop formed. In normal operation the member H' is so set that the
55 loop drawn is less than the maximum length possible. When, as in forming the last row of loops at the outer end of a glove finger it is desired to lengthen the loops, the operator prior to starting on this row
60 throws the lever I back, thereby moving the member H' toward the base of the conical surface on which it is mounted. In consequence the following row of loops are drawn longer than those drawn before. At the
65 completion of this row of loops the member

H' is automatically returned to its initial position by the engagement of the stud I⁴ with the cam I⁵.

To prevent the needles from improper movement each set is locked except when
70 the lugs G' are in engagement with the cam plate members by a locking yoke J which is pivotally connected to the corresponding member E or E' by pivot screws J', and is normally held in the locking
75 position by means of springs J³ which connect arms J⁴ of the member J with pins J⁵ carried by the members E and E'. Each locking member J has a locking bar J² which extends transversely to the needle
80 jacks or butts and when the locking member is in the locking position enters notches G⁶ in the jacks or butts. The locking bars J² are lifted out of engagement with the jacks at the proper instant to permit the
85 needles to be reciprocated by means of a cam flange H¹⁴ carried at the lower end of the conical portion H' of the cam carriage H with adjustable cam engaging projections J⁶ carried by arms J⁷ extending from
90 the member J. The locking bars J² are of particular value in preventing the needles from being moved with the needle plates when the latter are moved by the actuation
95 of levers F⁵.

A guide frame K for the thread guide carriage L is secured by arms K' to the
100 outer end of the member E'. The frame K is provided with upper and lower guide rods K² and K³ on which is mounted the thread guide carriage L. The latter is provided with an arm L' having bosses L² through which pass the side rods L³ of the supporting frame for the thread guide.
105 The rods L³ are connected by upper and lower crossbars L⁴. The upper crossbar L⁴ is provided with a pin L⁵ which enters a slot L⁶ in the upper end of a lever L⁷ pivoted to the carriage L by fulcrum pin L⁸. Fulcrum blocks L⁹ secured to the rods L³
110 have journaled in them the trunnions M' of the tubular thread guide M. The thread guide M is provided with a projection M² which fits in a cam way L¹⁰ provided at the lower end of the lever L⁷. The cam way
115 L¹⁰ is inclined to the axis of the trunnions M'. In consequence of these arrangements when the lever L⁷ is oscillated so that the relative movement of the pin L⁵ is from one end to the other of the slot L⁶, the frame rods
120 L³ are raised or lowered, and the trunnions M' are bodily raised or lowered and, in addition, the inner end of the thread guide M is also swung up or down about the axis of the trunnions M' by the movement of
125 the pin M² in the inclined slot L¹⁰. The carriage L, it will be understood, is caused to travel back and forth along the rods K² and K³ to hold the thread down in position to be engaged by the upper row of
130

needles during the movement from the left to the right, as seen in Fig. 1, and up in position to be engaged by the lower row of needles in its travel from the right to left. The lever L^7 is turned about its fulcrum as the carriage L reaches the extremity of its movement in either direction by adjustable screw stops L^{11} carried by frame K .

The carriage L is reciprocated in proper time relation to the reciprocations of the individual needles caused by the travel of the stitch cam member H through a bell crank lever L^{13} mounted on a fulcrum pin L^{14} carried by an extension A^6 of the bracket A^2 .

The free end of one arm L^{13} of this lever is connected by a link L^{15} to the carriage L . The free end of the second arm L^{16} of the bell crank lever carries a follower roll L^{17} which is adapted to enter cam ways L^{18} , L^{19} .

formed in a pair of oppositely disposed cam members L^{19} , L^{191} respectively, which are adjustably secured to the member D . It will be apparent from the drawings that as the cam H engages the needles mounted on the upper holder E' , for instance, the cam roll L^{17} will engage the cam member L^{19} and cause the carriage L to move to the right, (see Fig. 4,) and that when the cam H engages the needles in the lower holder E , the cam roll L^{17} will engage the cam L^{191} and cause the carriage L to move to the left. To assist in guiding the movement of the thread guide carriage, an elongated roll L^{20} is journaled on the lower end member I^4 and engages a guide plate L^{21} carried by the posts F^9 extending from the lower needle plate F . The thread guide M has secured to it a needle guide N which is V-shaped in cross-section and is so arranged that when the thread guide is in the upper position the upper needles will pass along the under side of the under flange of the member. This serves to support the needles as the thread is drawn over them. The carriage also has secured to it upper and lower latch turning plates O and O' . The operation of these is shown in Fig. 11. When each needle after being extended at its maximum distance is about to be retracted, the corresponding guide plate O or O' will be in position to engage the latch of the needle and turn it forward to some extent. This prevents all difficulty which might otherwise arise from the free end of the latch gouging into the loop to be cast off the needle when the needle is fully retracted.

It will be observed that each latch turning plate when in operation passes beyond the various needles before the latter are fully retracted to cast off the previously formed loops and does not traverse the needles until the latter have been initially extended. On this account the plate does not engage in its operating movement either the hooks of the needles or the latches when

the latter are closed. On the return or idle traversing movement of each plate it is lifted well to one side of the set of needles with which it coöperates.

The operation of the machine will be readily understood from the foregoing.

The advantages obtained with the construction described are numerous and important.

The ease and rapidity with which the work may be hooked on when the needles are all brought side by side with the hooks facing in the same direction adds greatly to the amount of work which may be performed, especially when the machine is intended for use in forming the tubular fingers on flat glove blanks or to perform like operations where each knitting operation requires only a very short time to complete.

The use of a rotating cam or cams for actuating the needles of a double flat needle plate machine instead of the reciprocating cam heretofore used on this type of machine, reduces the labor of operation and permits more rapid operation and a more satisfactory mechanical construction. Instead of a single cam H a plurality may be employed, as illustrated diagrammatically in Fig. 1^a. It will be understood that where a plurality of cams are employed, these must be arranged so that no pair of cams are diametrically opposed to each other, since at the time one set of needles is being actuated by one of the cams, the other set of needles should not be acted upon by any of the other cams. In other words, for regularly timed operation, there should be an odd number of cams disposed at equal angular intervals about the axis of the circular path through which the cams are carried. It will also be understood that there are as many pairs of cams L^{19} , L^{191} as there are cams H and that the cams L^{19} , L^{191} should be arranged as shown in Fig. 1^a, so that the carriage L will be thrown in one direction when the upper set of needles are being operated by one of the cams H and will be thrown in the opposite direction during the following period of operation in which the lower set of needles are being operated by another of the cams H .

By replacing the needle plates and needles by other plates and needles, the gage of the latter can be quickly changed without other change in the machine. The formation of the grid like middle plate and needle jack formed by the open frame E^{15} and the spacing bars gives a construction in which the guide ways for the needle jack projections G' may be easily and accurately formed and the grid like frame be readily given the conical surface necessary to permit the overhanging lock H to be properly guided thereby.

While the particular embodiment of the invention disclosed herein has been found

to give excellent results in practice it will be understood by those skilled in the art that changes may be made in the form of the embodiment without departing from the spirit of the invention and that some of the features of the invention may well be used under some circumstances without a corresponding use of others.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a knitting machine having two sets of needles, supporting means for maintaining the needles of each set parallel to themselves and normally with their hooks extending in a direction opposite to that in which the hooks of the other set extend, and means for adjusting the supporting means to bring the needles of the two sets into such relation that their hooks point in the same general direction.

2. In a knitting machine having two sets of needles, supporting means for maintaining the needles of each set parallel to themselves and in the same plane, and normally at an angle to the plane of the needles of the other set, and with the hooks of the needles of one set pointing in a direction opposite to that of the hooks of the other set, and means for adjusting the supporting means to bring the needles of the two sets into such relation that their hooks point in the same general direction, said adjusting means being arranged to preserve a substantially constant distance between the hook end of one side needle of one set and the hook end of the corresponding side needle of the other set during the adjusting operation.

3. In a knitting machine, a pair of needle plates, supporting means therefor normally supporting the needle plates in a position in which each is opposed to the other, means for adjusting the supporting means to bring one needle plate alongside the other.

4. In a knitting machine, a support provided with a curved guide, a needle plate mounted on said support, a second needle plate also mounted on said support and adjustable along said curved guide from a normal operating position in which it is opposed to the first mentioned needle plate into a position in which it extends alongside of the first mentioned needle plate.

5. In a knitting machine, a support, a pair of needle plate holders mounted thereon, a needle plate slidably received in each of said holders, means for adjusting one of said holders on said support to move it from a normal operating position in which the needle plate mounted in it is opposed to the needle plate mounted in the other holder into a position in which the two needle plates extend side by side, and means for automatically retracting the two needle

plates in their holders when the needle plates are brought alongside of one another.

6. In a knitting machine, a support, a pair of needle plate holders mounted thereon, a needle plate slidably received in each of said holders, means for adjusting one of said holders on said support to move it from a normal operating position in which the needle plate mounted in it is opposed to the needle plate mounted in the other holder into a position in which the two needle plates extend side by side, means for automatically retracting the two needle plates in their holders when the needle plates are brought alongside of one another, and means for preventing the needles from being retracted when the needle plates are so retracted.

7. In a knitting machine of the double inclined flat needle plate type, the combination with the needles and the needle plates in which they are mounted, of a support on which the needle plates are mounted, a carriage mounted to revolve on said support, a needle actuating cam carried by said carriage through a circular path as the carriage revolves, to actuate the set of needles mounted in one plate alternately with those mounted in the other, and means for rotating said carriage.

8. In a knitting machine, the combination of two flat needle beds, needles supported thereby and independently movable in intersecting planes, and a cam moving in a circular path to successively actuate the needles.

9. In a knitting machine, the combination of two normally opposed flat needle plates, needle jacks slidably mounted in said plates, said jacks being provided with cam engaging projections, the projections from the different needle jacks being of such length that in the normal position they all touch a circle surrounding the two needle plates, and a rotary cam revolving about an axis passing through the center of said circle.

10. In a knitting machine, the combination of two normally opposed flat needle plates, needle jacks slidably mounted in said plates, said jacks being provided with cam engaging projections, the projections from the different needle jacks being of such length that in the normal position they all touch a circle surrounding the two needle plates, a rotary cam revolving about an axis passing through the center of said circle, said cam having an adjustable portion which may be adjusted from a normal position to change the length of a predetermined number of loops formed, and means for automatically returning said portion to its normal position after said predetermined number of loops have been formed.

11. In a knitting machine of the double

opposed flat needle plate type, the combination with the needle plates and the needle jacks mounted therein and having cam engaging projections, of a grid having slots
 5 for guiding said projections, comprising a rectangular open frame and a plurality of parallel bars spaced apart from each other and secured at their ends to the ends of said frame, said bars being so shaped that the
 10 outer surfaces of the two grids form portions of a cone, and a rotating cam mounted to revolve about the axis of said cone and to bear on said surfaces.

12. In a knitting machine, the combination of the support C, the needle plate holder E' mounted thereon, the curved guide rib C² on said support, the needle plate holder E mounted on and adjustable along
 15 said curved guide rib C² from a normal operating position in which the two needle plates are opposed to each other into a position in which they extend side by side, the
 20 needle plates F slidably mounted, one in each holder, the levers F⁵ fulcrumed one on each of the holders E, E', and formed each with the open ended slot F⁷, the link connection between each needle plate and the
 25 lever F⁵, and the pin E¹⁸ carried by each needle plate holder and adapted to enter the slot in the lever F⁵ mounted on the other
 30 needle plate holder to thereby retract the corresponding needle plate in said other holder when the needle plate holders are moved into the side by side position.

13. In a knitting machine of the double inclined flat needle plate type, the combination with the needle plates and the needles
 35 mounted therein, of a member rotating continuously in one direction and provided with one set of cam surfaces, for engaging and
 40 actuating first the set of needles mounted in one plate and then those mounted in the other, as said member is rotated, and provided also with a second set of cam surfaces,
 45 a yarn guide mounted to reciprocate back and forth along the meeting edges of the needle plates, means for reciprocating said
 50 guide, comprising a lever having a cam engaging surface engaging said second set of cam surfaces on said rotating member, and means for rotating said member.

14. In a knitting machine of the double inclined flat needle plate type, the combination with the needles and the needle plates of
 55 a support on which they are mounted, said support having a curved guide along which one of the needle plates is adjustable from a normal operating position in which it is
 60 opposed to the other plate into a position in which it extends alongside of the other plate, a rotating member journaled on said member back of said guide, a needle actuating
 65 cam member carried thereby and overhanging the needle plates, whereby as said member is rotated the cam member engages and

actuates first the needles of one plate and then those of the other, while the cam member does not interfere with the movement of said needle plate along said guide.

15. In a knitting machine, an annular support and an annular member surrounding
 70 and mounted to revolve on said support and provided with gear teeth at its rear side, a pair of needle plates mounted on said support in front of said annular member, needles
 75 slidably mounted in said plates, a needle actuating cam member carried by said annular member and overhanging said needle plates and adapted to actuate first the
 80 needles in one plate and then those in the other as the member is rotated, and a driving gear mounted in said support and meshing with the teeth on said annular member.

16. In a knitting machine, an annular support and an annular member surrounding
 85 and mounted to revolve on said support and provided with gear teeth at its rear side, a pair of needle plates mounted on said support in front of said annular member, said support having a curved guide on its
 90 face along which one of said needle plates may be adjusted from a normal operating position in which it is opposed to the other needle plate into a position in which it extends
 95 alongside of said other plate, needles slidably mounted in said plates, a needle actuating cam member carried by said annular member and overhanging said needle
 100 plates and adapted to actuate first the needles in one plate and then those in the other as the member is rotated, and a driving gear mounted in said support and meshing with the teeth on said annular member.

17. In a knitting machine having a flat needle plate and a set of needles sliding
 105 therein, means for actuating the needles, a latch turning plate, means for causing it to move back and forth across said needles in timed relation to the actuation of the
 110 needles, and means for causing said plate to travel close to the plates when traveling in one direction to engage and turn forward the opened latch of each needle as the latter is retracted in casting a loop previously
 115 formed on it and to travel back at a greater distance from said needles and thereby clear them.

18. In a knitting machine of the double inclined flat needle plate type, the combination with the needle plates and the needles
 120 mounted therein, of a tubular yarn guide having its delivery end adjacent the meeting edges of the two sets of needles, means for actuating first the needles of one set and then the needles of the other set, means for
 125 causing the yarn guide to travel back and forth in front of the needle hooks, and means for angularly adjusting the yarn guide about an axis parallel to its direction of movement arranged to maintain the

yarn guide at one angle when the yarn guide moves in one direction and at another angle when moving in the other direction.

19. In a knitting machine of the double inclined flat needle plate type, the combination with the needle plates and the needles mounted therein, of means for actuating first the needles in one needle plate and then those in the other needle plate, a carriage movable back and forth parallel to the line of intersection of the needle plate planes, a needle latch turning plate for each set of needles, and a tubular yarn guide supported by said carriage, means for moving said carriage back and forth, and means for moving the yarn guide and the latch turning plates transversely to the line of movement of the carriage as the carriage reverses its direction of movement.

20. In a knitting machine of the double inclined flat needle plate type, the combination with the needle plates and the needles mounted therein, of means for actuating first the needles in one needle plate and then those in the other needle plate, a carriage movable back and forth parallel to the line of intersection of the needle plate planes, a frame carried by said carriage, a needle latch turning plate for each set of needles, and a tubular yarn guide supported by said frame, means for moving said carriage back and forth, and means for moving said frame transversely to the line of movement of the carriage as the carriage reverses its direction of movement.

21. In a knitting machine of the double inclined flat needle plate type, the combination with the needle plates and the needles mounted therein, of means for actuating first the needles in one needle plate and then those in the other needle plate, a carriage movable back and forth parallel to the line

of intersection of the needle plate planes, a frame carried by said carriage, a needle latch turning plate for each set of needles, and a tubular yarn guide supported by said frame, means for moving said carriage back and forth, and means for moving said frame transversely to the line of movement of the carriage as the carriage reverses its direction of movement, said means comprising a lever mounted on said carriage, and stationary stops, one engaging the lever at each limit of the carriage movement to swing it from one side to the other, and a connection between said lever and said frame.

22. In a knitting machine having a flat needle plate and a set of needles sliding therein, the combination of a movable cam for actuating said needles, releasable holding means normally holding said needles stationary in said plate, and means for releasing said holding means to permit the needles to move in said plate at the time at which the needles are being actuated by said cam.

23. In a knitting machine having a flat needle plate and a set of needle jackets sliding therein and provided with cam engaging projections, the combination of a spring pressed holding bar extending across said jacks and normally engaging them to hold them stationary, a cam movable transversely to said needle jacks and engaging said projections to actuate them and provided with means engaging said holding bar to lift it out of engagement with the jacks as they are traversed by said cam, and means for moving said cam.

FRANK WALTERS.

Witnesses:

ARNOLD KATZ,
D. STEWART.