

J. KELLNER & S. WORMS.
 FLAT KNITTING MACHINE.
 APPLICATION FILED JULY 17, 1912.

1,058,242.

Patented Apr. 8, 1913.
 5 SHEETS—SHEET 1.

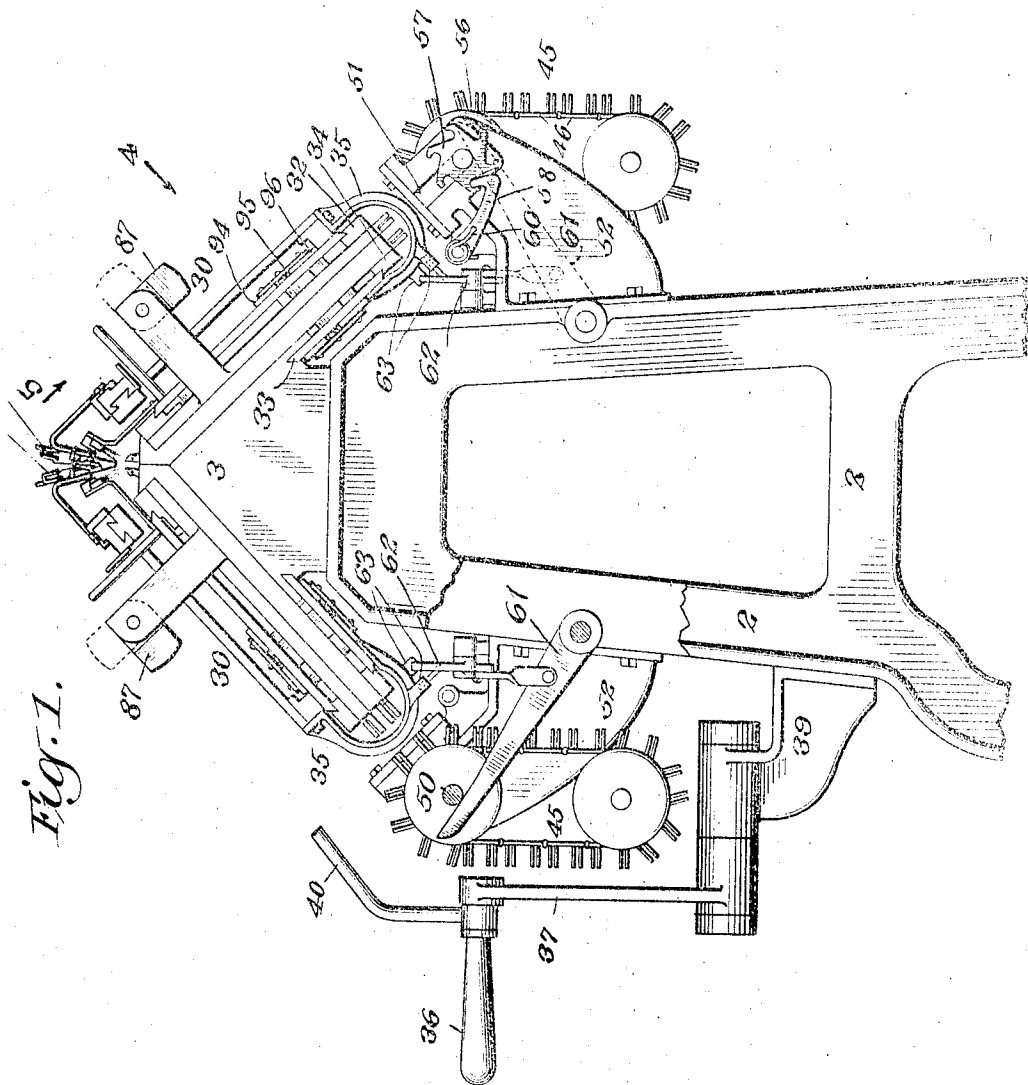


Fig. 1.

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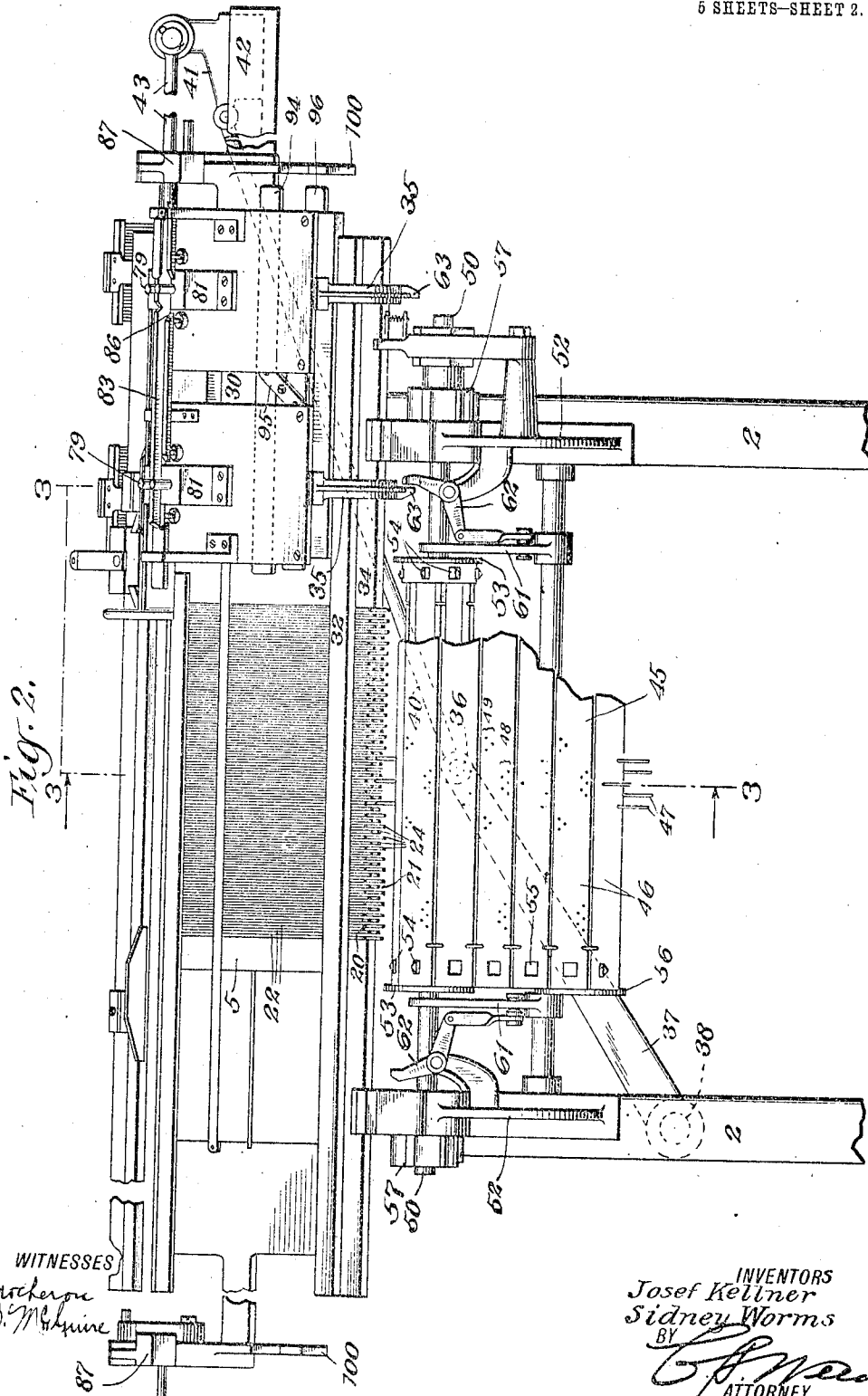
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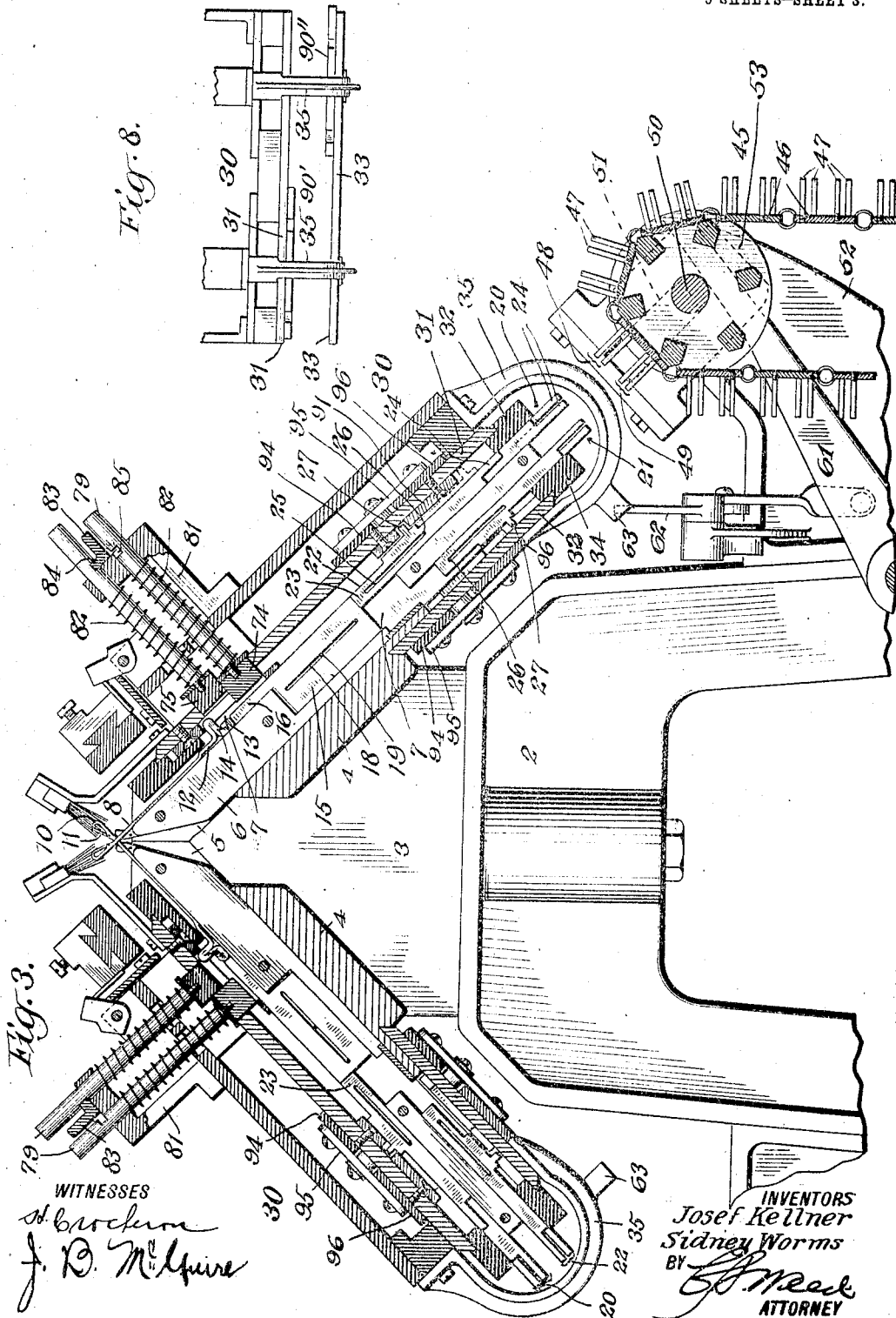


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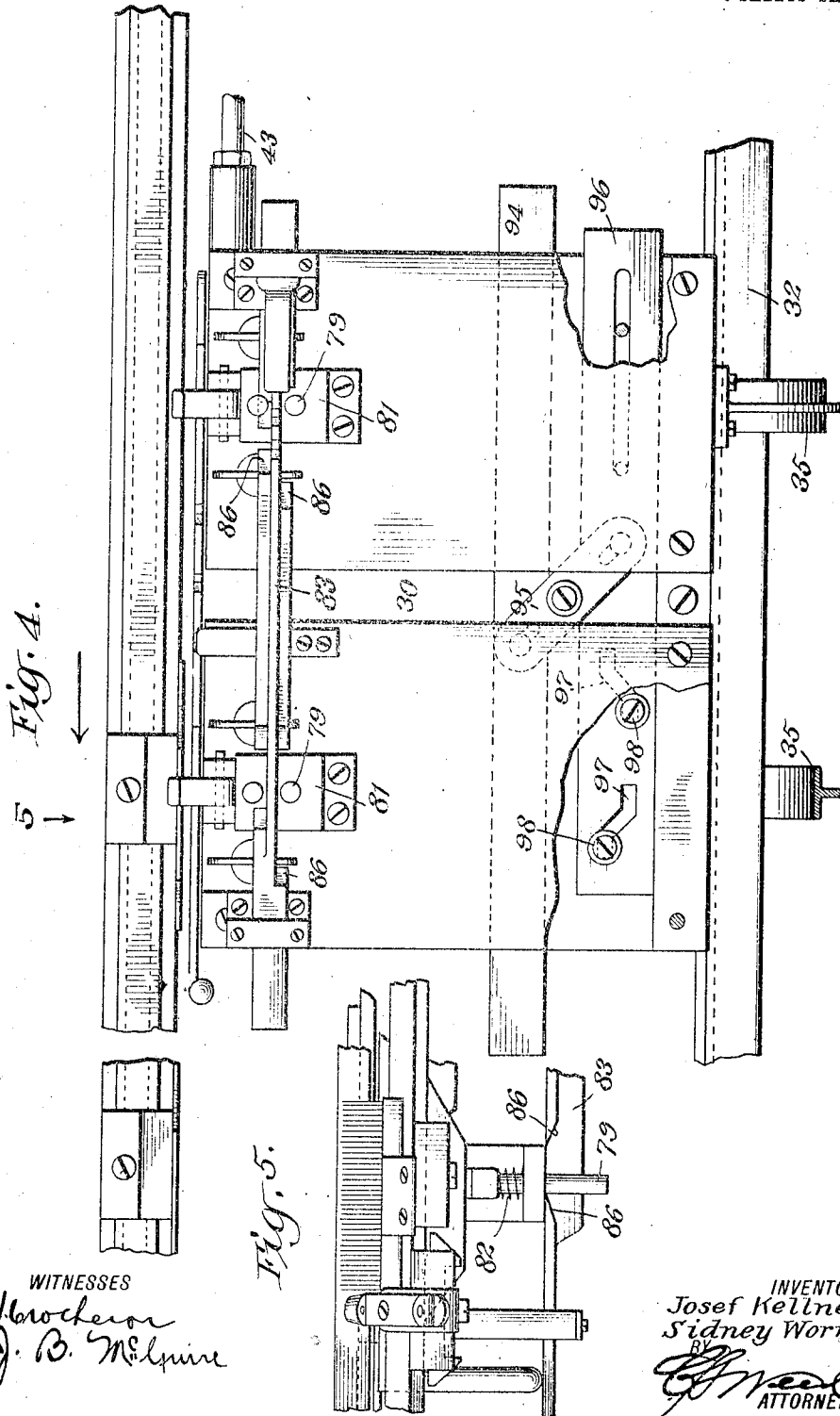


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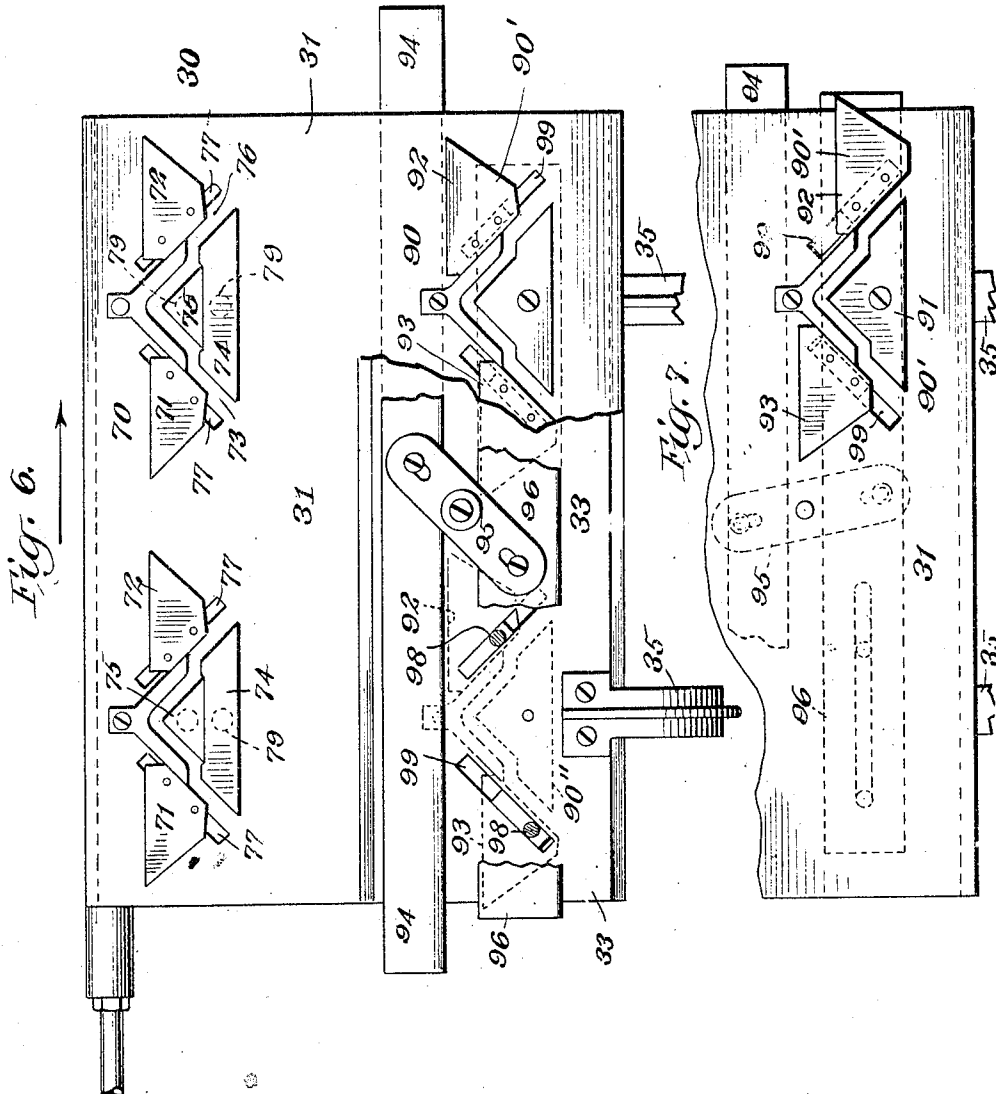
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5 SHEETS—SHEET 5.



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JOSEF KELLNER, OF BROOKLYN, AND SIDNEY WORMS, OF NEW ROCHELLE, NEW YORK, ASSIGNORS TO FRANKLIN KNITTING MILLS, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

FLAT-KNITTING MACHINE.

1,058,242.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, JOSEF KELLNER, a subject of the Emperor of Germany, and SIDNEY WORMS, a citizen of the United States, residing, respectively, at Brooklyn, in the county of Kings and State of New York, and New Rochelle, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Flat-Knitting Machines, of which the following is a specification.

This invention relates to knitting machines, and more particularly to that class known as flat knitting machines, the object of the invention being to provide an improved machine of this character in which, by means of a jacquard mechanism, certain of the needles may be pushed or advanced beyond certain companion needles so that in the operation of the machine various designs, according to the setting of the jacquard, may be provided on the article being knit, as for instance a necktie or muffler or other article adapted to be made on a machine of this character.

The primary object of the invention is the provision of a double lock jacquard machine of the class described, in which the improved form of needle helper shown and described in the contemporaneously pending application of Josef Kellner, one of the joint inventors of the present improvement, filed February 16, 1912, Serial No. 677,907, may be effectively used, the present invention being an improvement in part upon the contemporaneously pending application of the present parties filed April 1, 1912, Serial No. 687,564, and the improvement consists in part in providing a machine which will enable the use of a much wider needle bed and a more compact carriage, and by means of which at each stroke of the carriage a complete operation is accomplished and in which the necessity of having a certain predetermined distance between the centers of the cam locks is avoided, so that in the present improvement the cam locks may be placed close together and the operation of the jacquard simplified.

In the drawings accompanying and forming part of this specification, Figure 1 is a left hand end view of this improved ma-

chine; Fig. 2 is a front elevation of the machine showing the carriage nearly at its extreme right hand position; Fig. 3 is a cross-sectional view taken on line 3-3-3, Fig. 2, assuming the carriage to have been moved over the needle bed and showing the upper set of helping needles in operation with its cam lock and intermediate helper needle; Fig. 4 is a plan view of the carriage, with parts thereof partly broken away looking in the direction of the arrow 4, Fig. 1; Fig. 5 is a detail view looking in the direction of the arrow 5 in Figs. 1 and 4; Fig. 6 is a bottom plan view of the carriage; Fig. 7 is a bottom plan view of a part of the carriage with one of the plates removed and showing the cam lock in a different position; and Fig. 8 is a front view of a part of the carriage illustrating more clearly the position of the needle helper cam locks, one on the under face of the top plate of the carriage and the other on the upper face of the lower plate of such carriage.

Similar characters of reference indicate corresponding parts throughout the figures of the drawings.

In the present embodiment the machine comprises a pair of end frames 2, to each of which is securely bolted a head frame 3, which head frames are connected by suitable bed supporting members 4 disposed at an angle of about 45 degrees to the vertical. These diagonally disposed supporting members 4 constitute the means for supporting the needle beds 5. From this it will be observed that one side of the machine is a duplicate of the other, and therefore a description of one will serve as a complete description of the other.

Each of the needle beds consists of a number of sheet metal strips 6 located side by side and set edgewise upon the members 4 and bolted together to form guiding channels or ways 7 for guiding the needles 8 and needle helpers. Each needle is of the usual form, having a hook 10, a spoon latch 11 and a shank 12 provided with a tail 13 having a butt 14. In line with the tail of each of these needles and supported in a way of the bed is a needle helper, comprising a relatively thin bar 15 having a forwardly extending needle tail engaging

end 16. Each of these needle helper bars is provided with a longitudinally extending slot 18 through which a rod 19 passes and by means of which the helper is guided and prevented from movement in a vertical plane. These needle helpers form what may be designated as an intermediate set of needle helpers, and these intermediate needle helpers are actuated by the jacquard operated needle helpers, comprising two sets 20 and 21, one an upper set and the other a lower set and one set located under the other, and each needle helper consisting of a relatively thin bar 22 having its forward end 23 adapted to engage the lower end of an intermediate needle helper and provided with a rearwardly extending jacquard engaging end 24. Each set of these needle helpers is provided with a longitudinally extending slot 25 through which a rod 26 passes and by means of which the helper is guided and prevented from movement in a vertical plane. Each helper is also provided with a butt or projection 27 in position to be engaged by cams or cam locks for shifting the needle helpers and thereby through the intermediate helpers the needles. Since these needle helpers are extremely thin, corresponding in thickness as a rule with the thickness of the needles and therefore being not much, if any, over one sixty-fourth of an inch in thickness, it follows that if the needle helpers were located side by side where the needles are placed very close together, even though spaced apart by the sheet metal strips 6 of the bed, there would be insufficient distance between the ends of the helpers to permit the pins of the jacquard mechanism hereinafter described to engage one helper and advance it without such pins also engaging companion helpers unless the pins of the jacquard mechanism were so small that they would not be durable or sufficiently rigid. Consequently the ends of the needle helpers of each set, the two sets being spaced apart by a part of the needle bed, are so formed that the heel or tail ends of each pair are in alternation, that is to say the tail end of one helper is located to project in a plane above that of another, or in other words they are in staggered relation, this being obtained by rabbeting the ends of each pair in opposite directions, as shown more clearly in Fig. 3, so that the tail ends of the needle helpers of each set are located in alternation or staggered as it were, whereby the pins of the jacquard mechanism may be made sufficiently large to give them the proper rigidity and durability and at the same time insure that only those particular helpers which it is desired to advance will be engaged by the jacquard pins.

Carried by each needle bed, a part thereof above it and a part thereof below it, is a

movable carriage 30. This carriage comprises a top plate 31, which is supported by suitable guideways 32, and a bottom plate 33 likewise supported by suitable guideways 34, the two plates being connected by brackets 35 which straddle the ends of the upper and lower sets of needle helpers. The carriages may be shifted back and forth by any suitable means. In the present instance they are shifted by a crank 36 carried by an arm 37, see Figs. 1 and 2, the end of which is secured to a shaft 38 journaled on a bracket 39 of the machine. The hub of the crank is connected by a connecting rod 40 to a carriage 41 sliding on ways 42 on the bed of the machine, which carriage is in turn connected by rods 43 with the main carriage of the machine.

The jacquard mechanism, one at each side of the machine, consists of an endless member or belt 45 made up of articulated rigid cards or plates 46, each adapted to carry a series of jacquard pins 47, see more particularly Figs. 2 and 3. The series of pins of each plate are located in two sets 48 and 49, one set in position to cooperate with the upper set 20 of needle helpers and the other series or set of pins being in position to cooperate with the lower set 21 of needle helpers when the jacquard is thrown into position by the mechanism hereinafter described. A shaft 50 has its ends located in elongated slots or ways 51 of brackets 52 secured to the end frames, so that this shaft can be shifted up and down by the means hereinafter described. Secured to this shaft is a pair of flanged members 53 carrying projections or teeth 54 adapted to engage similarly formed openings 55 in the plates of the jacquard belt thereby to rotate such belt. Suspended below this shaft is a similarly formed pair of flanged members 56 for suitably holding the jacquard in perpendicular position during its movement. On each end of the shaft is located a ratchet 57, and in position to engage this ratchet is a pawl 58, so that during the upward movement of the shaft in its ways the teeth of the ratchet will be brought into engagement with the pawl, which is provided with a spring 60 for this purpose, and as the shaft moves downward in its ways the ratchet will be turned and thereby the shaft a predetermined amount to rotate the jacquard belt.

For raising the shaft of the jacquard mechanism thereby to bring the pins thereof into position to engage the needle helpers according as the pins of the jacquard are set, we have provided a rock shaft journaled in the end frames of the machine, and on this rock shaft adjacent to each end thereof is located a lever arm 61 extending forwardly into position under the jacquard shaft so as to raise the same and thereby

the jacquard into active position. Each lever arm is rocked by a bell-crank 62, one end of which is connected to the lever arm while its opposite end projects into the path of a lug 63 on the brackets 35 which straddle the ends of the needle helpers, whereby during the movements of the carriage these bell-cranks will be operated thereby to rock the lever arms and raise the jacquard mechanism into position to engage the ends of the needle helpers according to the setting of the pins of the jacquard.

The pins of the jacquard, which are provided with threaded ends, will be located to form the desired pattern, and according to the setting of these pins the needle helpers hereinbefore described will be shifted upward into position to be engaged by the cam locks about to be described. As the cams for operating the needles or needle helpers also temporarily lock the same in their shifted positions they have been herein termed cam locks. Each main carriage hereinbefore described is in the present instance provided with two sets of cam locks 70 and 90, the upper set 70 cooperating with the butts of the needles while the lower set cooperate with the projections or butts of the sets of needle helpers 20 and 21 provided the jacquard pins have thrown the helping needles or needle helpers into the path of such cams. Each set of cams 70 and 90, as a matter of fact, comprises in itself a set of cams, one set located adjacent to each end of the carriage, and each set of the top set of cams consists of two outer cam members 71 and 72 and a central cam member 73, which central cam member is made up of two parts or halves 74 and 75, the cam members 71, 72 and 73 being so formed as to provide a suitable way 76, shown of triangular form, whereby the needles will be successively projected upward and returned downward to their normal positions in the channels of the needle bed as the main carriage is shifted back and forth across the bed. The two cam parts 74 and 75 are located in an opening of the carriage so that either or both of them may be drawn upward to be flush with the underside of the carriage or to project below the same to form the raceway hereinbefore described. Obviously, when both parts 74 and 75 are drawn upward to be flush with the bottom of the carriage the needles will not be shifted or projected at all but remain in their normal positions, and obviously also when the cam 75 is drawn upward to be flush with the bottom of the carriage the needles will be projected only by that part 74 of the cam 73 and therefore a less distance than is the case when both cam parts 74 and 75 are projected below the carriage. The cam members 71 and 72 are adjustable relatively to the carriage by adjusting them

relatively to the slots 77 and clamping them in such adjusted position by thumb nuts. By this adjustment an increased tension may be placed upon the thread loops as may be desired. That is to say, if the cam members are adjusted downwardly in their slots the needles will be retracted a further distance so that the tension on the thread will be increased.

For raising and lowering the cam members or parts 74 and 75 within the opening thereof provided in the carriage suitable means is provided. This means comprises a pin or rod 79 secured to each of the cam part members 74 and 75, and suitably supported for reciprocatory movement in a bracket 81 carried by the carriage. Located on each of the pins is a spring 82 for normally holding the cam members in their lowered position below the bottom of the carriage. To raise the pins and thereby the cams to throw either one or both of them out of action suitable means is provided. This comprises a T-shaped bar 83 carried by and movable with the carriage and located above the brackets supporting the upper ends of the cam pins or rods and also having a sliding movement relatively to the carriage. The flanges 84 of this bar extend into notches 85 of the rods or pins and the flanges are provided with notched cam surfaces 85 which cooperate with the notched walls of the pins to raise the pins, these cam surfaces being so located as to alternately raise and lower the two cam members 75 of the upper sets of cams during the ordinary knitting operation of the machine, this being accomplished by providing at each end of the bed of the machine a shiftable dog 87 which when shifted downward this bar will be shifted relatively to the carriage as the same reaches the end of its movement on the needle bed in a manner which will be readily understood, especially as this is the same in construction as the similar mechanism in the joint application hereinbefore referred to. When, however, it is desired to use the jacquard mechanism, the shiftable dog 87 will be thrown upward and the T-shaped bar 83 will be manipulated so as to raise both of the cam members 75 of the upper set of cams and throw them entirely out of action. Consequently, as only the cam members 74 are left in position below the bottom of the carriage the needles will be projected by these cam members 74 only a predetermined distance, less than that which they would be projected if the cam members 75 were in action.

The lower set of cam locks 90 likewise comprises two sets of such devices. One set, however, as 90' is located on the underside of the top plate 31 of the carriage while the other set 90'' is located on the upper side of the bottom or under plate 33 of such car-

riage, so that the set 90' will cooperate with the set of needle helpers 20 while the set of cam locks 90'' will cooperate with the lower set of needle helpers 21. These two sets of cam locks 90' and 90'', however, are located relatively close together in their respective positions. Each set comprises a central cam 91 of triangular shape and a pair of triangular shaped side cams 92 and 93. This central cam 91 has substantially the same shape as the two central cams 74 and 75 of the upper set of cam locks, and the side cams 92 and 93 have substantially the same shape as the side cams 71 and 72 of the upper set of cam locks, so that a similar triangular raceway for the butts of the needle helpers is formed.

When the jacquard mechanism is inoperative it will be apparent that as the carriage moves from end to end of the needle bed all of the needles will be successively at certain times projected upwardly by means of the cams 74 and 75. When the jacquard mechanism, however, is used, as the cams 75 are thrown entirely out of operation it follows that while ordinarily the cams 91 would project the needles by means of the needle helpers in precisely the same way as when the cams 74 and 75 are in operation, yet these cams 91 will project only those needles selected by the jacquard. That is to say, when the jacquard is not in use and the needles are being projected by means of the cam locks 74 and 75 each needle of the bank or gang of needles will be successively projected by the cooperation of the two cams 74 and 75 a certain distance, and while the cam 91 will project the needles through the medium of the needle helpers the same distance as do both cams 74 and 75, yet the cam 91 will project only those needles which are selected by the jacquard instead of all of them successively as when the jacquard is not used.

Each cam 91 is a fixed cam secured to the underside of the needle carriage, while the cams 92 and 93 are automatically shiftable cams. These cams are shiftable by means of a lever or bar 94 linked by links 95 to a lever or bar 96, which bar 96 is provided with slots 97, see Fig. 4, for the reception of pins 98 carried by the cams 92 and 93, and which pins are carried by blocks mounted in inclined slots 99 in the carriage. The two bars 94 and 96 are carried by the carriage and are movable therewith and also have a movement relatively to the carriage as the carriage reaches the end of its movement. This movement relatively to the carriage is obtained by providing a fixed stop 100 at each end of the machine, which as the carriage reaches the end of its movement engages the bar 94 and shifts the same and thereby, through the medium of the links 95, shifts the bar 96 and so moves one side

cam down and the other up, in other words, reverses the positions of the cams. In Fig. 6 the two side cams 93 are shown down while the two side cams 92 are shown up, while in Fig. 7 the side cam 92 is shown down while the side cam 93 is shown up, the two side cams being thus alternately shifted according to the direction of movement of the carriage, and in the present instance when the carriage reaches the right hand end of the machine the cam 93, Fig. 6, will be shifted upwardly and when the carriage reaches the left hand end of the machine the side cam 92 will be shifted downwardly. This alternating movement of the side cams 92 and 93 is for the purpose of insuring the proper operation of the needle helpers. For instance, viewing Fig. 6, if the two side cams 92 were down instead of in the position shown, when the carriage is moving in the direction of the arrow in said Fig. 6 the tendency of the cams would be to repel the helpers instead of raising them to shift the needles, but by having the side cams in their upward position when the jacquard has shifted the needle helpers to bring the butts thereof into position to be engaged and received in the raceway at the right hand end of each set of cams they will properly enter the raceway so that the helpers will be projected still farther and so project the needles the proper distance. Furthermore, by having the side cams 93 lowered, as at the left in Fig. 6, when the projections or butts of the needle helpers have run through the raceway they will be shifted sufficiently far downward or below the cam lock so as to be out of the way during the movement of the carriage. It is understood, of course, that the mechanism for operating the set of cam locks 90' is duplicated for operating the set of cam locks 90''.

It will be observed that only those needle helpers that are selected by the jacquard mechanism and shifted thereby to bring the butts thereof into position to be engaged and operated by the needle helper cam locks will be shifted by such cam locks, the remaining needle helpers being left inoperative. In other words, the jacquard mechanism selects certain needle helpers and shifts them upward to bring their butts into the path of the cam locks, which thereupon, by reason of the formation thereof, further project the needle helpers upward so as to engage the intermediate helper and thereby the tails of the needles and project them the required distance.

From the foregoing, it will be observed that by locating the sets of cam locks 90' and 90'' one below the other they can be located relatively close together. It will also be observed that the needle helpers of each set operate upon the same set of intermediate needle helpers 15 and upon the same

needles, so that by projecting the needles selected by the jacquard mechanism through the medium of the several sets of needle helpers, and that by setting the jacquard according to certain designs or patterns, it will be obvious that a similar design or pattern will be formed on the article being knit. For instance, if the pins of the jacquard are set to form a triangular shaped figure then the knitted article will have at certain points therein a triangular shaped figure. It will also be observed that by staggering the needle helpers of each set we are able to dispose at least eighteen or more needles and needle helpers to the inch arranged in the manner herein shown, whereas heretofore in jacquard machines it has only been possible to dispose twelve needles to the inch, and by disposing the needle helpers in two banks or sets, one above the other, obviously a greater width of needle bed can be obtained, so that a wider article may be knitted than has heretofore been practicable or possible. In conclusion, it will thus be seen that the present improvement provides an improved form of double lock jacquard machine by means of which various patterns, according to the patterns for which the jacquard is set, may be obtained.

In the operation of the machine, the intermediate needle helpers 15 are operated by the two sets of helpers 20 and 21 to project the needles according to the setting of the jacquard mechanism as hereinbefore described. The return, however, of these intermediate needle helpers 15 to their normal positions when the needle helpers of the sets 20 and 21 are returned by their cam locks is accomplished through the medium of the needles when the needles are returned by the needle cam locks; in other words, the return of the needles to their normal positions by the needle cam lock mechanism returns the intermediate needle helpers to their normal positions, in a manner which will be readily understood.

We claim as our invention:

1. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, and means for operating said needle helpers.

2. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, an intermediate set of needle helpers one for each needle and operated by the needle helpers of either set, and means for operating the needle helpers of either of said first two sets.

3. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and two sets of needle help-

ers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, and means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles.

4. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, an intermediate set of needle helpers one for each needle and operated by the needle helpers of either set, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, and means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles.

5. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, and two sets of cam locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles.

6. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, an intermediate set of needle helpers one for each needle and operated by the needle helpers of either set, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, and two sets of cam locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles.

7. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, two sets of cam locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, and cam locks for shifting the needles independently of the needle helpers.

8. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, an intermediate set of needle helpers one for each needle and operated by the needle helpers of either set, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, two sets of cam locks

carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, and cam locks for shifting the needles independently of the needle helpers.

9. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, and two sets of cam locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, one set of cam locks being located below the other.

10. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, an intermediate set of needle helpers one for each needle and operated by the needle helpers of either set, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, and two sets of cam locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, one set of cam locks being located below the other.

11. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, and two sets of cam locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, one set of cam locks being located below the other but at one side thereof.

12. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, an intermediate set of needle helpers one for each needle and operated by the needle helpers of either set, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, and two sets of cam locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, one set of cam locks being located below the other but at one side thereof.

13. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of said two sets, a shiftable carriage, two sets of cam

locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, one set of cam locks being located below the other but at one side thereof, and two sets of cam locks for operating the needles independently of the needle helper cam locks.

14. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, jacquard mechanism for selecting and positioning the needle helpers of both sets, a shiftable carriage, and means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles.

15. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, jacquard mechanism for selecting and positioning the needle helpers of both sets, a shiftable carriage, means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, and an intermediate set of needle helpers between the needles and operated by the helpers of either set of needle helpers.

16. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, jacquard mechanism for selecting and positioning the needle helpers of both sets, a shiftable carriage, and means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, said means comprising cam locks located in planes one above the other.

17. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, jacquard mechanism for selecting and positioning the needle helpers of both sets, a shiftable carriage, means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, said means comprising cam locks located in planes one above the other, and an intermediate set of needle helpers between the needles and operated by the helpers of either set of needle helpers.

18. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, jacquard mechanism for selecting and positioning the needle helpers of both sets, a shiftable carriage, means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, and an intermediate set of needle helpers between the needles and operated by the helpers of

either set of needle helpers, each set of said helpers having their jacquard engaging ends located in staggered relation.

19. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and needle helpers carried thereby, jacquard mechanism for selecting and positioning the needle helpers, a shiftable carriage, and double cam locks carried by the carriage one below the other for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles.

20. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and needle helpers carried thereby, jacquard mechanism for selecting and positioning the needle helpers, a shiftable carriage, and double cam locks carried by the carriage one below the other for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, said needle helpers being located in two sets one above the other and one set operated by each of the cam locks.

21. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and needle helpers carried thereby, jacquard mechanism for selecting and positioning the needle helpers, a shiftable carriage, double cam locks carried by the carriage one below the other for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, said needle helpers being located in two sets one above the other and one set operated by each of the cam locks, and an intermediate set of needle helpers between the needles and the said first sets of needle helpers.

22. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, a set of needle helpers, a set of intermediate needle helpers between the needles and the first set of needle helpers, jacquard mechanism for selecting and positioning the first set of needle helpers, a shiftable carriage, and means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles.

23. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, a set of needle helpers, a set of intermediate needle helpers between the needles and the first set of needle helpers, jacquard mechanism for selecting and positioning the first set of needle helpers, a shiftable carriage, and two sets of cam locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, one set of cam locks being below the other.

24. In a knitting machine of the class described, the combination of a needle bed, a

bank of needles, two sets of needle helpers located one above the other, an intermediate set of needle helpers one for each needle and of sufficient height to be operated by the needle helpers of either set, and means for operating the needle helpers of either set of said first two sets.

25. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, an intermediate set of needle helpers one for each needle and of sufficient height to be operated by the needle helpers of either set, jacquard mechanism for selecting and positioning the needle helpers of either of said two sets, a shiftable carriage, and two sets of cam locks carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, one set of cam locks being located below the other.

26. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, each set of said helpers having their ends located in staggered relation, jacquard mechanism for selecting and positioning the needle helpers of both sets, a shiftable carriage, and means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles.

27. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, each set of said helpers having their ends located in staggered relation, jacquard mechanism for selecting and positioning the needle helpers of both sets, a shiftable carriage, and means carried thereby for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles, said means comprising two sets of cam locks located one below the other.

28. In a knitting machine of the class described, the combination of a needle bed, a bank of needles and needle helpers carried thereby, said needle helpers being located in two sets one below the other, means for selecting and positioning the needle helpers of either set, a shiftable carriage, and cam locks carried by the carriage one below the other for shifting the needle helpers selected by said means thereby to project the needles.

29. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, a bank of needle helpers, jacquard mechanism for operating said helpers, a shiftable carriage, cam locks carried thereby for actuating the needles and needle helpers, and means carried by the carriage for actuating the jacquard mechanism.

30. In a knitting machine of the class described, the combination of a needle bed, a bank of needles, a bank of needle helpers, jacquard mechanism for operating said helpers, a shiftable carriage, cam locks carried thereby for actuating the needles and needle helpers, means carried by the carriage for actuating the jacquard mechanism and comprising projections, a rock shaft, lever mechanism between said rock shaft and said projections, and arms carried by said shaft for raising said jacquard mechanism.

31. In a knitting machine of the class described, the combination of a needle bed, a bank of needles carried thereby, two sets of needle helpers located one above the other, an intermediate set of needle helpers of sufficient height to be operated by either of said two sets of needle helpers, jacquard mechanism for positioning the needles of the said two sets of needle helpers, a shiftable carriage, two sets of cam locks carried by the carriage one below the other for actuating said two sets of needle helpers, and means carried by the carriage for operating the jacquard mechanism.

32. In a knitting machine of the class described, the combination of a needle bed, a bank of needles carried thereby, two sets of needle helpers located one above the other, an intermediate set of needle helpers of sufficient height to be operated by either of said two sets of needle helpers, jacquard mechanism for selecting and positioning the needles of the said two sets of needle helpers, a shiftable carriage, two sets of cam locks carried by the carriage one below the other for actuating said two sets of needle helpers, and means carried by the carriage for actuating the jacquard mechanism and comprising projections, a rock shaft, lever mechanism between said rock shaft and said projections, and arms carried by said shaft for raising said jacquard mechanism.

33. In a knitting machine of the class described, the combination of a needle bed, a bank of needles carried thereby, two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of the said two sets, a shiftable carriage, and a plurality of sets of cam locks carried by said carriage one above one set of said needle helpers and the other below the other set thereof.

34. In a knitting machine of the class described, the combination of a needle bed, a bank of needles carried thereby, two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of the said two sets, a shiftable carriage, and a plurality of sets of cam locks carried by said

carriage one above one set of said needle helpers and the other below the other set thereof, the needle helpers of each set having their ends located in staggered relation.

35. In a knitting machine of the class described, the combination of a needle bed, a bank of needles carried thereby, two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of the said two sets, a shiftable carriage, a plurality of sets of cam locks carried by said carriage one above one set of said needle helpers and the other below the other set thereof, and means for reversing the position of each set of cam locks at a predetermined time.

36. In a knitting machine of the class described, the combination of a needle bed, a bank of needles carried thereby, two sets of needle helpers located one above the other and operative to actuate the same needles of the needle bed, jacquard mechanism for selecting and positioning the needle helpers of the said two sets, a shiftable carriage, a plurality of sets of cam locks carried by said carriage one above one set of said needle helpers and the other below the other set thereof, the needle helpers of each set having their ends located in staggered relation, and means for reversing the position of each set of cam locks at a predetermined time.

37. In a knitting machine of the class described the combination of a needle bed, a bank of needles, a set of slotted needle helpers, means for guiding them by means of the slots thereof, an intermediate set of slotted needle helpers, one for each needle, operated by the first set of needle helpers, means for guiding them by means of the slots thereof, and means for operating the first set of needle helpers.

38. In a knitting machine of the class described the combination of a needle bed, a bank of needles, a set of slotted needle helpers having staggered ends, means for guiding them by means of the slots thereof, an intermediate set of slotted needle helpers, one for each needle, operated by the first set of needle helpers, means for guiding them by means of the slots thereof, and means for operating the first set of needle helpers.

39. In a knitting machine of the class described the combination of a needle bed, a bank of needles, two sets of slotted needle helpers located one above the other, an intermediate set of needle helpers one for each needle and operated by the needle helpers of either set, and means for operating the needle helpers of either of said first two sets.

40. In a knitting machine of the class described the combination of a needle bed, a bank of needles, two sets of slotted needle

helpers located one above the other each set having staggered ends, an intermediate set of needle helpers one for each needle and operated by the needle helpers of either set, and means for operating the needle helpers of either of said first two sets.

41. In a knitting machine of the class described the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, an intermediate set of slotted needle helpers one for each needle and operated by the needle helpers of either set, and means for operating the needle helpers of either of said first two sets.

42. In a knitting machine of the class described the combination of a needle bed, a bank of needles, two sets of needle helpers located one above the other, and each set having staggered ends, an intermediate set of slotted needle helpers one for each needle and operated by the needle helpers of either set, and means for operating the needle helpers of either of said first two sets.

43. In a knitting machine of the class described the combination of a needle bed, a bank of needles, two sets of slotted needle helpers located one above the other, an intermediate set of slotted needle helpers one for each needle and operated by the needle helpers of either set, and means for operating the needle helpers of either of said first two sets.

44. In a knitting machine of the class described the combination of a needle bed, a bank of needles, two sets of slotted needle helpers located one above the other, and each set having staggered ends, an intermediate set of slotted needle helpers one for each needle and operated by the needle helpers of either set, and means for operating the needle helpers of either of said first two sets.

45. In a knitting machine of the class described the combination of a needle bed, a bank of needles, two sets of slotted needle helpers located one above the other, an intermediate set of slotted needle helpers one for each needle and operated by the needle helpers of either set, a shiftable carriage, two sets of cam locks carried thereby, one set being located below the other for shifting the needle helpers of said two sets, cam locks

for shifting the needles independently of the needle helpers, and jacquard mechanism for selecting and positioning the needle helpers of said two sets.

46. In a knitting machine of the class described the combination of a needle bed, a bank of needles, two sets of slotted needle helpers located one above the other, and each set having staggered ends, an intermediate set of slotted needle helpers one for each needle and operated by the needle helpers of either set, and means for operating the needle helpers of either of said first two sets, a shiftable carriage, two sets of cam locks carried thereby, one set being located below the other, for shifting the needle helpers of said two sets, cam locks for shifting the needles independently of the needle helpers, and jacquard mechanism for selecting and positioning the needle helpers of said two sets.

47. In a knitting machine of the class described, the combination of a pair of inclined needle beds, a bank of needles and needle helpers carried by each of said beds, jacquard mechanism for selecting and positioning the needle helpers, a shiftable carriage for each bed, and double cam locks carried by each carriage one below the other for shifting the needle helpers selected by the jacquard mechanism thereby to project the needles.

48. In a knitting machine of the class described, the combination of a pair of inclined needle beds, a bank of needles carried by each bed, two sets of needle helpers located one above the other on each bed and each set having staggered ends, an intermediate set of needle helpers operated by the needle helpers of either set, a shiftable carriage carried by each bed, two sets of cam locks carried by each carriage one set located below the other for shifting the needle helpers of said two sets, and means for selecting and positioning the needle helpers of the several sets.

Signed this 15th day of July, 1912.

JOSEF KELLNER.
SIDNEY WORMS.

Witnesses:

CLARENCE GOLDMAN,
JACQUES F. HECHT.