

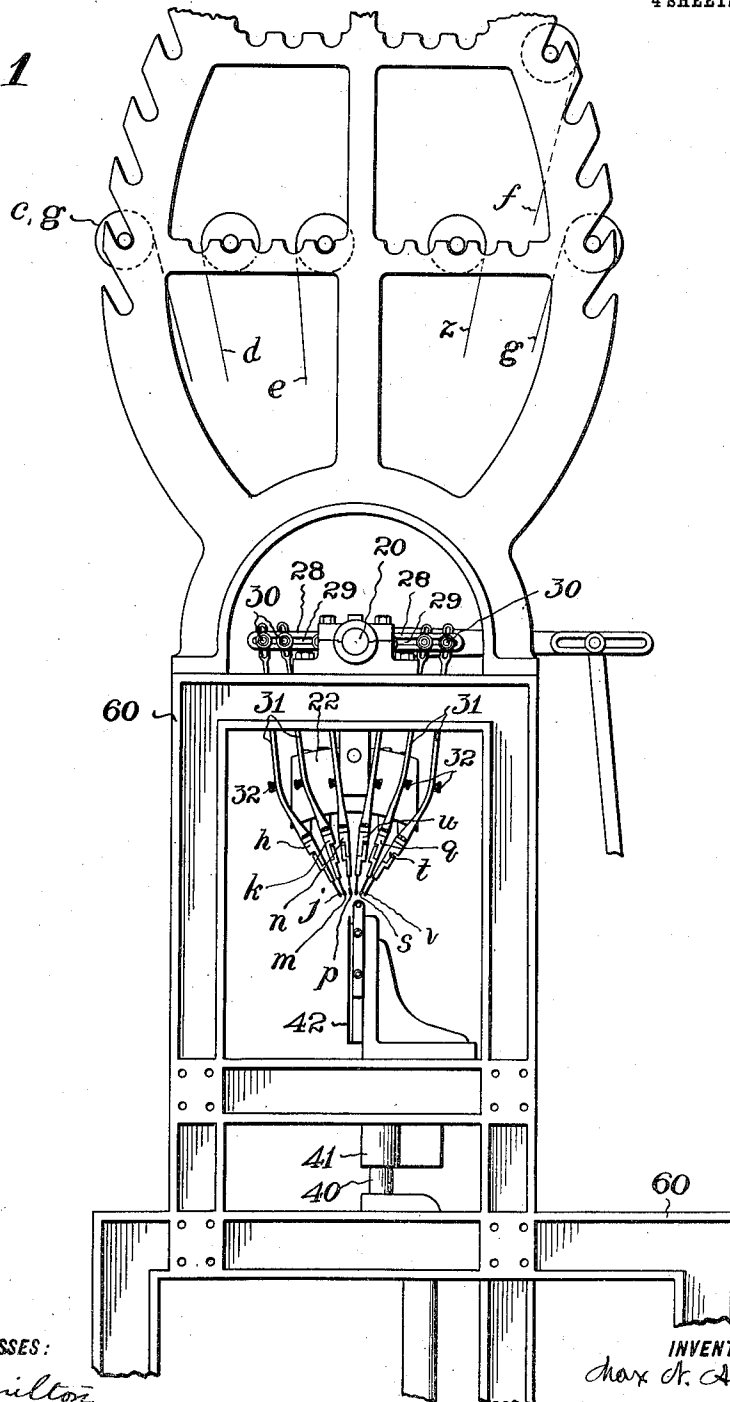
No. 779,109.

PATENTED JAN. 3, 1905.

M. N. AARON.
MACHINE FOR MAKING LACE TRIMMING.
APPLICATION FILED JULY 23, 1904.

4 SHEETS—SHEET 1.

Fig. 1



WITNESSES:

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William B Marks

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Max H. Aaron

BY

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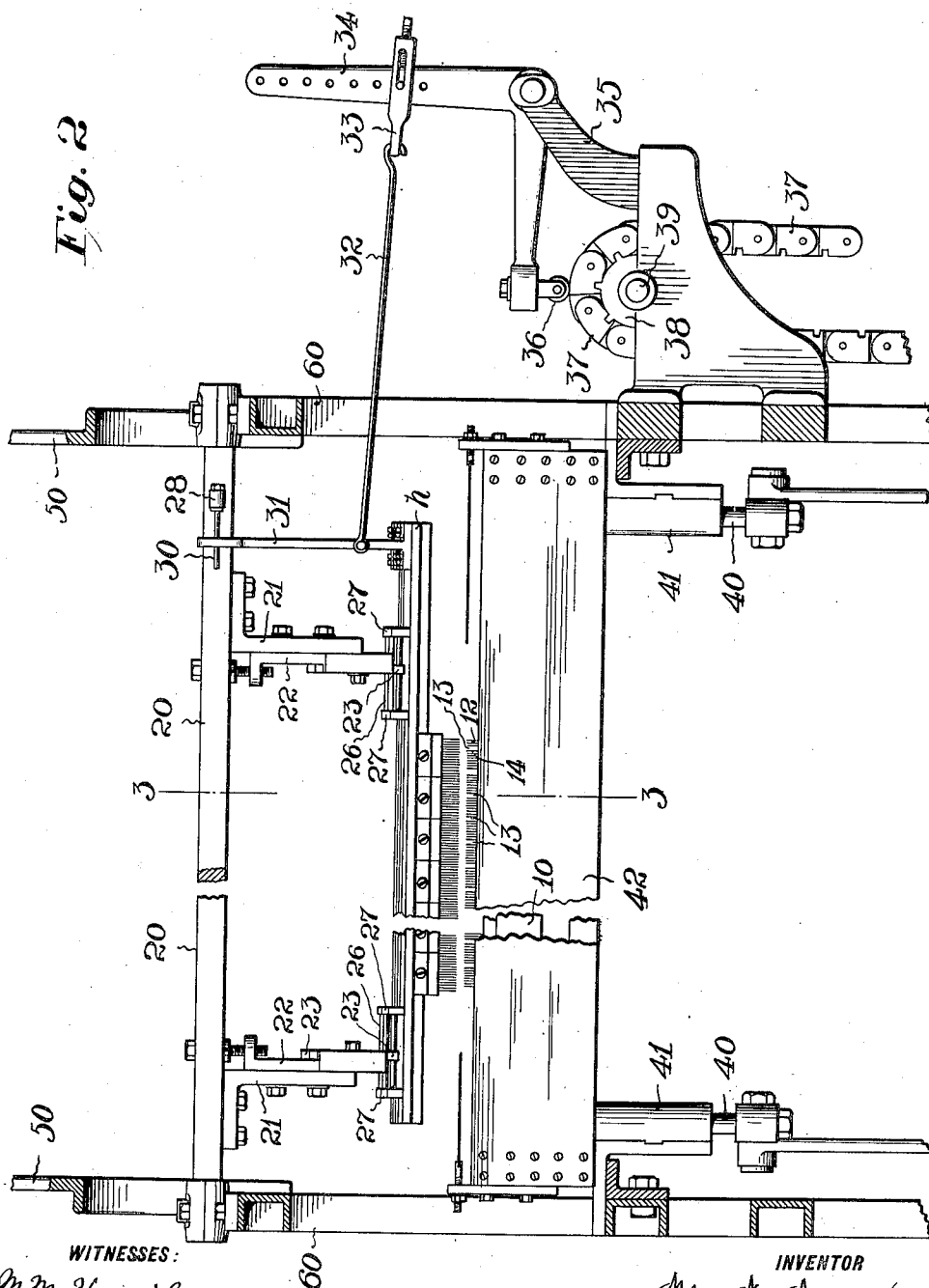
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4 SHEETS—SHEET 3.

Fig. 3

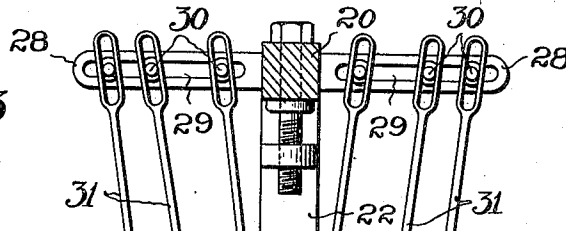


Fig. 4

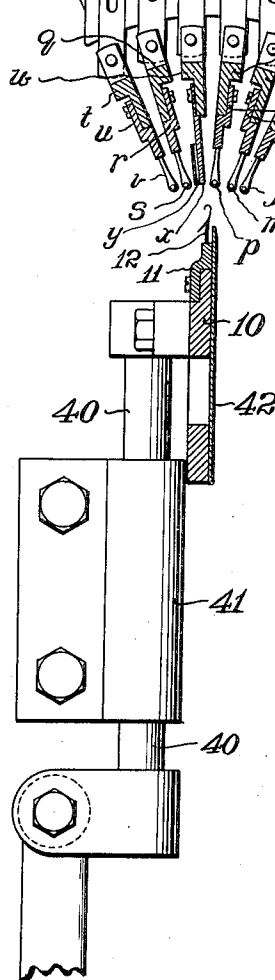
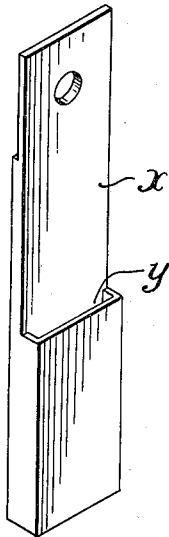
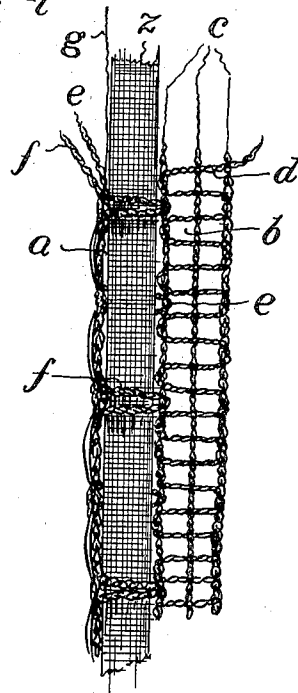


Fig. 5



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4 SHEETS—SHEET 4.

Fig. 6

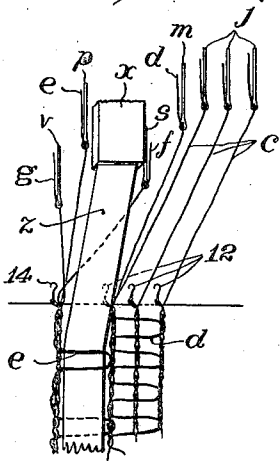


Fig. 7

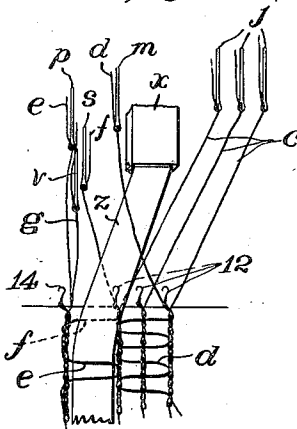


Fig. 8

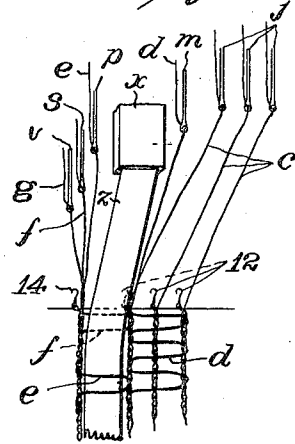


Fig. 9

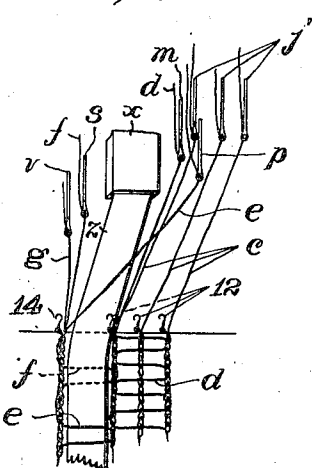


Fig. 10

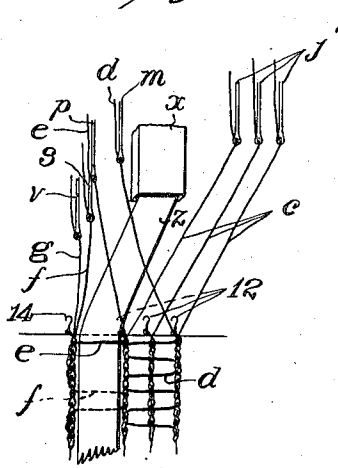
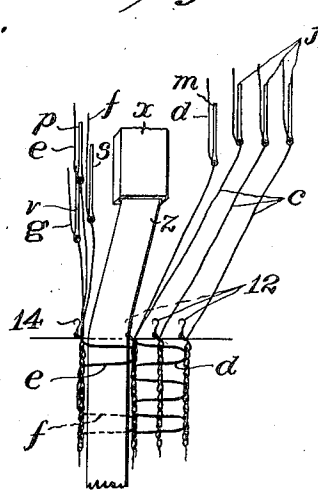


Fig. 11



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UNITED STATES PATENT OFFICE.

MAX N. AARON, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR MAKING LACE TRIMMING.

SPECIFICATION forming part of Letters Patent No. 779,109, dated January 3, 1905.

Application filed July 23, 1904. Serial No. 217,774.

To all whom it may concern:

Be it known that I, MAX N. AARON, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Machines for Making Lace Trimmings, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to machines for making lace trimmings, and particularly to that class of machines adapted to knit a fabric containing a ribbon-space. Heretofore it has been customary to insert the ribbon, braid, or tape within the space left for its reception in the fabric either by hand or by means of a special sticking-machine. The insertion of the ribbon by hand involves considerable time, additional handling, and consequent expense. The insertion by machinery involves the expense of the original cost and maintenance in operative condition of a special machine and also operators' wages and also requires the sewing together of the sections of fabric made on the machine prior to its passage through the sticking-machine.

The object of my invention is to insert the ribbon automatically in the process of knitting the fabric, thereby dispensing with additional labor and additional machines and substantially decreasing the cost of production of the ultimate fabric.

My invention consists of additions to or modifications of the regular machine for producing the fabric through which the ribbon is inserted, whereby the object stated is attained.

The invention will be more fully understood by reference to the following specification, the essential features of the invention being particularly pointed out in the claims.

In the drawings, Figure 1 is an end view, Fig. 2 a rear view, partly in section, and Fig. 3 an enlarged end view, partly in section, of the guide-bars and their supports. Fig. 4 is a perspective view of the ribbon-guide. Fig. 5 is a plan view of a typical fabric adapted to be made on a machine embodying my invention. Figs. 6 to 11, inclusive, are perspective

views showing the location of one set of guides relatively to each other and to the corresponding set of needles prior to successive reciprocations of the needle-bar, the view being taken from the rear of the machine looking upwardly and toward one side of the machine.

It may be well at the outset to describe a typical lace fabric with which it is desired in the manufacture of the fabric to incorporate the ribbon, as heretofore stated. Fig. 5 shows such a fabric consisting of the ribbon-space *a* and the heading or selvage *b*. The heading consists of three longitudinal threads *c* and the transverse threads *d*. The ribbon-space is formed by the longitudinal thread *g* and the threads *e* and *f*, the latter each being twisted along the thread *g* and also extending transversely back and forth between threads *g* and *c* and looped on the latter, the threads *e* and *f* thereby forming double transverse pillar-bars alternating with each other and spanning the space between threads *g* and *c*. The inner thread *c* of the heading may also be said to constitute the inner thread of the ribbon-space, being, in effect, the dividing-thread between the ribbon-space and heading. The ribbon is inserted in this space, being held in place by extending in front of each bar formed by thread *e* and back of each bar formed by thread *f*, or, in other words, extending in front of and back of alternate bars.

The fabric referred to is of course only one of numerous fabrics adapted to form a ribbon-space for the reception of a ribbon or braid, and such fabric is to be considered merely as illustrative and as an aid to an understanding of my invention and not as representing the only style of fabric to the manufacture of which my invention is applicable, my invention, in fact, being applicable to the manufacture of any lace or knitted fabric adapted to receive a ribbon.

The machine hereinafter described is in its main features a well-known type of what is known in the art as a "rib-lace machine," and therefore I consider it unnecessary to describe it in its entirety or to describe its particular mode of operation, which is well understood by those familiar with the art.

shall, however, describe its main features, and particularly the novel features that distinguish it from prior machines and the old features that intimately coöperate with such novel features. It will, however, be understood that my invention is not limited in its application to the particular type of machine shown, which is merely a type of machine to which I have already applied my invention and in connection with which I prefer to use my invention. I shall also limit the description to such of the mechanism as is essential to produce the particular typical lace fabric hereinbefore described. In the production of this fabric a series of guide-bars are employed, each of which carry a series of thread-guides, all of the bars being adapted to oscillate back and forth and some of the bars being adapted to be given a longitudinal movement, and all of the thread-guides coöperating with the usual vertically-reciprocating needle-bars carrying the needles.

h is the rear guide-bar, to which are fastened the plates i , carrying the guides j , said guides holding in position the longitudinal threads c of the heading. These guides are substantially stationary so far as longitudinal movement is concerned.

k is the next adjoining guide-bar, to which are fastened plates l , carrying the guides m , said guides governing the position of the transverse thread d . These guides are adapted to have a regular longitudinal reciprocating movement, so as to direct the thread d back and forth between the outer and inner threads c of the heading to form the transverse bars thereof.

n is the next adjoining guide-bar, to which are fastened the plates o , carrying the guides p , said guides governing the position of the thread e and being given an intermittent longitudinal reciprocating movement to form alternate cross-bars spanning the ribbon-space between the inner thread c of the heading and the thread g .

q is the next adjoining guide-bar but one, to which are fastened the plates r , carrying the guides s , said guides governing the position of the thread f and being given an intermittent longitudinal reciprocating movement (alternating with the similar movement given to the guides p) to form alternate cross-bars spanning the ribbon-space between the inner thread c of the heading and the thread g .

t is the front and next adjoining guide-bar, to which are fastened the plates u , carrying the guides v , said guides holding in position the outer longitudinal thread g of the ribbon-space. These bars are substantially stationary so far as longitudinal movement is concerned.

The above-described guide-bars are those ordinarily employed in the particular type of machine to which I have referred in the production of the special type of lace fabric de-

scribed. In these machines, however, other similar bars are usually provided, so that lace fabrics of a different or more complicated type may be made.

Between the guide-bars n and q I insert an additional guide-bar w , said guide-bar having secured thereto a bracket or ribbon-guide x , having a shouldered or enlarged lower end containing a wide but shallow orifice y , whose dimensions permit the insertion therein and passage therethrough of the ribbon z . The guide-bar w has no longitudinal movement.

10 is the usual needle-bar to which are secured the plates 11, carrying the needles 12 and 14. The arrangement of the needles is peculiar in that I provide three needles 12 separated by a space 13 from a single needle 14, the space being preferably of a width sufficient to accommodate two regularly-spaced needles, although the width of the ribbon or braid to be inserted will determine the width of the space. This vacant space 13 is located beneath the ribbon-guide x . The three needles 12 are beneath the guides j controlling the threads c . The needle 14 is beneath the guide v controlling the thread g .

It will be understood that each guide-bar contains a series of guides extending throughout its length and that the needle-bar contains a corresponding series of needles, so as to permit the simultaneous making of a number of distinct sections of fabric. It will also be understood that only such guides of each guide-bar are at any given time in active use as are necessary to guide the threads which its guide-bar is designed to control. It will also be understood that as the several sections of fabric are spaced apart during manufacture a certain number of the needles are idle. While I have described a particular arrangement of needles—namely, a single needle 14 spaced from three needles 12—it will be understood that there are as many sets of needles 12 and 14 as there are sections of fabric to be produced and that there may be beyond the needle 12 and beyond the needle 14 and adjacent thereto any number of idle needles. In fact, as shown, I prefer to arrange the needles in a continuous row along the needle-bar with the exception, however, that needles are omitted or a space provided between each needle 14 and the contiguous set of needles 12.

20 is a shaft having bearings in the machine-frame 60.

21 represents brackets depending from the shaft 20.

22 represents supports secured to bracket 21.

23 is a series of guide-bar holders, one for each guide-bar, said holders being slotted at 24 to receive a bolt 25, engaging the support 22, whereby the guide-bar holders are adjustably supported on the support 22.

Extending loosely through an orifice in the lower end of each holder 24 is a rod 26, fastened at its end in lugs 27, secured to the cor-

responding guide-bar. This permits each guide-bar to be moved in the direction of its length relatively to its corresponding holder 24.

5 To hold the guide-bars in definite position, a cross-head 28 is secured to the shaft 20. This cross-head is slotted at 29, and in said slot are a plurality of adjustable bolts 30. 31 represents levers secured at their lower ends to the several guide-bars, respectively, while their slotted upper ends engage, respectively, the bolts 30.

15 Secured to each lever 31 is one end of a connecting-link 32, the other end of which is hooked into the orificed end of a bar 33, adjustably secured to one arm of a bell-crank lever 34, pivoted on a bracket 35 on the machine-frame. The other arm of the bell-crank lever 34 carries a roller 36, engaging a pattern-chain 20 37, extending around a pattern-wheel 38 on the shaft 39.

The shaft 20 is oscillated by the usual means, (not herein shown,) thereby imparting the usual oscillatory movement to the guide-bars. 25 The pattern-shaft 39 is given a step-by-step rotary movement by the usual means, (not herein shown,) thereby feeding the several pattern-chains 37 and rocking the bell-cranks 34, and consequently giving the appropriate longitudinal movement to the guide-bars with which said bell-cranks are respectively connected.

35 Such of the hooked levers 32 as are connected to the guide-bars to which no longitudinal movement is to be imparted may be disconnected from their respective bell-cranks or the corresponding bell-cranks and pattern-chains may be removed or omitted. While the ribbon-guide bar *w* is shown supported 40 from the shaft 20 in the same manner as the other guide-bars, it is obvious that the particular way in which it is supported is not material.

The needle-bar 10 is secured in the usual 45 manner to a rod 40, which extends down through a guide 41, secured to the machine. The rod 40 is given a vertically-reciprocating movement by the usual means. (Not shown.) 42 is a stationary plate extending longitudinally back of the needle-bar and along the face of which the needle-bar slides.

50 is the usual beam-stand.

In the operation of the machine the needles are given a continuous up-and-down movement, engaging the threads *c* and *g*, pulling them down and casting them off to form loops, as on an ordinary knitting-machine and in the manner well understood in the art. The threads *d*, *e*, and *f*, however, are shown as 60 chain-threads—that is, they are looped prior to being put on the machine. The loops of the chain-yarn *d* are engaged by the same needles that form the loops on the outer and inner threads *c*—that is, the loops of the chain-thread *d* for several courses are engaged and

cast off by the same needle that forms the loops on the inner thread *c* and simultaneously with the formation of such loops. Then the guide for thread *d* moves longitudinally, carrying the thread *d* in position to cause its loops 7 to be engaged and cast off by the same needle that forms the loops on the outer thread *c*. Then the guide for thread *d* moves back again, carrying the thread *d* again in line with the inner thread *c*, and so on, alternately. Similarly, 75 the loops of the chain-yarn *e* are engaged and cast off for a number of courses by the same needle that forms the loops on the thread *g* and simultaneously with the formation of such loops, then the guide for thread *e* moves 80 longitudinally, carrying the thread *e* in position to cause one, at least, of its loops to be engaged and cast off by the same needle that forms the loops on the inner thread *c* and simultaneously with the formation of a loop, 85 then the guide for thread *e* moves back again to its former position, carrying the thread *e* again in line with the thread *c*, and so on. The chain-yarn *f* is acted upon by its guide and the needles in the same way as chain-yarn 90 *e*. It will be understood, however, that the invention is not limited to the manipulation of any particular kind of thread in any particular way. The space between the needles 12 and 14 permits the ribbon to feed within 95 said space and to be guided between the thread *g* of the ribbon-space and the inner thread *c* of the heading without interference with the needles or with the said threads. The location of the ribbon-guide bar *w* between the 100 guide-bar *n* for the thread *e* and the guide-bar *q* for the thread *f* insures the ribbon feeding in front of the transverse bars formed by the thread *e* and back of the transverse bars formed by the thread *f*, thereby causing 105 the ribbon to be drawn or fed through the ribbon-space alternately in front of and back of successive transverse bars of the ribbon-space in the course of manufacture of the fabric precisely in the manner heretofore effected by hand or by the employment of an 110 auxiliary machine.

An examination of Figs. 6 to 11, inclusive, will enable the successive operations of the guides and the paths of traverse of the 115 threads in the production of a definite length of trimming to be readily understood. The views are taken from one of the lower corners of the machine looking upwardly and toward the front. For purposes of simplification all the threads are shown as plain 120 threads, and the needles are shown without the usual latches.

In Fig. 6 the guides are in the position they occupy with respect to each other and the 125 needles just prior to the formation of one of the pillar-bars formed by the thread *f*. The guides *s* and *m* have moved to the right, so that on the next reciprocation of the needle-bar the thread *f* is engaged by the needle 12, 130

adjoining the space 13, to cause the thread *f* to be drawn from left to right across the ribbon-space, (thus forming one bar of the double pillar-bar,) while the thread *d* is engaged by the other two of the needles 12 to cause the thread *d* to be drawn from left to right across the threads *c*.

In Fig. 7 the guides are in the position they occupy with respect to each other and the needles just before the return of threads *f* and *d* from right to left, the guides *s* and *m* each having moved to the left, so that on the next reciprocation of the needle-bar the double pillar-bar spanning the ribbon-space is completed and another transverse bar *d* formed in the fabric.

In Fig. 8 the guides are in the same position, except that the guide *m* has again been moved to the right preliminary to the formation of another transverse bar *d* of the fabric.

In Fig. 9 the guides are in the position they occupy with respect to each other and to the needles just prior to the formation of one of the pillar-bars formed by the thread *e*. The guides *p* and *m* have moved to the right, so that on the next reciprocation of the needle-bar the thread *e* is engaged by the needle 12, adjoining the space 13, to cause the thread to be drawn from left to right across the ribbon-space, (thus forming one bar of the double pillar-bar,) while the thread *d* is engaged by the other two of the needles 12 to cause the thread *d* to be drawn from left to right across the threads *c*.

In Fig. 10 the guides are in the position they occupy with respect to each other and to the needles just before the return of threads *e* and *d* from right to left, the guides *p* and *m* on each having moved to the left, so that on the next reciprocation of the needle-bar the double pillar-bar spanning the ribbon-space is completed and another transverse bar *d* formed in the fabric.

In Fig. 11 the guides are in the same position, except that the guide *m* has again been moved to the right preliminary to the formation of another transverse bar *d* of the fabric.

It will be observed that the guide *p* is reciprocated on one side of the ribbon-guide and the guide *m* on the other side of the ribbon-guide, so that in the finished fabric the ribbon extends in front of and back of alternate double pillar-bars.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In a machine for making lace trimming having a ribbon-space and transverse bars spanning the ribbon-space, the combination, with the needles, of intermittently-reciprocating thread-guides operating alternately and adapted to guide the threads forming said transverse bars, and a ribbon-guide cooperating with said thread-guides to cause the ribbon

to interlace with the threads forming said transverse bars, substantially as described.

2. In a machine for making lace trimming having a ribbon-space and transverse bars spanning the ribbon-space, the combination, with the needle-bar and needles thereon two of which are spaced apart a distance greater than that between regularly-spaced needles, of thread-guides cooperating with the needles, and a ribbon-guide cooperating with the thread-guides, substantially as described.

3. In a machine for making lace trimming having a ribbon-space and transverse bars spanning the ribbon-space, the combination, with two needles spaced apart a distance greater than that between regularly-spaced needles, of thread-guides adapted to guide the threads forming said transverse bars, and a ribbon-guide cooperating with said thread-guides to cause said ribbon to interlace with the threads forming said transverse bars, substantially as described.

4. In a machine for making lace trimming having a ribbon-space and transverse bars spanning the ribbon-space, the combination, with two needles spaced apart a distance greater than that between regularly-spaced needles, of a ribbon-guide for the ribbon designed to be inserted in the ribbon-space, a thread-guide adapted to direct a thread in front of said ribbon and a thread-guide adapted to direct a thread back of said ribbon, substantially as described.

5. In a machine for making lace trimming having a ribbon-space and transverse bars spanning the ribbon-space, the combination, with two needles spaced apart a distance greater than that between regularly-spaced needles, of a ribbon-guide for the ribbon designed to be inserted in the ribbon-space, and thread-guides adapted to direct threads alternately in front of and back of said ribbon, substantially as described.

6. In a machine for making lace trimming for the ribbon-space consisting of two longitudinal threads and transverse bars spanning the space between said threads, the combination, with the needles, of stationary thread-guides for the threads forming the longitudinal threads of the fabric, longitudinally-reciprocating thread-guides for the threads forming the transverse bars of the fabric, and a ribbon-guide, arranged between the reciprocating thread-guides, and adapted to guide the ribbon between the threads controlled by the said longitudinally-reciprocating thread-guides, substantially as described.

7. In a machine for making lace trimming for the ribbon-space consisting of two longitudinal threads and transverse threads spanning the space between the longitudinal threads, the combination, with two needles spaced apart a distance greater than that between regularly-spaced needles, of thread-

guides adapted to guide the threads to said needles, and a ribbon-guide adapted to direct the ribbon between the threads forming the longitudinal threads of the ribbon-space, substantially as described.

8. In a machine for making lace trimming having a ribbon-space and transverse bars spanning the ribbon-space, the combination, with the needle-bar and needles thereon two of which are spaced apart a distance greater than that between regularly-spaced needles, of thread-guides, cooperating with the needles, and adapted to guide the threads forming the transverse bars of the fabric, and means to feed a ribbon between the threads carried by said thread-guides and within the space between said needles, substantially as described.

9. In a machine for making lace trimming, in combination, two longitudinally-reciprocating thread-guide bars, a ribbon-guide bar between the reciprocating thread-guide bars, a vertically-reciprocating needle-bar, and two needles arranged thereon, said needles being spaced apart a distance greater than the distance between regularly-spaced needles, substantially as described.

10. In a machine for making lace trimming, in combination, two thread-guide bars, a stationary ribbon-guide bar between the thread-guide bars, a vertically-reciprocating needle-bar, two needles thereon between which the ribbon is adapted to pass, and means to reciprocate each thread-guide bar back and forth intermittently alternately with the reciprocation of the other thread-guide bar, thereby forming double pillar-bars alternately in front of and back of the ribbon, substantially as described.

11. In a machine for making lace trimming, in combination, two thread-guide bars, a stationary ribbon-guide bar between the thread-guide bars, a vertically-reciprocating needle-bar, two needles thereon spaced apart a distance greater than the distance between regularly-spaced needles, and means to intermittently reciprocate each thread-guide bar back and forth alternately with the reciprocation of the other thread-guide bar, substantially as described.

12. In a machine for making lace trimming, in combination, two longitudinally-reciprocating thread-guide bars, a thread-guide bar in front of one of said reciprocating guide-bars, a thread-guide bar back of the other of said reciprocating guide-bars, a ribbon-guide bar between the reciprocating thread-guide bars, a vertically-reciprocating needle-bar, and two needles arranged thereon, said needles being spaced apart a distance greater than the dis-

tance between regularly-spaced needles, substantially as described.

13. In a machine for making lace trimming having a ribbon-space, in combination, stationary thread-guides carrying the two threads between which the ribbon-space is formed, two reciprocating thread-guide bars carrying the threads forming the pillar-bars spanning the ribbon-space, a ribbon-guide bar, a vertically-reciprocating needle-bar, needles thereon, and means to intermittently reciprocate each reciprocating thread-guide bar back and forth alternately with the reciprocation of the other reciprocating thread-guide bar, substantially as described.

14. In a machine for making lace trimming having a ribbon-space, in combination, two thread-guide bars carrying the side threads between which the ribbon-space is formed, two reciprocating thread-guide bars carrying the threads forming the pillar-bars spanning the ribbon-space and uniting the side threads, a ribbon-guide bar, a vertically-reciprocating needle-bar, two needles thereon, one for forming the loops of one side thread and engaging the pillar-bars thereto and the other for forming the loops of the other side thread and engaging the pillar-bars thereto, said needles being spaced apart to permit the ribbon to pass between them, and means to intermittently reciprocate each reciprocating thread-guide bar back and forth a distance substantially equal to the distance between said needles and alternately with the reciprocation of the other reciprocating thread-guide bar, substantially as described.

15. In a machine for making lace trimming, in combination, two longitudinally-reciprocating thread-guide bars, a thread-guide bar in front of one of said reciprocating guide-bars, a third longitudinally-reciprocating thread-guide bar back of the other of said reciprocating guide-bars, a thread-guide bar back of the third longitudinally-reciprocating guide-bar, a ribbon-guide bar between the two first-named longitudinally-reciprocating guide-bars, a vertically-reciprocating needle-bar, and a plurality of needles arranged thereon, two of said needles being spaced apart a distance greater than the distance between regularly-spaced needles, substantially as described.

In testimony of which invention I have hereunto set my hand at Philadelphia on this 20th day of July, 1904.

MAX N. AARON.

Witnesses:

M. M. HAMILTON,
WILLIAM B. MARKS.