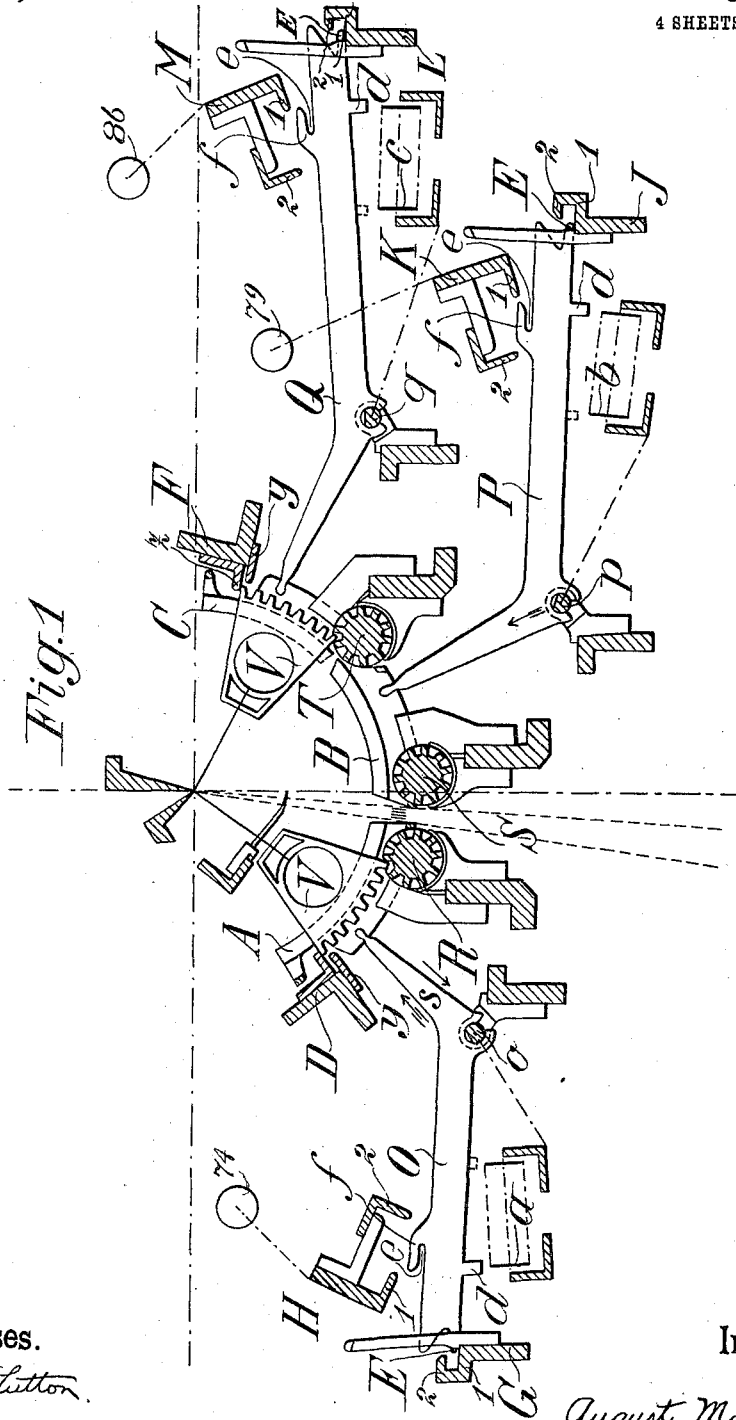


A. MATITSCH.
 LACE MAKING MACHINE.
 APPLICATION FILED OCT. 22, 1907.

1,036,872.

Patented Aug. 27, 1912.
 4 SHEETS—SHEET 1.



Witnesses.

Jesse N. Lutton.

B. Rommers

Inventor.

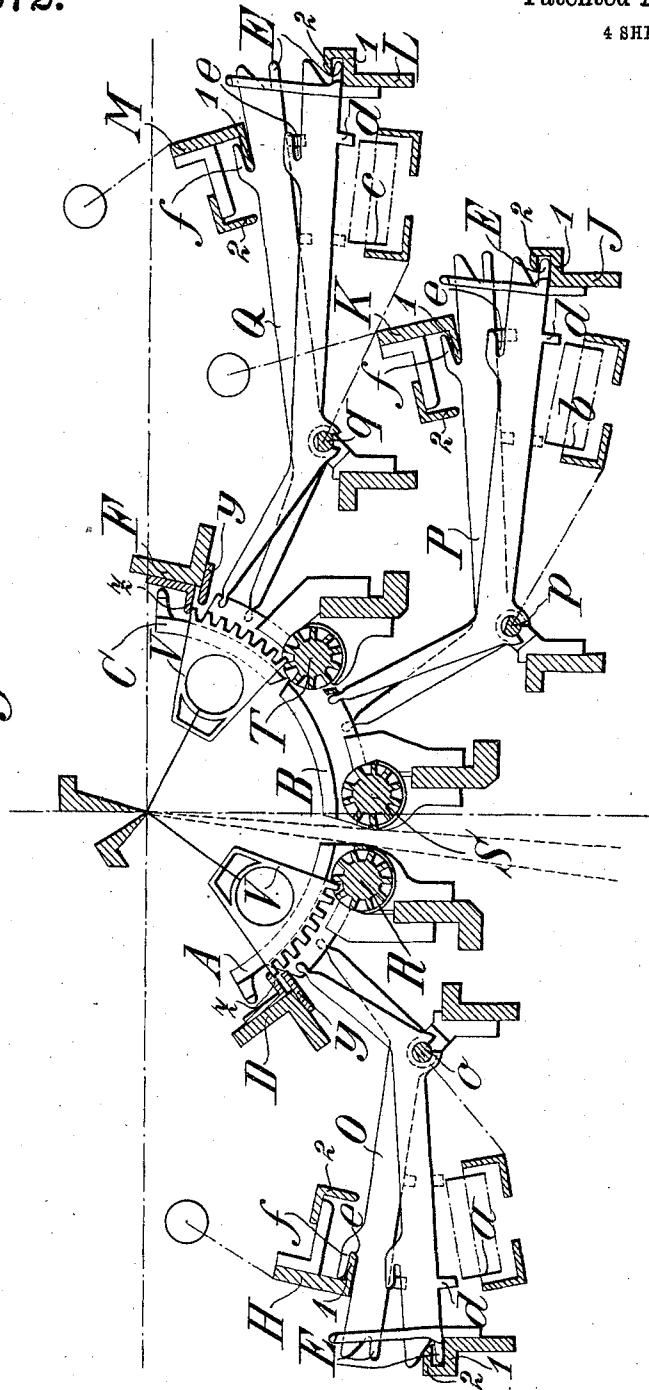
August Matitsch
 by *Henry Orth*
 atty.

A. MATITSCH.
 LACE MAKING MACHINE.
 APPLICATION FILED OCT. 22, 1907.

1,036,872.

Patented Aug. 27, 1912.
 4 SHEETS—SHEET 2.

Fig. 2



Witnesses.

Jesse W. Sutton.

B. Sommers

Inventor.

August Matitsch
 by Henry O. [Signature]
 Atty.

A. MATITSCH.
 LACE MAKING MACHINE.
 APPLICATION FILED OCT. 22, 1907.

1,036,872.

Patented Aug. 27, 1912.

4 SHEETS—SHEET 3.

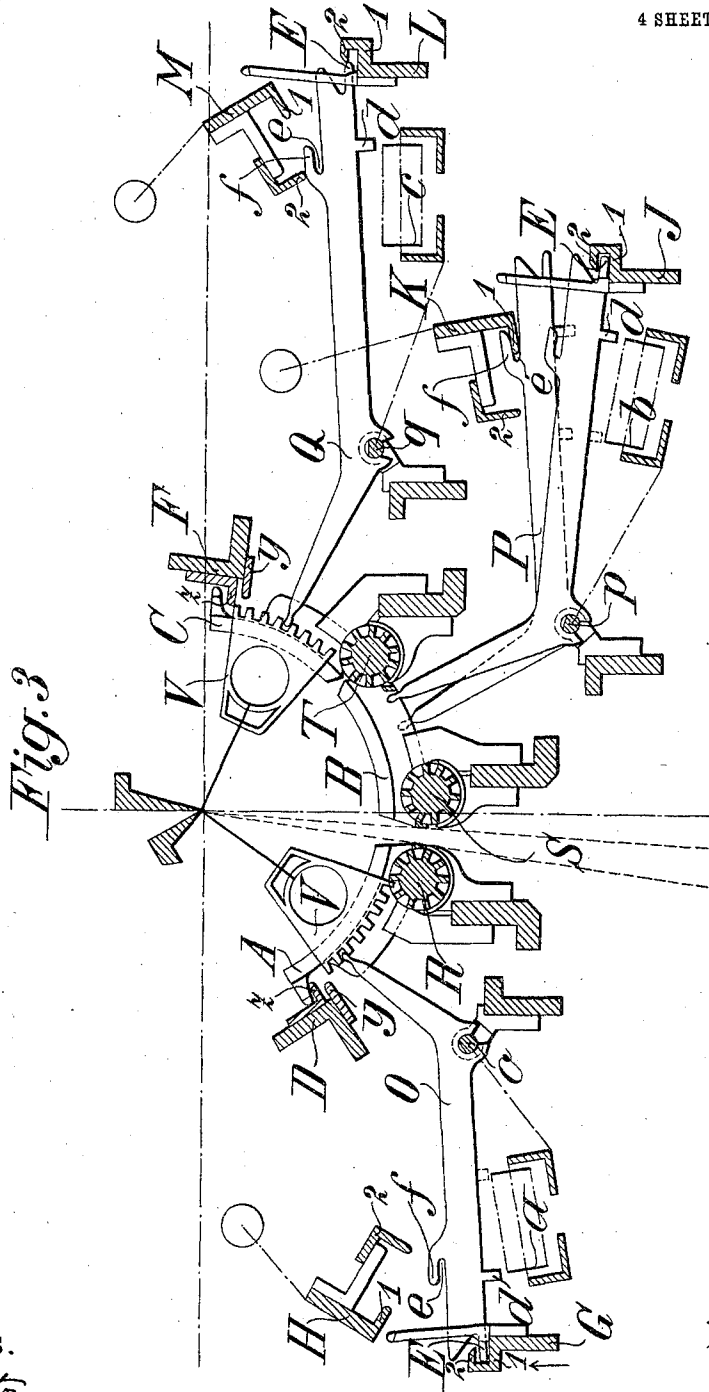


Fig. 3

Witnesses.

Jesse N. Sutton.

B. Rommers

Inventor.

August Matitsch

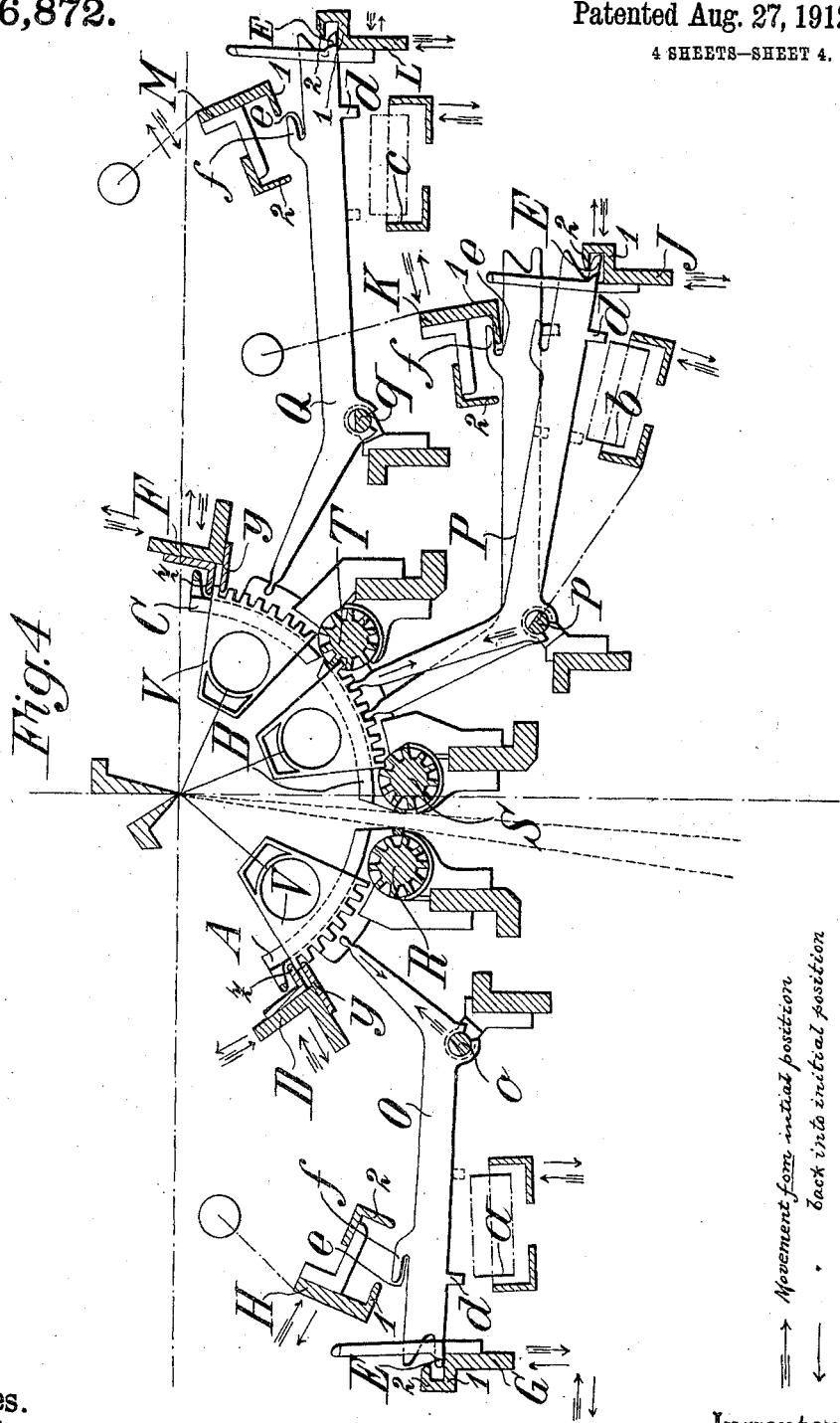
by Henry O. [Signature] atty

A. MATITSCH,
LACE MAKING MACHINE.
APPLICATION FILED OCT. 22, 1907.

1,036,872.

Patented Aug. 27, 1912.

4 SHEETS—SHEET 4.



Witnesses.

Jesse N. Sutton.

B. Kommer

Inventor.

August Matitsch
by Henry [Signature] Atty.

UNITED STATES PATENT OFFICE.

AUGUST MATITSCH, OF VIENNA, AUSTRIA-HUNGARY, ASSIGNOR TO THE FIRM OF M. FABER & CO., OF VIENNA, AUSTRIA-HUNGARY.

LACE-MAKING MACHINE.

1,036,872.

Specification of Letters Patent. Patented Aug. 27, 1912.

Application filed October 22, 1907. Serial No. 398,598.

To all whom it may concern:

Be it known that I, AUGUST MATITSCH, subject of the Emperor of Austria-Hungary, residing at Vienna, Empire of Austria-Hungary, have invented certain new and useful Improvements in Lace-Making Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to machines for making pillow lace of the kind described in the specifications of the following U. S. Letters Patent granted to me Nos. 586,136, dated June 13, 1897; 705,539, dated July 22, 1902 and 797,067, dated August 15, 1905.

According to the present invention the machine is so constructed that the movement of the pushers or pickers is controlled by jacquard actuated lifting bars which act directly upon the pushers or pickers without attached slides or pull rods. The pickers transfer the carriages that are moved into the outer combs either to holding bars to hold those carriages which according to the pattern of lace being made are not to be moved, a function heretofore performed by the pickers themselves; or the pickers transfer the carriages to their adjacent toothed rollers whose function is to bring the carriages into the middle comb. The pickers pertaining to the middle comb select and move the carriages in said comb into engagement with the toothed rollers which transfer them to the respective outer combs.

The number of pull rods required for a machine of the type under notice amounts to thousands; for example, for a 12 point machine of 200 inches width of material 7200 are required. As each of these pull rods costs about one quarter of a dollar to make, it is obvious that their omission renders it possible to make the machine a great deal cheaper than with them.

In drawing the thick threads into the warp bars in the existing machines the threads can only be guided to beneath the pull rods by the fingers; there they have to be transferred to a long small hook, which brings them up over the warp bars, after

which they can be drawn into the holes which are in the warp bar by a second short small hook. In addition to this the introduction of the threads can only be carried out correctly and with certainty by making use, in addition to the long small hook, of another special instrument which prevents the long small hook being incorrectly introduced between the threads already drawn in. The operation of drawing in the threads in the existing machines is therefore a complicated one as well as tedious; on the other hand in the improved machine, in consequence of the absence of the pull rods, the operator can, as in the well known English lace machines ("Levers" machines), bring the threads with his fingers directly up to the warp bars and draw them in with the small hook without use of the special instrument mentioned. It is obvious that in consequence of this the drawing in of the threads can be performed much more quickly than in the old machine, much time being saved and the machine being enabled to produce a correspondingly greater amount of work.

Another and important improvement embodied in the improved machine lies in the provision of means whereby the separation or segregation of the external pickers, the function of which is to separate carriages which must stay in the external combs, from those pickers which have to deliver carriages to the toothed rollers, as well as the separation or segregation of the middle pickers, which have to transfer carriages to the front toothed roller, from those pickers which have to pass carriages over to the rear toothed roller, is accomplished before the upwardly projecting end of the picker is brought into the notch of the carriage sector.

In the improved machine a further advantage follows from the fact that the holding back of the carriages in the two external combs is not performed by the pickers, and also that the external pickers only have to come into action when the carriages are brought into the middle comb and not when they are removed therefrom, that is to say the work of the picker is ended when the carriage moved by it has been passed onto the toothed rollers and engaged thereby with absolute certainty. The middle pickers on the other hand do not bring the car-

riages into the middle comb, but operate only when those carriages that are in the middle comb are to be moved into the outer combs, therefore they perform only half the work heretofore done by them. In consequence of this the period of time during which the pickers are in action is short and much time is left during which they can be arranged after one operation and positioned for the next. In addition to this there is also the fact that in the improved machine the arrangement of resetting of the pickers can be done and a resetting of the pickers is done while the carriages are in motion in the combs so that the carriages do not have to make any pauses in their movement at the moment of the selection of the pickers. The improved machine therefore works much more smoothly and consequently with greater certainty and can make a greater number of revolutions per minute than the machine of the older construction thereby increasing the production.

A special advantage, especially in fine machines, lies in the fact that the thick threads can pass as in the known lever machines freely to the top bars. In the present machines they have to pass between the pull rods and are moved conjointly thereby in their forward and backward movement when the pull rods stand close alongside, as far as the thick threads are not tightly stretched. Under certain circumstances the attainment of a proper thread tension is thereby prevented.

Finally, in the improved machine there is a much smaller consumption of power as the lifting and moving forward and backward of the numerous and, in their entirety, very heavy top bars is done away with.

The advantages which the present invention offers are, as has been hereinbefore set forth, considerably lessened primary cost of the machine by the omission of the pull rods, and, increased production which is brought about firstly by the saving of time resulting from the capability of convenient and rapid manipulation when drawing in the thick threads, and secondly, by the increased rate at which the machine can be driven, as the selection of the pickers, and the separation thereof to correspond to the selection into two groups without a pause in the movement of any other mechanism, can be and is already performed for each revolution or cycle of operations during the previous revolution or cycle of operations. Furthermore the capability of adjusting the tension of the thick threads is particularly useful and permits of a more accurate and more sensitive regulation thereof as well as considerable economy in driving power.

Referring to the drawings, in which like parts are similarly designated:—Figures 1-4 of the drawings are transverse sections

of the improved machine showing the essential components thereof, that is to say, the carriages, combs, pickers, toothed rollers, catch bars and lifting bars in the various positions of their working movements that are operated by means similar to those described in my above noted prior patents.

The machine has three combs, a front comb A, a middle comb B and a rear comb C. At the commencement of each revolution there is a series of carriages in each of the front and rear combs, but no carriages in the middle comb. The external combs, that is to say the front comb A and the rear comb C are moved in the direction of their length in exactly the same way as in the machines shown in the above mentioned patents.

In this machine there are employed three toothed rollers R, S, T. The foremost roller R is situated beneath the rear end of the front comb A. The two other rollers are situated under the middle comb B; the so-called middle toothed roller S being under the front end thereof and the rear toothed roller T under the rear end thereof. The toothed rollers have to take over the carriages from the external pickers, bring them into the middle comb without help from the middle pickers, there hold them fast so that the middle pickers can be correctly brought into the notches in the carriage sectors, then to rotate outwardly to a slight degree so that the carriages are free for a moment during which they are pressed by the middle pickers into engagement with the middle or rear toothed rollers and brought out of the path of the other roller, after which the carriages are engaged by the teeth of the toothed roller against which they have been pressed by the pickers and are transmitted by such roller to the respective external combs. The foremost toothed roller R is auxiliary to the center roller S as it were, in that it transfers to such center roller the carriages coming from the front comb A, to pass them into the center comb B and furthermore to take over the carriages moved forward by the middle toothed roller S out of the middle comb B and to completely transfer them to the front comb A. In each slot of the combs is arranged a picker, O indicating the front picker, P the middle picker and Q the rear picker and as in the old machines, the pickers of each kind are each strung upon shafts *o*, *p*, *q* respectively, in such way that each separate picker can be rotated independently of the others. In order that the separation of the pickers of each kind into two groups may be effected before the entrance of its upwardly projecting end into the notch of the carriage sector, these ends must be pushed directly into and out of the tooth spaces and not rotated into and out of them. This is accom-

plished by suitably moving to and from the respective combs, the shafts o , p q upon which the pickers are strung.

In order that the lifting bars a , b and c respectively shall be able to act directly upon the pickers each picker is provided with a downwardly extending projection d . If the lifting bars be suitably adjusted then the projections upon them act upon the projections of the corresponding pickers and cause such pickers to rotate when the lifting bars rise. The function of the lifting bars in the improved machine is merely to separate the pickers of each kind into two groups according to the purpose which they are to serve and in this machine the lifting bars do not serve to hold fast the pickers in the group; this is performed for each kind of picker and for each group thereof by special longitudinal bars G H , J K , and L M , respectively which seize the pickers at the right moment, hold them fast and rotate them. The longitudinal bars G and H , also J and K , L and M , each consist of two angle bars rigidly connected to each other and the parts of which marked 1 and 2 act upon the pickers when the latter are suitably adjusted. The longitudinal bars G , J and L are movable in two directions, namely horizontally in a direction toward and away from the pickers and vertically upward and downward; on the contrary the longitudinal bars H , K and M are only capable of rotating about their horizontal axes 74, 79, 86 and swing toward and away from the pickers.

Before the pickers O and Q , which as usual consist of two armed levers, are actuated by their lifting bars a and c and are rotated thereby, they all rest with their ends E on the part 1 of the longitudinal bars G and L , in such a way that these ends E when the pickers are rotated by the lifting bars can move upward unimpeded by the parts 2 of these longitudinal bars G and L . The pickers of the external combs have only to bring the carriages into and out of the sphere of action of the toothed rollers; the holding of the carriages in the external combs being performed not by the pickers, but by longitudinal bars D , F , which are called catch bars. Each of these catch bars is provided with two tooth like extensions y and z and the catch bars can be rotated in an arc of a circle toward and away from the middle comb as well as raised and lowered. When raised, the teeth y , Fig. 4, of the catch bars D and F are situated in the rearmost notches of the carriage sectors and thus hold the carriages fast in the corresponding external comb. At the conclusion of the cycle of operations the bars D and F move out of mesh with the carriages to release them; simultaneously the bars are rotated toward the middle comb. When

the bars are rotated toward the carriages the teeth z act upon the outer edges of the carriages so that the carriages are clamped fast between the teeth z and the toothed rollers R and T opposite the inner edges of the carriages. This is the position at the commencement of each cycle, Fig. 1. The holding fast of the carriages is necessary at the moment in which the upwardly projecting ends of the pickers are to be brought into the notches of the carriage sectors as otherwise the carriages would not be compelled to be accurately in that position which is imperative for the faultless entrance of the pickers. The tooth y of the catch bars D or F serves to seize and hold fast those carriages which are to be held back in the outer combs, Fig. 4. For this purpose on suitably rotating the bar toward the center of the arc the tooth is moved into the outermost front or rear notches in the carriage sectors; this movement is effected after the selected carriages have been thrown out of connection with the toothed rollers by their corresponding pickers and the other carriages have been moved up to the toothed rollers R or T by the corresponding pickers so far toward the middle comb that they no longer can be seized by the catch bars D or F . The carriages are then released from engagement by the pickers, for which purpose the axles o , p and q are moved back into their starting positions. The teeth y of the catch bars D and F have to hold the carriages pushed up by the pickers O and Q fast until immediately before the moment in which the carriages conveyed by the toothed rollers are brought back out of the middle comb into the outer combs and the toothed rollers have completed their outward rotation. When the moment has arrived, the catch bars D and F are rotated toward the middle comb until the teeth z bring all the carriages of the front comb and all those of the rear comb into one row, so that the carriages are again held fast between these teeth z and the toothed roller R or T and therefore arrive in the initial position for the next cycle. The bars H , K or M have to seize the pickers which have been rotated upward by the lifting bars immediately after the latter have completed their upward movement and hold such pickers until the ends of the upwardly projecting arms are each moved into a notch in a carriage sector which, as before stated, is effected by suitably moving the axles o , p or q . In order that the bars H , K , M , shall be able to hold the rotated pickers in the correct position each picker is formed with a finger like projection f near its end E beneath which is situated a notch e . When the pickers have been rotated by the toothed rollers then the notches e of the rotated

pickers are located opposite the parts 1 of the bars H, K, M and if the bars be swung toward the pickers these parts 1 will enter the notches and prevent the particular selected pickers from following the lifting bars when the latter move downward. Immediately the ends of the upwardly projecting arm of the pickers have been pushed into the notches of the carriage sectors in consequence of the shifting of the axles *o*, *p*, *q* the bars H, K and M are to swing backwardly so that the parts 1 thereof release the pickers again. The parts 2 of the bars now come into action and rotate the released outer pickers so that they bring the outer carriages engaged by them out of the reach of the toothed rollers R or T and move the released middle pickers so that they pass the carriages engaged by them over to the rear toothed roller T. For this purpose the parts 2 of the bars H, K, M are so placed that at the moment the bars swing away from the pickers and disengage the parts 1 from the pickers, the parts 2 come into contact with the upper edge of the finger like projections *f*, press on them and cause the pickers to rotate and the carriages engaged by those particular pickers are suitably moved out of place in the comb and passed over to the catch bars and the rear roller. After this has been done, the upwardly projecting ends of the pickers are brought out of the notches of the carriage sectors by the rearward movement of the axles *o*, *p* and *q* and into their starting positions, the bars H, K and M by further pressure of the part 2 upon the pickers have now to bring these pickers so far as their lateral movements are concerned back into their starting position. This action of the bars only relates to those pickers which have been rotated at the commencement by the lifting bars. The bars G, J and L have to seize, hold fast and rotate the pickers which are not rotated by the lifting bars. This movement of the bars G, J and L first brings the pickers into that position which is necessary for the correct entrance of their projecting ends into the notches of the carriage sectors, then after the entrance has taken place, effects the transference of the carriages engaged by these pickers to the toothed rollers and after the pickers have been brought out of contact with the carriages also effects the bringing back of the pickers into the starting position. For this purpose the bars G, J and L, after the lifting bars have already raised the pickers which are to be acted upon by the bars H, K and M are moved toward the pickers which are not raised. The end E of these pickers is thereby located between the parts 1 and 2 of the bars G, J and L so that the pickers are held fast. After this the bars G, J and L are moved downwardly and the upwardly projecting ends of the pickers are thereby moved into the necessary position for the correct entrance into the notches of the carriage sectors, when the axles *o*, *p* and *q* are moved toward the combs. After the ends of the pickers have entered into the notches and after the carriages which are to be held fast in the outer combs have been brought out of the path of the lifting bars the bars G, J and L move upwardly again and away from the pickers so that the picker ends E are released. In consequence of this movement the upwardly extending ends of the front and middle pickers engaged by the bars G and J turn toward the front toothed roller R and the upwardly extending ends of the rear pickers are moved toward the rear toothed roller T by the bar L, so that the carriages engaged by the respective pickers are passed over to the corresponding toothed rollers. At the end of these operations the upwardly projecting ends of the pickers are brought out of the notches of the carriage sectors, the bars G, J and L are returned by a further upward movement into their starting positions and bring back the pickers conveyed by them into the positions they occupied at the start. At the commencement of each cycle of operations the carriages are located completely in the outer combs and are held fast in each row by the teeth *z* of the catch bars D and F of the toothed rollers R and T until the combs and top bars are moved out of place, see Fig. 1.

The operation of this construction of the improved machine when manufacturing lace is as follows:—Before the beginning of a cycle of operations the lifting bars *a*, *b* and *c* have been selectively positioned by the bottom bar jacquard according to the pattern card, all the pickers have been separated into two groups of each set, that is to say, have been set for the proper insertion into the notches of the bobbin carriages and finally the lifting bars *a*, *b* and *c* are brought into their original lowest position, (Fig. 2). Fig. 3, shows the middle pickers P set in the manner just described for insertion into the notches of the carriage sectors. At the commencement of each cycle the axles *o* and *q* of the outer pickers are pushed toward the combs and the upwardly projecting ends of the outer pickers thereby brought into the notches of the carriage sectors. Immediately this has taken place, the carriages which are to remain behind in the outer combs, are brought out of the path of the toothed rollers R or T by their respective bars M and H and are seized and held fast by the tooth *y* of the catch bars D and F, Fig. 4. At the same time the carriages which are to be brought from both outer combs into the middle comb are passed over to the toothed rollers, Fig. 3, by those pick-

ers which have not been lifted by the lifting bars α and c and are held by bars G and L, said bars G and L moving upward to accomplish this movement. The rollers now begin to rotate toward the middle comb. The toothed roller R transfers the carriages to toothed roller S which conveys them into the middle comb and thence back into the front comb. The toothed roller T transfers the carriages into the middle comb and then back into the rear comb. Immediately the carriages have been definitely engaged by the toothed rollers and the catch bars D and F, the axles o and q of the outer pickers are moved away from the combs and back into their starting positions in consequence of which movement the pickers release the carriages so that the carriages conveyed to the middle comb can pass on unimpeded by the pickers. During this operation the pickers, with their bars G, H, L and M return to their initial position, Fig. 4. The carriages conveyed into the middle comb are there all simultaneously brought into the central position in exactly the same way as is described in the before-said specification of Letters Patent No. 797,067, are held fast therein by the toothed rollers S and T while the outer combs and the top bars move and while the upwardly projecting ends of the central pickers, which are set simultaneously with the outer pickers, are brought into the notches of the bobbin carriages, Fig. 4. When this has taken place, the toothed rollers begin to rotate outwardly and thereby release the carriages for a short time. The carriages to be brought forward to the front comb are passed onto the toothed roller S by the corresponding central pickers rotated forwardly by bar J and the carriages which are to be moved backwardly are passed onto the toothed roller T by rotating the corresponding central pickers backwardly, which is done by the part 2 of bar K; the carriages being engaged by the rollers and conveyed to the corresponding outer combs. At the moment in which the toothed rollers have taken over the carriages from the middle pickers, the pickers have completed their function and they are together with their axle p and the bars J, K respectively brought into their original or starting position. When all the pickers are in their original or starting position then they are set for the next revolution while the carriages are brought back into the outer combs. When the carriages have passed into the outer combs and the toothed rollers have completed their outward rotation the carriages that have just been brought into the outer combs are then again brought by the catch bars D and F into a row with the carriages that have been held back in the outer combs and are then held between the catch bars and the toothed rollers R and T, until the

entrance of the outer pickers into the notches of the carriage sector has taken place at the next cycle.

I claim:—

1. In a lace making machine, the combination with combs, toothed thread carriages and transfer rollers; of pickers for each comb and jacquard-controlled lifting bars whereby the pickers may be directly operated upon to selectively position them.

2. In a lace making machine, the combination with combs, toothed thread carriages movable from one comb to another and transfer rollers; of pickers for each comb, each picker having a projection, and jacquard-controlled lifting bars arranged for acting on said projections to selectively position the pickers.

3. In a lace making machine of the type described, the combination with groups of pickers and means whereby the pickers of each group may be selectively positioned; of means common to a group of pickers movable to engage and hold those pickers selected.

4. In a lace making machine of the type described, the combination with groups of pickers and jacquard-controlled means whereby the pickers of each group may be directly selectively positioned, of means common to a group of pickers movable to engage and hold those pickers selected, and means common to said group of pickers movable to engage and move those that are not actuated by the jacquard controlled means.

5. In a lace making machine of the type described, the combination with the carriages and pickers, of means whereby the pickers may be selectively moved and means whereby the pickers may be moved into engagement with the carriages after their selection.

6. In a lace making machine of the type described, the combination with the carriages and three combs; of pickers for each comb, means adjacent the outer combs to engage and hold all carriages to be held therein when moved to said means by the pickers.

7. In a lace making machine, the combination with three combs and carriages therein; of means whereby carriages may be selected and moved into the outer combs, and catch bars adjacent the outer ends of the front and rear combs movable into engagement with the carriages that are in said combs and that are to be held therein.

8. In a lace making machine, the combination with three combs, one of which is stationary, and carriages movable in the slots of said combs; of rollers whereby the carriages may be transferred to and from the middle comb, means whereby the carriages may be transferred from the outer

combs to the rollers, and catch bars to engage and move the carriages in the outer combs out of engagement with the rollers after said carriages have been transferred to the outer combs.

9. In a lace making machine three combs, the middle one of which is stationary, and carriages arranged to move from one comb to another, a roller adjacent each comb and means whereby carriages in the respective combs may be brought into engagement with the respective rollers for transfer from one comb to another.

10. In a lace making machine of the type described, a group of pickers, a finger-like projection on each picker, means to selectively move the pickers, and a swing bar to engage the projections of the selected pickers.

11. In a lace making machine of the type described, a group of pickers, means to selectively move the pickers, means common to all the pickers of the group to engage and hold the selected pickers and means to engage the unselected pickers and move them.

12. In a lace making machine of the type described, a group of pivoted pickers, means to selectively move the pickers, means common to all the pickers of a group to engage and hold the selected pickers, means to simultaneously move the pivotal points of the pickers of the group, and means to engage notches in the rear ends of the pickers to operatively move them.

13. In a lace making machine, in combination, three combs the middle one of which is stationary, toothed carriages movable in the comb slots, a toothed roller for each comb whereby the carriages may be moved from one comb to another, pickers for each comb, jacquard-controlled lifting bars arranged to directly act upon said pickers for selectively positioning them, means whereby the pickers may be moved into engagement with their respective carriages after being positioned, and catch bars for the outer combs, whereby the carriages moved thereto

by the selected pickers may be held inoperative, and means whereby the unselected pickers may be moved to transfer their carriages to their adjacent rollers.

14. In a lace making machine, the combination of three combs the middle one of which is stationary, and toothed carriages movable in the slots of the combs; a toothed roller pertaining to and adjacent each comb, pickers pertaining to each comb, and catch bars adjacent each outer comb, whereby carriages in the outer combs that have been moved to said catch bars by their respective pickers may be held by said bars in the outer combs, and means whereby those pickers that do not transfer to the catch bars may be operated to move their respective carriages to adjacent rollers.

15. In a lace making machine of the type described, the combination with the carriages, the pickers and the combs; of a bar movable to and from the combs on which each set of pickers is mounted, jacquard-controlled means acting directly on the pickers to select pickers of each set, a bar having both vertical and oscillating movement on which one of said sets of pickers is capable of resting, said bar capable of engaging and moving the unselected pickers.

16. In a lace making machine of the type described, the combination with the combs; of pickers comprising angle levers one arm of which is provided with a notch and a finger, means whereby the pickers may be selectively moved, a bar movable to and from the combs forming a pivot common to all the pickers of a set, a bar movable to engage the notches in the pickers to actuate unselected pickers and a bar movable to engage the fingers to hold the selected pickers.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

AUGUST MATITSCH.

Witnesses:

JOSEF RUBASCH,
ROBERT W. HEINGARTNER.