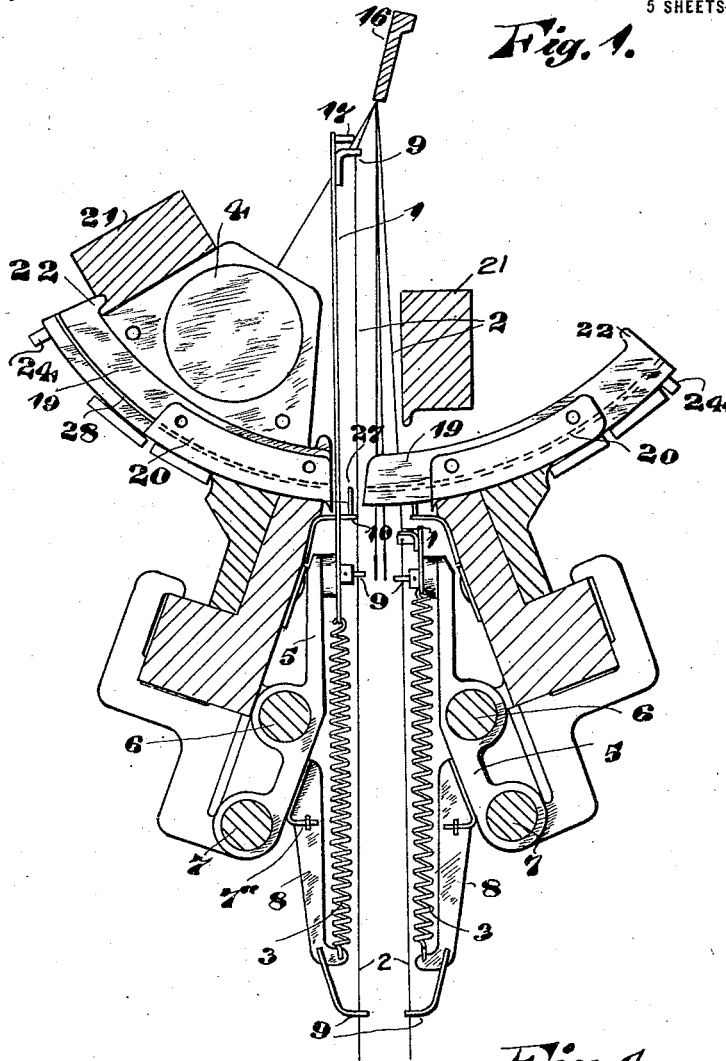


W. COOMBES.  
TWIST LACE MACHINE.  
APPLICATION FILED JAN. 18, 1922.

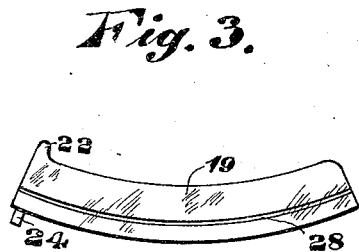
1,418,130.

Patented May 30, 1922.

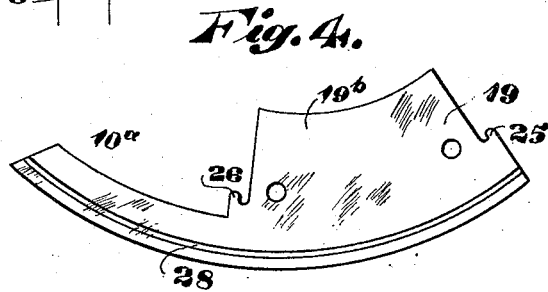
5 SHEETS—SHEET 1.



*Fig. 1.*



*Fig. 3.*



*Fig. 4.*

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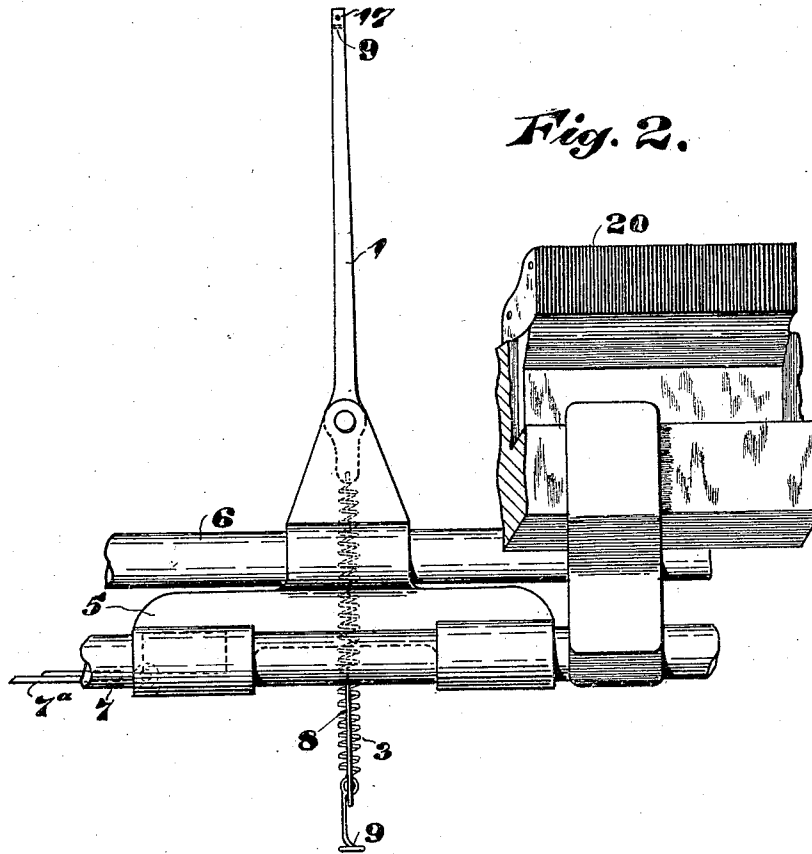


Fig. 2.

Fig. 7.

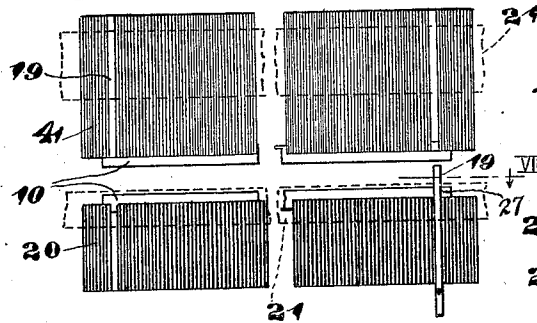
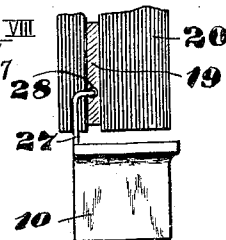


Fig. 8.



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5 SHEETS—SHEET 3.

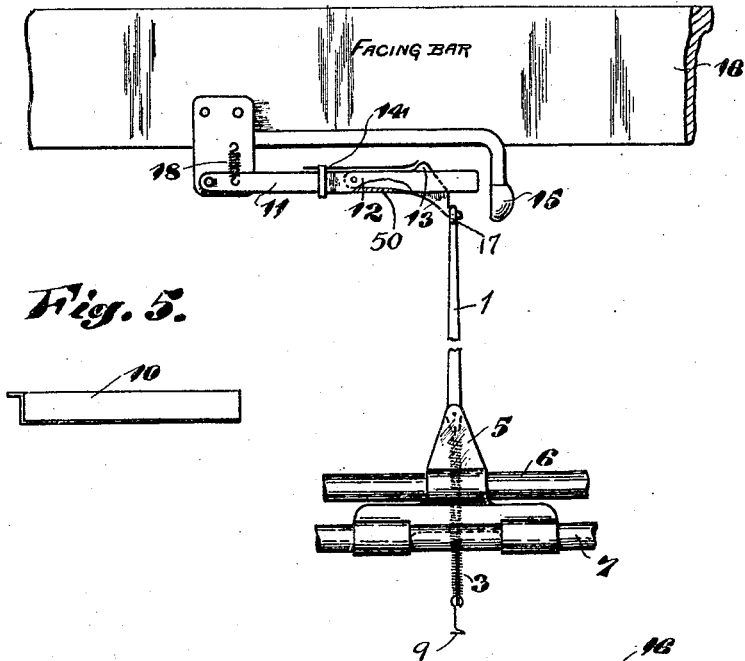


Fig. 5.

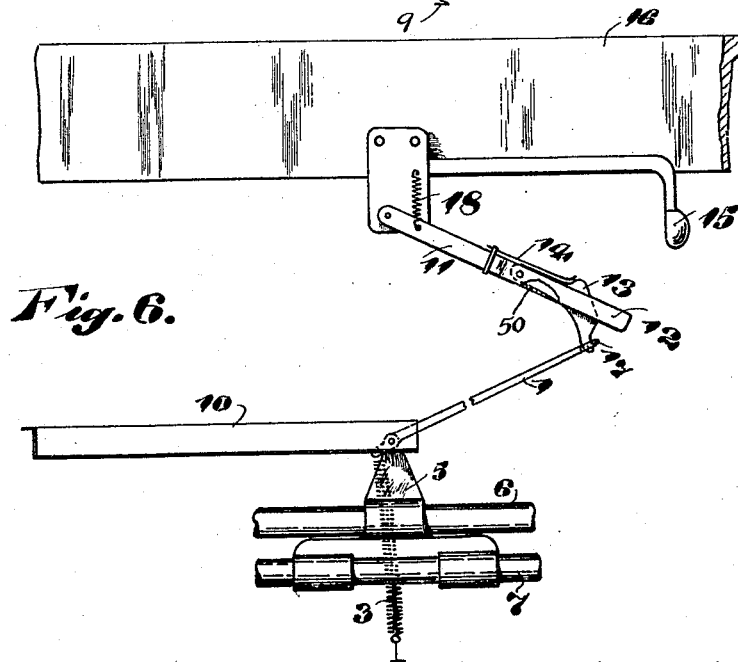


Fig. 6.

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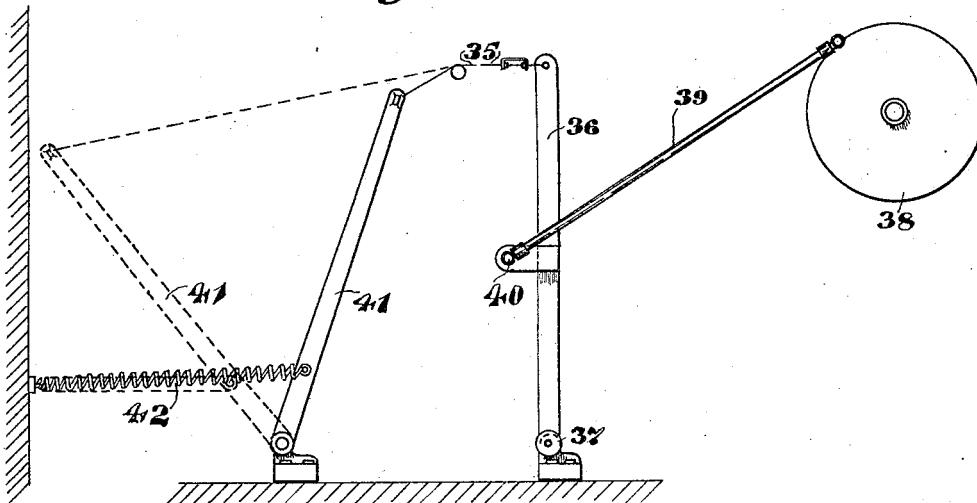
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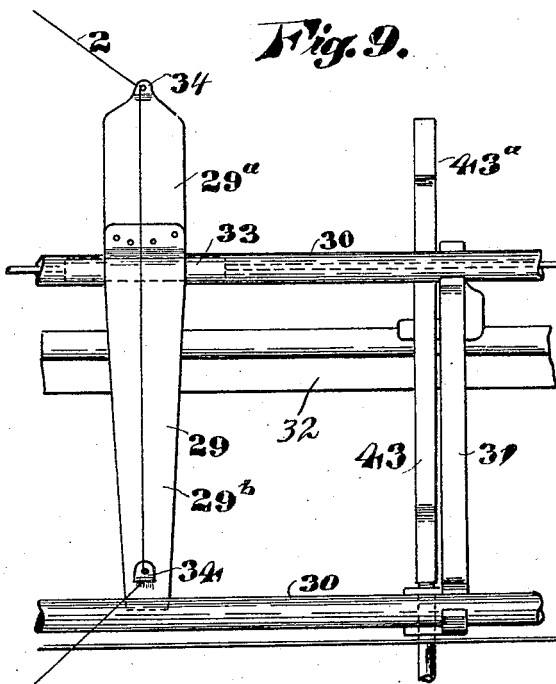
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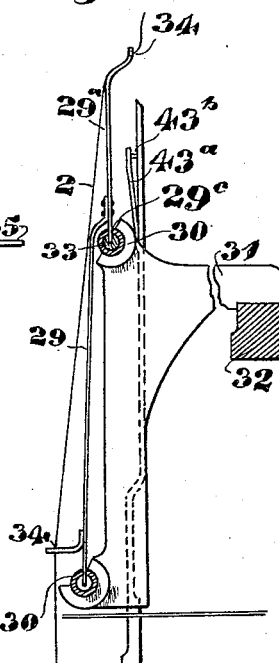
*Fig. 12.*



*Fig. 9.*



*Fig. 10.*



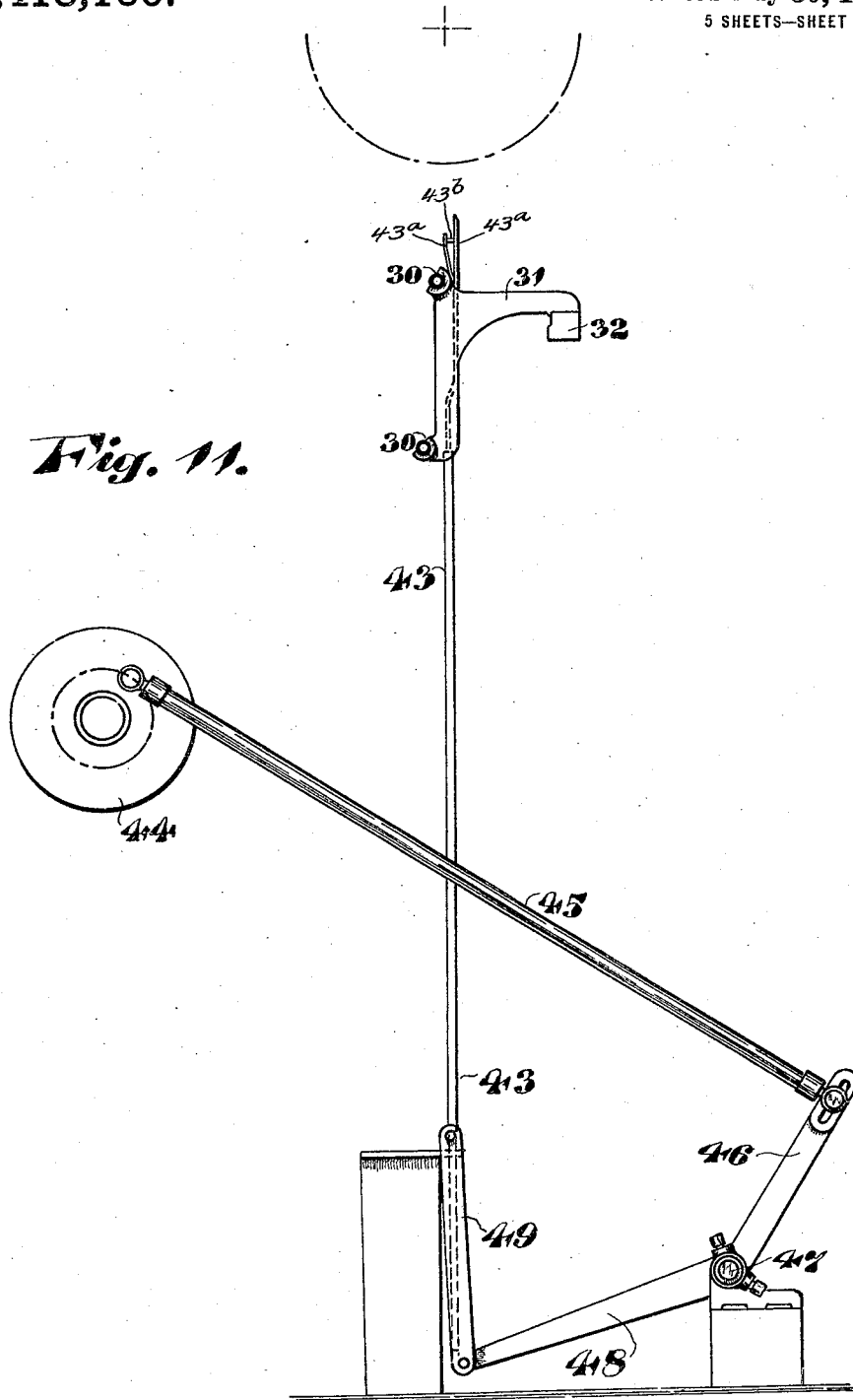
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TWIST LACE MACHINE.  
APPLICATION FILED JAN. 18, 1922.

1,418,130.

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5 SHEETS—SHEET 5.



*Fig. 11.*

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# UNITED STATES PATENT OFFICE.

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## TWIST LACE MACHINE.

1,418,130.

Specification of Letters Patent. Patented May 30, 1922.

Application filed January 18, 1922. Serial No. 530,159.

*To all whom it may concern:*

Be it known that I, WILLIAM COOMBES, residing at 4 Cope Street, Hyson Green, Nottingham, in the county of Nottingham, in England, subject of the King of Great Britain, have invented Improvements in and Applicable to Twist Lace Machines, of which the following is a specification.

This invention relates to improvements in and applicable to twist lace machines and has for its principal object the provision of improved means for introducing weft threads between the warp and bobbin threads.

The principal feature of this invention comprises means for traversing the weft threads at any phase of any motion of the machine.

In the carrying into effect of the present invention the weft threads may be traversed when the carriages are in either combs and in any intermediate position. Consequential upon such arrangement the time lost in holding the carriages stationary or slowing down the machine during the traverse of the weft thread carriers is entirely eliminated and further the machine may be run at a considerably faster speed and the fabric produced at a correspondingly quicker rate. In principle the present invention consists in the combination of means for positioning the weft thread carriers during traverse so that they are situate below the carriages and for raising such weft into the shed after or when same is formed.

In the ordinary manufacture of lace and for beating up the wefts hitherto laid in machines of the type characterized points have been actuated in the usual manner to beat up the wefts.

In the realization of the principal object of the present invention however it will be appreciated that the threads having been laid beneath the carriages will be positioned out of reach of the points and before such points can finally beat the wefts into the shed it is necessary to materially raise same.

Actually the beating up motion comprises two independent motions the first one, necessitated by reason of the fact that the threads are laid below the carriages, consisting in raising the wefts above the points, and the second one, comprising the beating up of the weft into the shed by the said

points, the points and point bars being not illustrated in the accompanying drawings since no novelty is herein claimed for them.

In order that this invention may be fully understood reference will be made to the accompanying drawings in which:—

Fig. 1 is a cross section through the comb bars and adjacent parts of a lace machine illustrating one means according to this invention for traversing and laying the weft threads.

Fig. 2 is an elevational view taken at right angles to Fig. 1 and illustrating more clearly the weft carrier.

Figs. 3 and 4 illustrate two convenient forms of retaining members adapted to be incorporated for retaining the weft threads beneath the carriages during the movement of such carriages between the combs.

Fig. 5 illustrates in front elevation a convenient means for controlling the weft thread carrier at each end of its traversing movement, many of the parts of the machine in this view, as in others of this case, being omitted for the sake of clearness in illustrating the parts actually shown.

Fig. 6 illustrates the action of the arrangement shown in Fig. 5.

Fig. 7 is a diagrammatic plan view of Fig. 1, the weft thread carriers not being shown.

Fig. 8 is a diagrammatic sectional view taken on the line VIII of Fig. 7.

Fig. 9 shows in front elevation a modified form of the invention.

Fig. 10 is an end view of Fig. 9.

Fig. 11 illustrates suitable means for operating the weft thread lifters employed in the arrangement shown in Figs. 9 and 10.

Fig. 12 illustrates means for effecting the traversing motion of the weft thread carrier.

In one method of carrying out this invention the weft thread carriers comprise pivoted members 1 suitably formed to guide and retain the wefts 2, each carrier guiding and retaining one or more threads. Normally said carriers 1 are retained in a vertical or approximately vertical position under the action of springs 3. Upon traversing a carrier by means of cams or other suitable mechanism well known in this art such carrier is deflected from its vertical position, illustrated at the left hand side of Fig. 1 and in Fig. 5, and is caused to assume a horizontal position or other suitable posi-

tion, as illustrated at the right hand side of Fig. 1 and in Fig. 6, to enable the carriers to pass underneath the lowest edge of the carriages 4. Upon completing their traverse the weft threads 2 are positioned beneath the carriages 4 and the carriers 1 are then adapted to rotate conveniently under the action of the said springs 3 into their normal position thus positioning the wefts within reach of the usual points which beat them up into the shed.

The carriers 1 are conveniently pivoted to brackets 5 adapted to slide along suitably located rods 6, 7, each bracket 5 having a downwardly extending arm 8 to which one extremity of spring 3 is connected. Eyes 9 are also provided through which the weft thread is guided. The traverse of bracket 5 with carrier 1 is effected by a pulling effort exerted on wires 7<sup>a</sup> by suitable mechanism such as hereinafter described.

To deflect the carrier members 1 from the vertical to the horizontal position so as to pass beneath the lowest edge of the carriages, fixed longitudinal angle members 10 or the like are provided, beneath which the carriers are adapted to pass, such angle members being supported by convenient frame members of the machine such as the comb bars, as represented in Fig. 1. Further, at each end of the traverse of the carriers 1 means may be provided for suitably inclining the carriers prior to their meeting the extremity of the angle bar 10 so as to prevent sudden deflection of the carriers, and practically eliminating shock thereon. Conveniently such means, which are illustrated in Figs. 5 and 6, may comprise a pivoted arm 11 having a bifurcated portion 12 between the bifurcations of which a catch member 13 is pivoted, said catch being pressed by spring 14. A buffer element 15 is also provided adjacent the free extremity of the bifurcated arm 11, which latter together with the buffer 15 are suitably secured to usual facing bar 16 or other convenient frame member of the machine. Fig. 5 illustrates a carrier 1 at the right hand end of its traverse, it having passed beyond the angle bar 10 and standing in an upright position due to the action of the spring 3. The carrier is provided at its upper end with a pin or lateral projection 17 that is adapted to engage with the lower end or hooked portion of the catch 13 which is carried by the pivoted arm 11. As the carrier 1 moves toward the right, completing its traverse in that direction, the pin 17 thereof passes beneath the catch 13, engaging with the under side of the hook thereof, which is moved upward against the action of the spring 14 to permit the carrier to pass and complete its movement, it then occupying a position between the hook of the catch and the buffer 15, as represented in Fig. 5.

Upon the weft carrier commencing its return movement, toward the left in Figs. 5 and 6, the pivoted arm 11 is drawn downward by the weft carrier, against the resistance of the spring 18, causing the parts to assume the positions represented in Fig. 6, the carrier 1 being inclined so that its lower end is then in proper position to engage with the angle bar 10 by which the inclined position of the carrier is maintained. A further movement of the carrier and its supporting bracket 5 toward the left, from the position indicated in Fig. 6, causes the separation of the weft carrier from the catch 13, the pin of the former slipping off the hooked portion of the latter, whereupon the arm 11 is raised to its normal position by the spring 18. The underside of the catch member 13 bears upon a lateral web 50 extending between the bifurcations 12 of the pivoted arm, thus limiting the movement of the catch in a downward direction beyond what is shown in Figs. 5 and 6 but permitting it to rise against the action of the spring 14, as has been described.

Means may be provided for retaining that portion of the wefts 2 laid at the beginning of each traverse in a position beneath the carriages, and such means may comprise retaining members 19 sliding in the combs and adapted to be engaged by the catch bars 21. Said members 19 are suitably shaped to slide along the combs 20 and in one arrangement are provided with a nose 22 at their outer extremity only (Fig. 3). Said nose 22 accommodates the catch bar 21 on one side of the machine and such bar 21 in traversing the carriages 4 simultaneously traverses the retaining members 19. Such members are not, however, engaged by the catch bar on the opposite side of the machine, and as the catch bar engaging said retaining members swings inwardly, the said members slide by gravity or under the influence of a suitable spring and occupy a position with a portion thereof depending over or extending across the space between the comb bars so as to retain that portion of the wefts first laid in a position below the carriages. Suitable stops such as 24 limit the inward movement of the retaining members 19.

After the engagement of the carriages 4 by the first mentioned catch bars 21 the said retaining members will be again engaged and moved outwards ceasing to hold the wefts in their retained position below the carriages.

The retaining members 19 as above described and as shown in Fig. 3 of the drawings can be employed for laying either one or two wefts, and it will be understood that if one weft only is being laid then a retaining member is located at each end of the traverse of the weft, whereas if both

front and back wefts are being laid then two retaining members 19 are positioned at each end of the weft traverse, that is to say, one retaining member at each end of the front and one at each end of the back weft. In the latter arrangement the two members for retaining the front weft are actuated by the front catch bar and the members retaining the back weft are actuated by the back catch bar. Further, when one, say the front weft, is being raised into the shed formed by the warp and bobbin threads, then the other or back weft is held in the retained position beneath the carriages.

In a modification as shown in Fig. 4 the retaining members are provided with noses 25 at their inner extremities and with noses 26 situate at a distance therefrom equal to the distance between the noses of the carriages 4, these noses being engaged by the catch bars the same as are the noses of the carriages. The members 19 are each formed with an extension 10<sup>a</sup> beyond the outer nose 26, said extension 10<sup>a</sup> acting as the retaining element for holding that portion of the wefts first laid below the carriages. In this arrangement the guide may be formed with a breast portion 19<sup>b</sup> and is actuated in conjunction with the carriages so as to travel simultaneously with them.

To prevent the weft threads retained by the members 19 from being drawn laterally towards the combs, by the said members as they are moved to their outer positions, an element such as the bent or offset wire 27 (Figs. 1 and 8) is fixed intermediate the thread and comb being supported by the angle bar 10 as represented in Figs. 1 and 8. The cranked part of the element 27 has a sliding engagement with a groove 28 in the face of the members 19.

The position of the wire element 27, that is, the distance to which same projects into the space intermediate the combs, controls the time of release of the weft thread from the retaining member 19.

In a modified method of carrying out this invention illustrated in Figs. 9 and 10 the weft thread carriers are in the form of vertically disposed plates 29 adapted to traverse upon a plurality, of horizontally disposed tubes 30, two of these being shown, supported within bearings carried by suitable brackets 31 secured to any convenient fixed frame member 32 of the machine. Each thread carrier 29 may be constructed of upper and lower flat portions 29<sup>a</sup> and 29<sup>b</sup> riveted together, the lower portion 29<sup>b</sup> being, at the junction between the two portions offset from the vertical plane of the upper portion 29<sup>a</sup>, so as to conveniently pass the upper supporting tube 30 the lower end of said upper portion constituting a downwardly extending tongue piece 29<sup>c</sup> which projects through a longitudinal slit formed in the

upper tube 30 where it is secured to a short core piece 33 of circular section adapted to slide axially along the tube interior. The lower end of the lower carrier portion 29<sup>b</sup> also projects into and slides along a slit in the lower carrier guiding tube 30. Eyes 34 are furnished on the carrier for guiding the weft threads 2.

The upper extremities of the weft thread carriers are located at a position below the carriages, and are adapted to be drawn along the tubes 30 to lay the thread 2 by any suitable means. In one method of traversing the carriers 29, a wire or equivalent flexible, but non-extensible, member 35 passes axially along the upper tube 30 and is secured to the sliding core piece 33. One extremity of the wire 35 is connected to the upper end of a lever 36 pivoted at its lower end to a fixed pivot 37 secured to a floor bracket or any convenient frame member of the machine, see Fig. 12. This lever 36 is caused to oscillate on its pivot by the rotation of a crank, eccentric or the like 38 through the medium of a connecting rod 39 pivotally connected to lever 36 at 40. This device effects a traversing movement of the carriers in one direction, the opposite or return traverse being effected by connecting the opposite extremity of wire 35 to a second pivoted lever 41 to which a spring 42 is attached. This spring draws upon the lever 41 and tends to keep the wire 35 taut. This traversing mechanism is also applicable for use in connection with the before described pivoted carriers 1.

The carriers 29, which are non-rotatable, lay the weft threads below the carriages, and after the shed has been formed and the carriages swung clear, such wefts are actuated to move upwardly into such shed. Suitable means for lifting the wefts comprises a plurality, say two, of vertical rods 43 arranged one at or near each end of the length of weft laid. The rods 43 are suitably guided to slide vertically, the vertical movements being effected as represented in Fig. 11 from a crank or eccentric 44 through connecting rod 45, oscillating arm 46 fixed upon rock shaft 47, second oscillating arm 48, and double link 49, the rod 43 being connected to said link 49, so as to be raised or lowered in accordance with the movement of the link. The upper extremity of each lifter 43 is formed with a branch 43<sup>a</sup> which constitutes with the main part of the rod a fork, said fork having a small cross piece 43<sup>b</sup> upon which the thread is adapted to be borne.

It will be understood that there may be any convenient number of weft thread carriers as above described and that any convenient lengths of fabric may be produced on the same machine at the same time.

Further it will be realized that by reason of laying the wefts below the carriages as



described not only is the speed of working increased but also the present danger of damage to the fabric and machine by reason of the carriers encountering the carriages 4  
5 or the points common to lace machines for beating up the weft threads is entirely eliminated.

Where rotatable carriers are employed, positive means may be furnished for rotating same from the normal to the traverse position.

The weft leaves the retaining members 19 prior to the end of travel of carrier.

I claim:

15 1. In a twist lace machine, the combination with carriages and means for moving them backward and forward, of pivotally supported weft thread carriers, traversing means therefor, and means for deflecting the carriers upon their pivots while being traversed, whereby they may pass below the paths of movement of the carriages as the latter move backward and forward.

20 2. In a twist lace machine, the combination with the carriages and means for moving them backward and forward, of pivotally supported weft thread carriers, traversing means therefor, means tending to hold the carriers in a substantially vertical position with their ends from which the weft threads are delivered above the paths of movement of the carriages as they move backward and forward, and means for deflecting the carriers into approximately horizontal positions during their traversing movements, whereby they may deliver their threads below the paths of movement of the carriages.

30 3. In twist lace machines pivoted weft thread carriers, traversing and guiding means therefor, deflecting members secured on the inner face of the comb bars for deflecting the carriers into a substantially horizontal position during traverse and springs for returning the carriers to a substantially vertical position after completing each traverse movement.

40 4. In twist lace machines, weft thread carriers, longitudinal slotted tubes for guiding same, carriages and means for moving them backward and forward, means for traversing the weft thread carriers, means for retaining the threads below the carriages during traverse, nonextensible members arranged within the said guiding tubes and connected to the carriers, pivoted oscillating arms connected with the said nonextensible member for causing the traverse of the thread carriers in one direction and springs also connected with the nonextensible member for causing the traverse of the carriers in the other direction.

50 5. In a twist lace machine, the combination of weft thread carriers, supports on which they are mounted, hollow slotted tubes by which the said supports are guided and

along which they are movable, non-extensible members arranged within the tubes and connected with the supports for the thread carriers, and means for moving the said non-extensible members to cause the thread carriers to be traversed. 70

6. In twist lace machines, weft thread carriers pivotally mounted on brackets, said brackets slidably located on rods, secured to the machine, a spring connecting the lower extremity of each carrier to an arm mounted on the corresponding bracket, angle members secured to the machine for deflecting and retaining the carriers in a horizontal position during traverse and means for eliminating shock to carriers when being deflected. 80

7. In a twist lace machine, pivoted thread carriers, means for traversing the carriers, the ends of the carriers from which the threads are delivered being located so as to introduce the weft threads between the warp and bobbin threads when at the ends of their traversing movements, means for deflecting the thread carriers while being traversed, means for automatically restoring the thread carriers to their normal positions on reaching the ends of their traverses, and shock absorbing means for acting on the thread carriers at the ends of their movement comprising for each thread carrier a pivoted arm carrying a pivoted spring-pressed catch with which the thread carrier engages as it approaches the end of its movement, the catch being free to move in one direction but rigid against movement in the other, whereby the carrier may freely pass the catch as it completes its traverse, but is caught thereby as it begins its return traversing movement, causing the pivoted arm to swing and deflect the thread carrier, and a buffer located beyond the end of the pivoted arm. 105

8. In a twist lace machine, the combination with the carriages, combs and means for moving the carriages backward and forward, of weft thread carriers, means for traversing the carriers in planes below the paths of movement of the carriages, and retaining means for the weft threads situated at each extremity of the traverse of a weft thread carrier, the said retaining means being directed and held by the combs and arranged to lie across the open space between the opposite combs to retain the weft threads below the carriages while they are being placed by their carriers. 115

9. The combination stated in claim 8 in which the thread-retaining means are formed with projections adapted to be engaged by the means that move the carriages. 125

10. In twist lace machines the combination with the carriages, the combs therefor, and means for moving them backward and forward, of weft thread carriers, guiding 130

means therefor, means for traversing the carriers below the carriages, thread retaining members, said members situated at each extremity of the traverse and conforming to the configuration of a truncated carriage with an extension thereto, said extension being arranged to lie across the space separating the opposite combs and retaining the weft threads during traverse of the carriers.

10 11. The combination stated in claim 8, including means for preventing the weft threads from being drawn laterally toward the combs as the said thread-retaining means

are moved from across the space between the combs.

12. The combination stated in claim 11 when the thread-retaining means are each formed with a groove and the means that prevent the weft threads from being drawn laterally consist each of a bent wire the end of which enters the groove in the thread-retaining means.

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Witnesses:

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