L. L. DE SEREVILLE.

MACHINE FOR MAKING NETWORK WITH SQUARE MESHES.

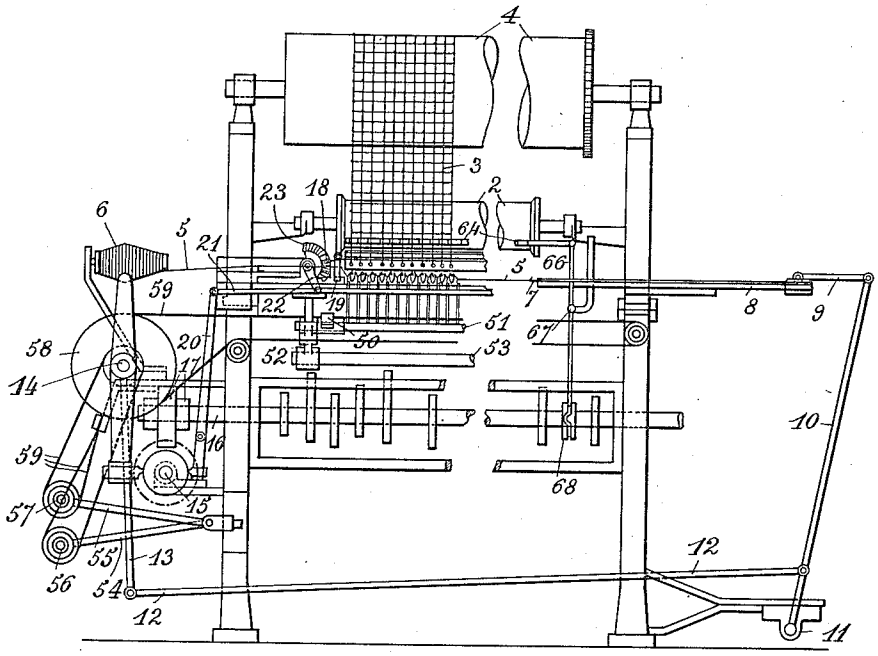
APPLICATION FILED APR. 26, 1912.

1,144,733.

Patented June 29, 1915.

3 SHEETS—SHEET 1.

Fig.1




Witnesses:
Waldo M Chapin
William C Lang

Inventor:
Léon Ligneau de Séréville
by
Rosenbaum & Stockbridge
Attys.

L. L. DE SEREVILLE.

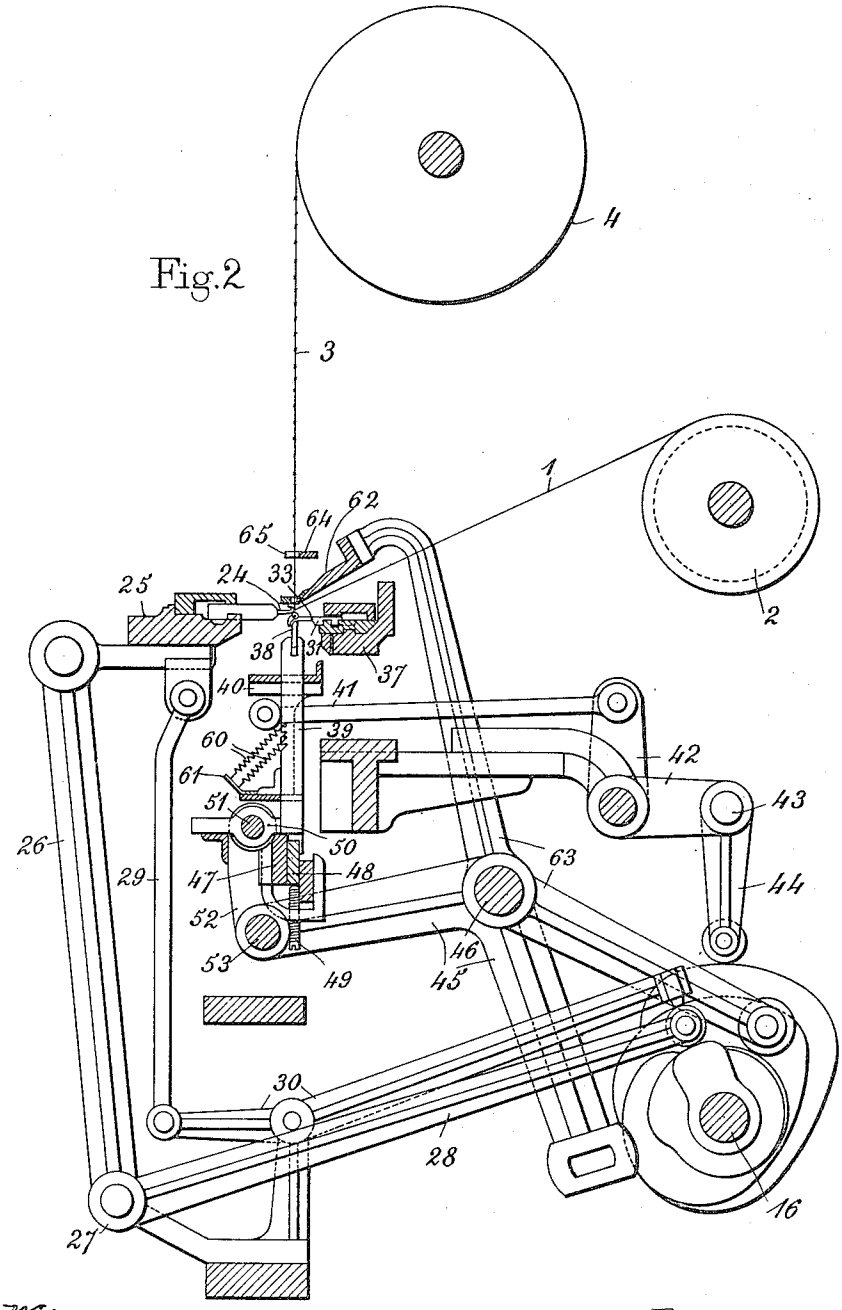
MACHINE FOR MAKING NETWORK WITH SQUARE MESHES.

APPLICATION FILED APR. 26, 1912.

1,144,733. Patented June 29, 1915.

3 SHEETS—SHEET 2.

Fig.2




Witnesses:
Walds M. Chapin
William C. Loy

Inventor,
Léon Lignau de Séréville
by
Rosenbaum & Stockbridge
Attys.

L. L. DE SERÉVILLE.

MACHINE FOR MAKING NETWORK WITH SQUARE MESHES.

APPLICATION FILED APR. 26, 1912.

1,144,733.

Patented June 29, 1915.

3 SHEETS—SHEET 3.

Fig.5

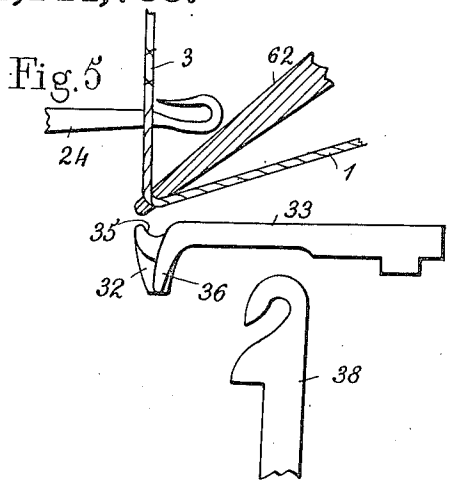



Fig.6

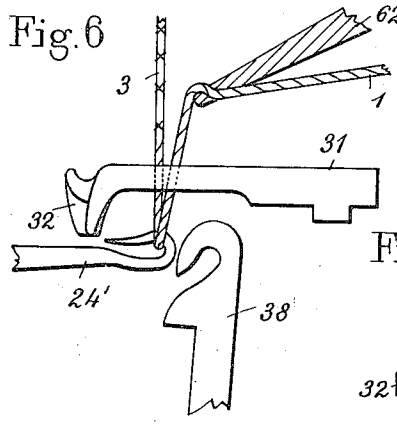



Fig.7

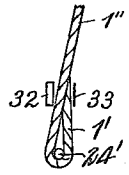



Fig.9

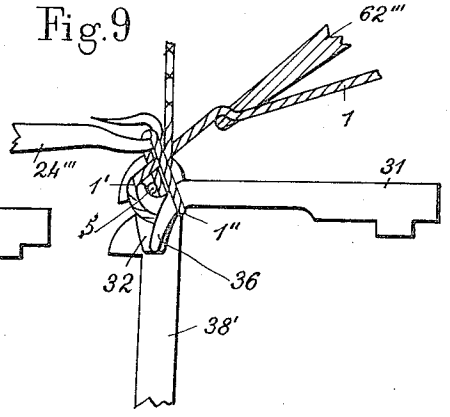
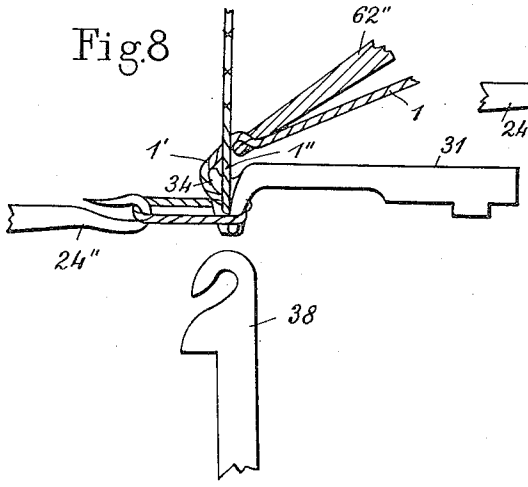



Fig.8



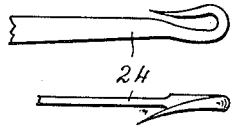




Fig.3

Fig.10

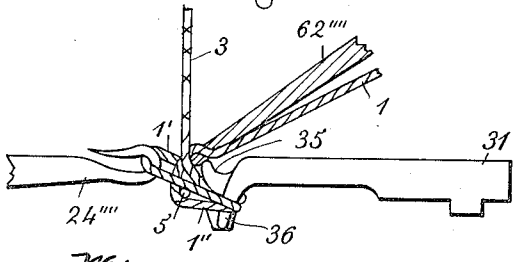
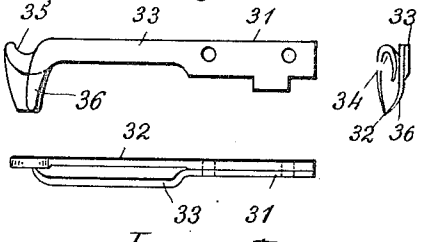



Fig.4




Witnesses:
Waldo M Chapin
William C Leng

Inventor,
Léon Ligneau de Séréville
by
Rosenbaum & Stockbridge
Attys.

# UNITED STATES PATENT OFFICE.

LÉON LIGNEAU DE SÉRÉVILLE, OF PARIS, FRANCE.

## MACHINE FOR MAKING NETWORK WITH SQUARE MESHES.

1,144,733. Specification of Letters Patent. Patented June 29, 1915.

Application filed April 26, 1912. Serial No. 693,330.

*To all whom it may concern:*

Be it known that I, LÉON LIGNEAU DE SÉRÉVILLE, citizen of the French Republic, residing at Paris, in the Department of the Seine, France, have invented certain new and useful Improvements in Machines for Making Network with Square Meshes, of which the following is a specification.

Network as made at present, whether made by hand or mechanically, consists of a number of lozenge shaped knotted meshes. Network manufactured by hand is solely obtained by using a single thread called the "weft thread", whereas the mechanically made article can be obtained either by means of a single weft thread or by means of a certain number of warp threads and as many weft shuttles as there are meshes. This network with knotted lozenge-shaped meshes whether manufactured by hand or mechanically principally serves for fishing purposes. It is also employed on a small scale for the decoration of furniture or for embroidery work, but for this purpose, and this has prevented its more general adoption, the meshes must be square. Consequently artificial means have to be employed for treating the network for these purposes, for example by cutting out square pieces in a network with lozenge-shaped meshes and by firmly dressing, sizing or starching these square pieces while stretching them, so as to transform while stretching them, so as to transform the lozenge-shaped meshes into square meshes. The disadvantage of this kind of network called "square mesh" is that after a certain time the action of the dressing fails for various reasons, the meshes of the nets reassume their original lozenge shape which destroys the effects formed on the nets when the dressed meshes were square.

This invention has reference to a novel product and the method of obtaining the same, this product consisting of a network with crocheted and knotted meshes absolutely and naturally square, the square construction of the meshes being obtained directly without artificial means during the mechanical manufacture of this new network, the constructive principle of which consists in employing for the manufacture of the said square meshes, a number of warp threads equal in number to that of the meshes to be obtained in width with a single weft thread. The process for obtaining this new product can be effected by suitable mechanical arrangements utilizing particularly certain parts similar to those employed in the existing machines for forming network with lozenge-shaped meshes and employing a single weft thread.

I shall now describe my invention with reference to the accompanying drawing showing for the sake of example a mechanical arrangement permitting of producing a network with crocheted and knotted meshes absolutely square, in which:

Figure 1 diagrammatically shows a front elevation of the essential and principal parts of the machine. Fig. 2 is a cross section on an enlarged scale. Figs. 3 and 4 show details of the different hooks employed. Figs. 5–10 show the various principal phases in the production of a square mesh.

In this machine described for the sake of example, as well as in any other arrangement for the production of network with square meshes by means of a certain number of warp threads and a single weft thread, the essential parts are those aiding in the formation of these square meshes and having various movements with respect to each other occurring in a definite order, these movements being obtained by any suitable mechanical means.

Referring to Figs. 1 and 2 the warp threads 1 are wound on to a drum 2 or can be separately wound on spools arranged on a rack or support situated at the back of the machine. The network 3 with square meshes is wound as it is produced on to a drum 4. These two drums 2 and 4 are each intermittently rotated in the known manner by known means for the purpose of feeding the necessary warp thread for the formation of the network as well as for rolling up the network manufactured. The weft thread 5 coming from a spool 6 is passed through the meshes in a similar manner to that usual in machines manufacturing network with lozenge-shaped meshes, that is to say by means of a needle 7 consisting of a steel rod inclosed in a sleeve 8 and actuated by a connecting rod 9 and a lever 10 turning on the pivot 11. A connecting rod 12 connects the lever 10 to the lever 13 pivotally mounted on the shaft 14, the lever 13 being actuated by an eccentric fitted to the cross shaft 15, turning at the same speed as a cam shaft 16, by intermediation of a helicoidal gear

17, the cam shaft 16 controlling in their order the various movements of the parts essential to the formation of the square meshes. The end of the weft thread 5, which is cut after the formation of each row of square meshes, is attached to the end of the needle 7 by means of a device somewhat similar to the weft-feed devices also used in machines for producing network with lozenge-shaped meshes, in order to pass the uncut weft thread around the hook of the needle. This is effected in the present case by causing the needle 7 to enter a hole formed in the axis of the sectional pinion 18. The weft thread 5 which passes in the same pinion but through another eccentric hole having its end held beneath a fixed spring 19. By intermediation of a lever 20, of a connecting rod 21 and of a crank 22, the toothed sector 23 drives the pinion 18, which, on being rotated, causes the winding of the weft thread 5 around the back of the needle 7 and its engagement in a beveled slot sufficing to assure the passage of the weft thread through the meshes being formed in the return of the needle 7 into its sleeve 8. On each side of the selvages of the network, knives are arranged operated by any suitable means, which cut the weft thread, the end of which belonging to the spool 6 is held beneath the fixed spring 19, any system removing the small piece of weft thread from the end of the needle 7 and remaining there after having been cut.

The necessary essential parts for the formation of square meshes are:

1. The needles 24 shown in detail in Fig. 3. They are arranged horizontally in one row in a bar or fitting 25 which can be moved horizontally and vertically, the combination of both its movements enabling the needles to occupy the desired position at any moment. The horizontal movement of the needles 24 is effected by a lever 26 pivoted at 27 and a lever 28 actuated by the cam shaft 16. The vertical movement is effected by a connecting rod 29 actuated in similar manner by an angle lever 30.

2. The spring hooks 31 each consisting of two parts 32 and 33 shown in detail in Fig. 4. The part 32 has in front a groove 34 and a notch or recess 35, the groove serving to house one of the portions of the loop formed by the warp threads 1, as shall hereinafter be explained, the notch being intended for the passage of the needle 7. The part 33 is formed by a spring blade, the point 36 of which presses against the part 32. These hooks 31 are arranged in a line parallel to the row of hooks 24 and are mounted on a bar or fitting 37 rigidly attached to the frame of the machine.

3. The draw hooks 38 which are presented equally in a line parallel to that of the hooks 24 and the spring hooks 31. These draw hooks 38 are each fastened to bars or plates 39 held between the teeth of a kind of comb 40 which permits the horizontal and vertical displacement of the hooks 38. These displacements are effected for the horizontal movement by means of a connecting rod 41, an angle lever 42 pivoted at 43 and another connecting rod 44 raised by the cam shaft 16; the second or vertical movement is obtained by means of an angle lever 45 pivoted at 46 and raised by the cam shaft 16. This lever 45 does not directly lift the bars 39 of the hooks 38 but lifts an arrangement of parts upon which rest the said bars 39, and are constituted by a bar 47 and a counter-bar 48, the height of which can be regulated by threaded rods 49, so as to obtain a variable height of the descent of the hooks 38 and of their bars 39. This descent or drop of the hooks is assured by means of a thrust device 50 moved to-and-fro along the bars 39 which it unhooks from the bar 47 on to the counter-bar 48 as it moves along its course. The displacement of this thrust device 50 is obtained by means of a guide 51 carried by arms 52 pivotally mounted on a bar 53 and of a set of levers 54—55 operated by eccentrics mounted on the shaft 15 which by alternately lowering the pulleys 56 and 57 causes a disk 58 to rotate in one direction or the other and consequently the displacement of the cable 59 to one part of which is fastened the thrust device 50. The drop of the bars or plates 39 on to the counter-bar 48 is effected by means of springs 60 fastened to one end of the bars 39 and at the other end to a bar 61 running along the bars 39 and attached at its ends to the frame of the machine.

4. The warp bar 62, preferably of triangular section and provided with openings through which the warp threads 1 are passed. This warp bar 62 can be moved so that it can be moved forward or drawn backward, this movement being assured by mounting this bar 62 near its ends on angle levers 63 pivoted at 46 and driven by the cam shaft 16.

5. The disengaging bar 64 which after the formation of the square meshes permits of disengaging the portions of loops so as only to allow a definite portion of each loop to engage in the grooves 34 of the spring hooks 31. This bar 64 is provided with a number of teeth 65 corresponding to the number of warp threads, which cause it to resemble a saw-blade with large teeth. It has a slight alternating movement obtained by means of a connecting rod 66 pivoted at 67 and by a grooved cam 68 keyed to the cam shaft 16.

By a combination of the five essential parts above described as well as by their cooperation in definite order the network with knotted and square meshes is obtained directly by connecting together the warp

threads with the weft thread in accordance with a special method of connection. This construction of the meshes resulting from this combination of the essential movements of the parts is shown in Figs. 5 to 10 and is effected as follows: When the weft thread 5 has just been knotted and the drum 4 has wound on a certain quantity of network 3, the said weft thread 5 is situated slightly above the level of the hooks 24 (Fig. 2). The latter are then moved forward and pass between the warp threads 1 (Fig. 5) stretched between the last row of meshes of the network 3 and the openings of the warp bar 62, the summit of the triangular section of which forms a beak. This passage of the hooks 24 being terminated the warp bar 62 draws back to occupy the position 62′ (Fig. 6), thereby causing the warp threads 1 to engage with the hooks 24 owing to their slightly twisted point (Fig. 3). The said hooks 24 then drop so as after having passed between the parts 32 and 33 of the spring hooks 31 to occupy the position 24′ (Fig. 6), the warp threads forming loops as shown in Fig. 7 between the parts 32 and 33 of the spring hooks 31 presenting the small pieces 1′ and 1″ which lie in the same plane, and therefore the piece 1′ will be concealed for the greater portion of its length. Starting from the position of Fig. 6, the needles 24 are drawn to the front of the machine, so that the lower points of the spring hooks 31 are between the two small portions 1′ and 1″ of the loops formed with the warp threads 1. The warp bar 62 is also drawn to the front so that the small portions 1′ are pushed beneath the grooves 34 of the spring hooks 31, the small portions 1″ resting free between the parts 32 and 33 of the spring hooks 31, owing to the lateral displacement of the warp threads by the disengaging bar 64. The warp bar 62 then draws backward to occupy the position 62″ (Fig. 8). One thus obtains the interlacing shown in Fig. 8. The needles 24 previously drawn to the front then effect a raising movement so as to occupy the position 24‴ (Fig. 9). The catch or draw hooks 38 are at this moment raised up so as to engage at 38′ between the spring hooks 31 (Fig. 9) so that in this position the openings of the said hooks will coincide with the notches 35 of the spring hooks 31, thereby forming a passage through which passes the needle 7 which seeks the weft 5 and draws it back by means of the parts referred to above. As soon as the needle 7 has returned into its sleeve 8, the bars 39 are all successively pushed to the back by the passage of the thrust device 50 and will then rest on the counter-bar 48. By this displacement the hooks 38 pull the weft thread 5 which has just passed so as to take the necessary quantity of thread for the width of each mesh, a quantity which may be variable owing to the regulation of the drop of the bars 39 by the counter-bar 48 and the screws 49. When the weft is thus caught, presenting a broken line visible in Fig. 1, the warp bar 62 again advances to occupy the position 62⁗ (Fig. 10) while at the same time the needle 24 occupies the position 24⁗ (Fig. 10). In this movement the weft threads are disengaged from the draw hooks 38. The needles 24 continuing to descend, all the threads which interlace the hooks 31 at their lower portions are released and only the needles 24 remain engaged in the meshes, where for their part they are released by a raising and forward movement under the warp bar 62, which forces the loops forming the knots of the meshes to be tightened up on the said bar 62.

The drum 4 winds up so as to bring the network into the position Fig. 5 and again permits the needles 24 to pass between the warp threads stretched above the warp bar 62, and to commence a new row of meshes.

The meshes can be obtained of different dimensions and can if necessary be rectangular by varying the displacement of the drum 4 and the height of the fall of the hooks 38 and 39 of the weft thread.

With this method of directly manufacturing network with square meshes it is possible to obtain squares of network with square meshes, with double or reinforced selvages, or even network with square meshes with lines of different color either in the weft or in the warp thread or in both together so as to obtain a kind of Scotch effect, these combinations being obtained by means of a weft feeder with several threads.

It is obvious that various modifications and ramifications of the details of construction may be effected, and a network with square meshes produced, and it is intended that such structures shall come within the scope of the present invention as set forth in the appended claims.

Having now particularly described and ascertained the nature of my said invention, I declare that what I claim is characterized:

1. A machine for weaving rectangular meshed netting having firm knots comprising a plurality of movable parts and stationary spring hooks, said parts including a warp bar having a plurality of openings through which the warp threads pass and hooked needles, a cam shaft, means for moving said needles and warp bar for forming loops in the warp threads around said spring hooks, said means including cams on said shaft, a needle for drawing the weft strand through the loops so formed, means for controlling said needle controlled by said cam shaft, a draw bar for engaging with the weft strand intermediate the loops said draw bar coöperating with said spring hooks to form a guiding means for the needle carry-

ing the weft thread, and means for actuating the draw including a cam mounted on said cam shaft.

2. A machine for weaving rectangular mesh netting having firm knots, comprising rolls having an intermittent motion, the warp strands being wound on one of said rolls and the completed net on the other, a warp bar having apertures therein through which the warp strands pass, movable needles for engaging said strands, stationary spring hooks, means for moving said warp bar and needles for forming a loop around said hook, means for passing a needle to which the weft thread is secured through the loop so formed, and movable draw bars engaging with said weft strand intermediate the loops, said draw bars coöperating with said spring hooks to form a guiding means for the needle carrying the weft thread.

3. A machine for weaving rectangular meshed netting having firm knots comprising rolls, warp strands being wound on one of said rolls and the completed net on the other, a warp bar having apertures therein through which said warp strands pass, movable hooked needles for engaging said strands, stationary spring hooks, means for moving said warp bar and needles for forming loops on said hooks, a movable needle for passing the weft strand through the loop so formed, movable draw bars for engaging said weft strand intermediate said loops, said draw bars coöperating with said spring hooks to form a guiding means for the needle carrying the weft thread, and means for moving said draw bars, the further movement of said needle and said warp bar disengaging knots from the stationary hooks.

4. A machine for weaving netting in square meshes and having firm knots, comprising a plurality of stationary spring hooks, a warp bar having a plurality of openings therein through which the warp threads pass, a plurality of hooked needles, means for moving said hooked needles and warp bar to form loops in the warp threads around said spring hooks, a needle for drawing the weft thread through the loops so formed, movable draw bars having hooked upper ends for engaging said weft threads intermediate the warp threads, said spring hooks having recesses therein coöperating with the hooked portions of said draw bars to form the guiding means for the needle carrying the weft thread, and means for actuating said draw bars.

5. A machine for weaving netting in square meshes and having firm knots, comprising a plurality of stationary spring hooks, a warp bar having a plurality of openings therein through which the warp threads pass, a plurality of hooked needles, means for moving said hooked needles and warp bar to form loops in the warp threads around said spring hooks, a needle for drawing the weft thread through the loops so formed, movable draw bars having hooked upper ends for engaging said weft threads intermediate the warp threads, said spring hooks having recesses therein coöperating with the hooked portions of said draw bars to form the guiding means for the needle carrying the weft threads, and means for actuating said draw bars, said means for actuating said warp bars, hooked needles, and draw bars, comprising a single shaft and a plurality of cams carried thereby engaging with a plurality of levers respectively connected to said warp bar, hooked needles and draw bars.

6. A machine for weaving netting in square meshes having firm knots, a stationary spring hook having spaced fingers and a hooked portion on the end of one of said fingers, a warp bar having an aperture therein through which the warp thread passes, a hooked needle and means for imparting a movement to said needle and warp bar to cause said hooked needle to engage the warp thread, carry it down between the fingers of said spring hook in the form of a loop, engage one side of said loop on the hooked portion of said spring hook, carry the end of the loop up over the end of said spring hook to form an eye in the warp thread, means for passing a weft thread through the eye thus formed, a draw bar having a hook engaging said weft thread and means for moving said draw bar to cause a definite length of weft thread to be interposed between two warp threads, said means for moving the hooked needle and warp bar thereafter carrying these parts to a position to cause the warp thread to disengage from the spring finger and tighten the knot formed around the weft thread, and means for moving said draw bar to disengage it from the weft thread.

In testimony whereof I affix my signature in presence of two witnesses.

LÉON LIGNEAU DE SÉRÉVILLE.

Witnesses:
CHARLES AILIR,
LUCIEN CRESPIN