

C. & A. RENARD.  
POWER LOOM FOR WEAVING ORIENTAL AND OTHER KNOT STITCH CARPETS.  
APPLICATION FILED FEB. 2, 1911.

1,164,117.

Patented Dec. 14, 1915.

4 SHEETS—SHEET 1.

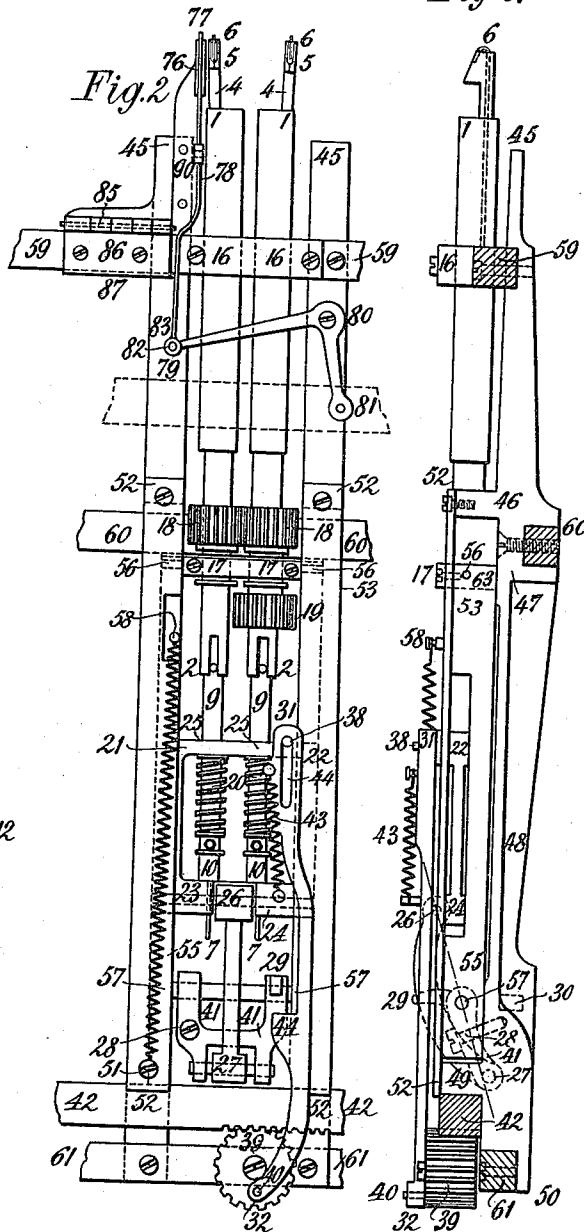
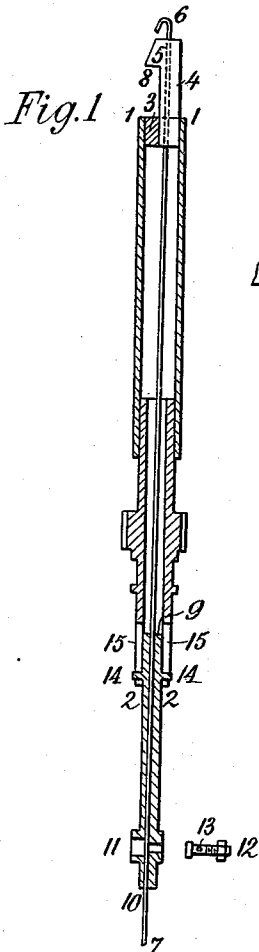
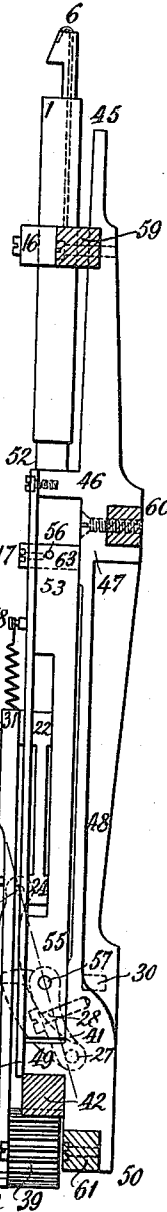


*Fig. 3*



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Fig. 4.

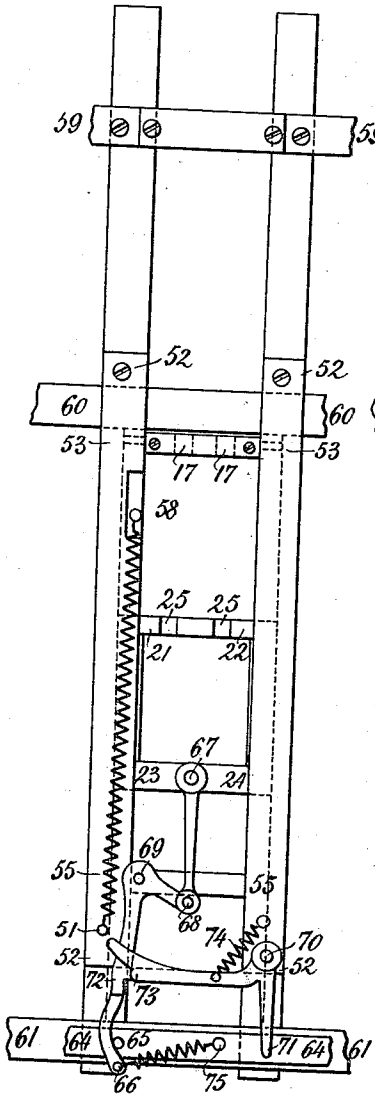


Fig. 5

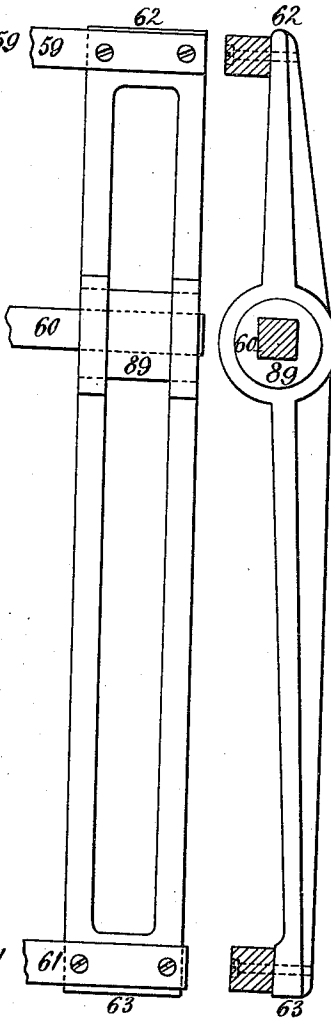


Fig. 6.

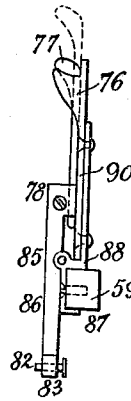


Fig. 7.

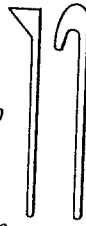
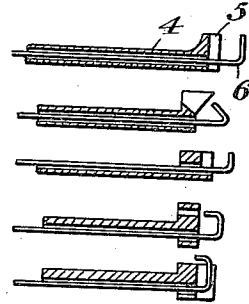


Fig. 5<sup>a</sup>

Fig. 8.



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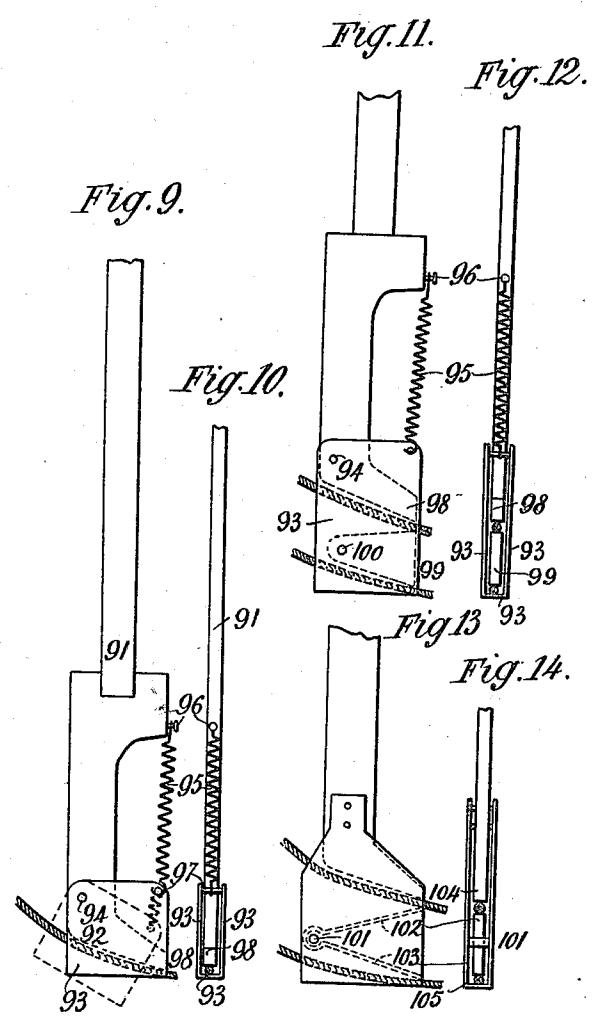
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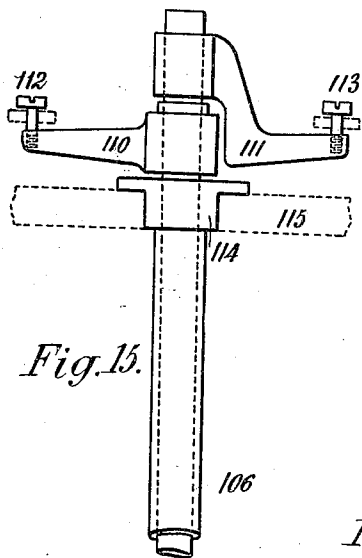


Fig. 15.

Fig. 17.

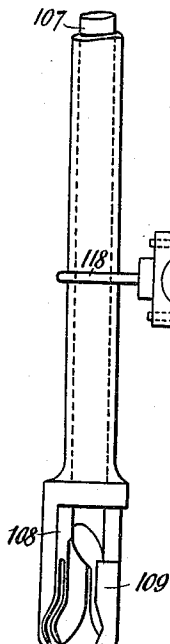


Fig. 16

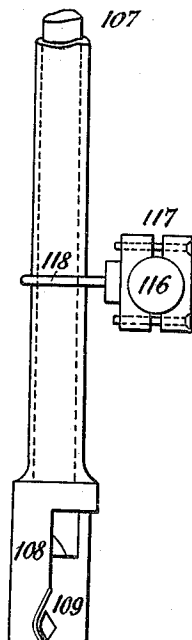


Fig. 18.



Fig. 19. Fig. 20. Fig. 21.

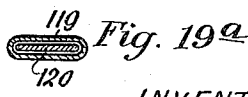
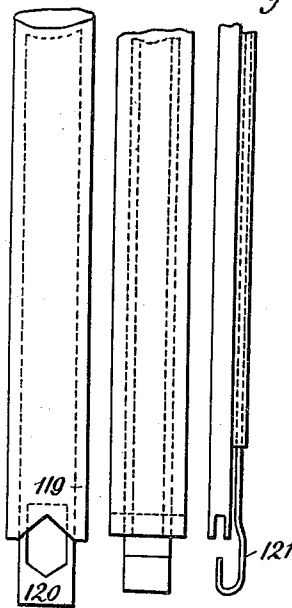


Fig. 19a

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# UNITED STATES PATENT OFFICE.

CHARLES RENARD AND ALBERT RENARD, OF NONANCOURT, FRANCE.

POWER-LOOM FOR WEAVING ORIENTAL AND OTHER KNOT-STITCH CARPETS.

1,164,117.

Specification of Letters Patent.

Patented Dec. 14, 1915.

Application filed February 2, 1911. Serial No. 606,143.

*To all whom it may concern:*

Be it known that we, CHARLES RENARD and ALBERT RENARD, citizens of the Republic of France, residing in Nonancourt, Eure, France, have invented certain new and useful Improvements in Power-Looms for Weaving Oriental and other Knot-Stitch Carpets, of which the following is a specification.

Our invention relates to power looms for making oriental, Persian, wound and other knot-stitch carpets.

The improvements do not in any way alter the principles and processes described in the specifications of United States Patents No. 894,287 of July 28, 1908, and No. 969,565 of September 6, 1910, and which are as follows: The distribution of the pile thread by a distributor having its blades or strips extending to the center of distribution; by the nippers which seize the pile thread, draw it and keep it in tension; by the action of the two warp threads which are lifted together or separately, separated one from the other, raised up to the under side of the pile thread in tension at first by the divider and afterward by the looping or knotting tool as soon as they are free of the divider; by the intervention of the looping tool which unites the two warp threads with the pile thread, seizes the latter, draws it along, loops it and locks it; by the cutting of the pile thread, by the suspension of the knotters and their double oscillation, and by the automatic locking of the stitch. The result of this combination of operations is, that at a given moment for the execution of a stitch there are united at the distribution center the distributor, the distributing nipper, the pile thread, the cutters, the two warp threads and the nippers of the looping tool, which union of parts constitutes an encumbrance shown in the drawings of the said specification No. 894,287 of 1906. Otherwise there is no other objection but the restriction of the number of knotters which can be placed one beside the other in the width of a loom.

The present invention has for object (1) in no way to modify the principles and processes described, nor the function of the parts, but to reduce to the minimum the encumbrance which they may cause and consequently to arrange a larger number of knotting apparatuses upon a single loom; (2) at the same time to perfect the knotting of the stitches, that is to say, to obtain an

equality of length of each thread of the knotted stitch, and a regularity of its locking and also to prevent the failure of stitches in the carpet; which conditions can only be realized so far as in each operation of distribution, nipping, cutting and knotting, the ends of the pile threads are firmly held and also directed and placed in a precise manner.

In the accompanying drawings which illustrate our improvements, Figure 1 is a longitudinal section through one of the tubes; Fig. 2 is a top view of a pair of grippers and operating devices therefor and a frame in which they are mounted; Fig. 3 is a side view of Fig. 2; Fig. 4 is a face view similar to Fig. 2, of another mechanism embodying the invention; Figs. 5 and 5<sup>a</sup> are respectively a face view and a side view of a frame for carrying a pair of grippers and their operating mechanism; Fig. 6 is a side view of the cutting device of Fig. 2; Fig. 7 shows in side view other shapes of cutting blades; Fig. 8 shows in central longitudinal sections other shapes of tubes and hooks than those of Fig. 1; Figs. 9 and 10 are respectively a front and a side view of a pile thread distributing device; Figs. 11 and 12 are similar views of another construction thereof; Figs. 13 and 14 are similar views of still another construction thereof; Fig. 15 is a face view and Fig. 16 an end view of another style of gripper, in open position; Figs. 17 and 18 are similar views of the same in nearly closed position; Figs. 19 and 19<sup>a</sup> are respectively a face view and a transverse section of another style of gripper; Figs. 20 and 21 are respectively a face view and an edge view of still another style of gripper.

Fig. 1 shows a section taken through its axis of one of the modified tubes 1, 2, of the looping device. It contains no inner tube and it is closed at 1 by a plug 3 in which is fixed the guide 4 and the end of which forms a sheath 5 in which is inserted the hook 6, the stem of this hook extending from 6 to 7. At the same time this arrangement forms the shoulder 8 designed to hold the two warp threads in the knotting operation. At the other end, at 2, there enters with slight friction a tube 9, 10 on which are two opposed pins 14, 14 which enter slots 15, 15 made to receive them so that the tube 1, 2 can carry along the tube 9, 10 in its rotary movement but leaves it free to perform its

backward and forward movements in the direction of the length of the slots, which correspond to the opening and closing of the gripper formed in this system by the hook 6 and the sheath 5. To this end the stem of the hook 6, 7 passes into the tube 1, 2 and through the tube 9, 10 and is fixed to the latter at 11 by the bolt (shown at 12 removed from its apertures) by passing into the hole 13 made flush inside with the head of the bolt in order that on tightening the latter the stem may be firmly held between the head of the bolt and the side of the tube. To place the bolt 12 a ring is brazed upon the tube near its end 10. It is slotted as shown in the drawing thus allowing of obtaining a firm locking of the stem of the hook between the head of the bolt and the inner side of the tube. Any holding means can be used which provides for firmness in fixing and facility in adjusting the hook.

Fig. 2 shows a top view of the looping device, the two tubes 1, 2, 1, 2, their guides at 16, 16, 17, 17, and the pinions 18, 18 gearing together and fixed on the said tubes. The tubes can be actuated by the pinion 19 fixed on one of the tubes; all the pinions 19 being operated by a common rack located above them (not illustrated) or by any other suitable means. Compressed springs 20, 20 are arranged between the parts 21, 22 and 23, 24, which constitute what may be called a small carriage. The passing of the ends of the hook-stems 6, 7 through the side 23, 24 insures their direction and at the same time that of the tubes 9, 10, 9, 10 which are guided at their other end by entering the tubes at 2, 2 and are held in bearings 25, 25 in the cross bar 21, 22; the upper ends of the springs 20 bearing against suitable washers interposed on the under sides of the bearings 25.

Fig. 3 is a side view of the looping device the drawing of which has been limited to the members there shown in order to render the description more clear. On the two projections 46 and 49 of each side of the frame 45, 46, 47, 48, 49, 50 there is fixed by screws a plate 52, 52 of a width equal to the thickness of the sides of the frame, a free space being left between said plates and the sides of the frame (in height) and between the projections 46 and 49 (in length) in which slides the large carriage 53, 55; the sides of this large carriage having recesses in which lie the sides 22, 24 of the small carriage. The two sides of the large carriage are connected together by the piece forming the bearing 17, 17 by means of the two pins 56, 56 which are riveted therein; at the other end the small shaft 57, 57 also forms a tie-bar and its ends are riveted in the two sides of the carriage; this carriage bears upon the projections 49 of the frames under the action of the spring fixed at one end to the

frame at 51 and at the other end to the carriage by the pin 58 which can move backward and forward in the recess at this place in the plate 52, 52 and allow the free sliding movement of the large carriage from the projection 49 to the projection 46. For this movement it is only necessary to overcome the force of the spring 58, 51 in the contrary direction.

Figs. 2 and 3 show the frames of the looping device connected by the bars 59, 59, 60, 60, 61, 61 by slotted and screwed parts in order to form a strong frame. These figures also show the small carriage 21, 22, 23, 24 connected to a bent rod, attached by a pin 26 to the small carriage and by a pin 27 to a piece 41, 41, rocking upon the shaft 57, 57 which rocking movement can be limited by a screw 28 which for its regulation abuts against a projection 30 fixed on the inner side of the left hand frame of the looping device; finally at 29 it has a projection which serves as a stop to the rocking movement as will be hereinafter explained. A rod 31, 32 connects the small carriage, by means of the pin 38 to the pinion 39 on which is fixed the pin 40. The pinion is held by a screw forming a shaft screwed in the lower bar 61, 61 of the frame. The pinion is actuated by a rack 42, 42 which receives its to and fro movement from a cam and lever upon the side of the loom so that this movement is transmitted to the pinion, to the rod, and, finally to the small carriage which, actuating the hook 6, 7, causes the opening and closing of the grippers 5, 6. After the grippers have gripped the yarn they are pulled through the warp in the manner usual in this class of machines by pulling back the gripper-carrying frames. In this movement the small carriage 22, 24 bears against the top of its recess in the large carriage 53, 55 and the latter yields as far as may be necessary; being always pulled backward by its spring 51, 58. We would add that in Fig. 2 the tubes of the looping device are represented in parallel directions; however, the operations above described are not interfered with if the tubes are convergent, and they can be thus arranged.

Finally in Fig. 8, several examples of different kinds of hooks and tubes forming the sheaths show that their possible arrangements and combinations are many.

Different mechanical means from those hereinbefore described may cooperate to the same ends. Thus for example, Fig. 4 shows another system for holding the small carriage for closing the grippers and which also effects their automatic opening by the drawing of the knot; the same bar, tubes, hooks, pinions, springs 58, 51 are employed; and even the same small carriage except on the side 23, 24 wherein is fixed the pivot 67;

and the same large carriage, but upon the cross bar which unites its two sides 55, 55 is fixed the pivot 69. These two pivots 67 and 69 as well as a pivot 70 fixed upon the plate 52, 52, are perpendicular to the planes of the carriages. Upon the pivot 69 rocks a lever 66, 68 connected to the small carriage by the connecting rod 68, 67. It is actuated by the spring 66, 75; upon the pivot 70 rocks a lever 71, 73 the play of which is limited by coming against the stud 51 to which the spring 51, 58 is attached. It is actuated by the spring 74. The part 72 forming a notch is made on the lever arm 66, and forms a projection at the top; the lever arm 73, forms a projection below so that these levers can rock one above the other; but when the projection 72 strikes against the projection 73 there is a blocking of the lever which brings about that of the small carriage corresponding to the closing of the grippers. This blocking is produced by the movement of the plate 64, 64; the pin 65 acts upon the lever 66, 68, which pulls on the rod 68, 67 and brings the small carriage to close the grippers, and at the same time causes the lever 73, 71 to be drawn under the action of the spring 74 and the two projections 72, 73 meeting causes the block, then under the sliding action of the large carriage at the locking of the stitch the stop 72 will slide upon the projection 73 and will be disengaged therefrom; the plate 64, 64 meanwhile accomplishing its return movement will have disengaged the stop 65 and stretched the spring 66, 75 so that the opening of the grippers does not meet with any impediment and is effected suddenly under the action of the spring 66, 75. In cases where (by reason of the failure of a stitch) the sliding of the carriage shall not take place, the stop 75 acting upon the arm 71 of the lever 71, 73 will cause it to rock upon the pivot 70 and will disengage the projection 73 thus effecting the opening of the grippers.

In the two mechanisms for opening and closing the grippers which have just been explained no member extends beyond the frames of the looping devices and their number can thus be increased. On the other hand the side frames of the looping devices are only occupied for half of their width and become common from one looping device to the other without any loss of space, and thus allow the largest possible number of looping devices in the width of the loom. It should be understood that their number varies according to their proper dimensions which are in relation to the size of the materials entering into the manufacture of the knot-stitch carpet.

We will now describe the method of suspending the knotters: In Fig. 5 is shown a piece 62, 89, 63 forming an open frame and

receiving the bar 60 in a tube 89, the bars 59 and 61 being fixed by screws respectively at 62, 63. The suspension is effected in the middle of the frame by the tube 89 forming a rock shaft, the piece 62, 63 supporting at once the axis and the bars of the looping devices of the loom. A like arrangement is provided at each end of the bars connecting all the looping tools of the same loom. The means for cutting the pile thread consists of cutters of suitable shape arranged to cut the pile thread to the required length between the gripper and the distributor at the moment following the seizure of the pile thread by the grippers of the looping device. This cutting means is arranged as shown in top view near the looping tool at Fig. 2 and in side view and detached from the looping tool at Fig. 6. It consists of a lever 81, 79, rocking upon its center or pivot 80 fixed to the frame 45 receiving its to and fro movement at 81 through the plate shown in dotted lines which is itself operated by a lever and cam upon the side of the loom, the said plate actuating the cutters of all the looping devices of the loom at the same time. This to and fro movement is transmitted by the pin 82 to which is connected the eye 83 of the bar 83, 78 on which is fixed the cutting blade 77, the latter being held upon the bar by any suitable method of fixing. The whole can be easily dismantled in order to allow a prompt replacement of a blade or its prompt sharpening. A sheath 76 mounted at 90 upon the frame holds the blade 77 between its two sides at its end 76. The forms of the sheath may have any useful modifications; the blade itself may have any cutting angle up to that of the form of a hook in Fig. 7. The blade being thin it is preferable to operate it by a pulling action as above. Arrangements either for actuating the sheath, or the sheath and blade at the same time, may also be employed, the blade being operated by either a pushing or a pulling action. There is a peculiarity in this system of adding a cutter to the looping devices which is that the sheath and the cutter bear upon the warp and the pile of the carpet and form an obstacle to the lowering of the grippers of the looping tool at the moment when they ought to closely approach the warp of the carpet and the knotting line in order to effect the locking of the knot, which movement of approach should be greater as the pile is shorter. With the object of avoiding this obstacle the sheath instead of being fixed at 90 is fixed at 86 on the bar 59, 59, and its attaching piece is made in the form of a hinge 85 about which it is rocked by the pile of the carpet when the grippers of the looping tool are lowered for the locking of the knot. This rocking is always of slight extent, and the sheath and the blade may resume their normal position

by their own weight. The hinge is provided with flanges 87 and 88 in order to fix it more securely on the bar 59.

The distribution of the pile threads is as follows: The distributing blades of the pile thread which bring it to the distributing center are illustrated in Figs. 9 and 10. This distributing blade is of any suitable construction at the part 91, but at its lower part 92 it is incased in a movable U-shaped guide 93. This guide rocks upon the axis 94 and is held on the point 98 of the blade by the tension of the spring 95 fixed upon the movable guide 97 and on the blade at 96. The open position of this guide, indicated by the dotted lines in Fig. 9, shows the facility which it gives for providing each blade with its pile thread and also the facility for controlling the tension on the pile thread by the spring 95. Another improvement is the provision of distributing blades for a number of pile threads.

The movable guide shown in front elevation at Fig. 11 and in side elevation at Fig. 12 has its center of oscillation at 94 and its spring 95, but in this guide is placed a piece 99 having its center of oscillation about a pin 100 fixed upon the two sides of the movable guide. One of the pile threads passes into the guide above the piece 99, and the other beneath, and both are held at the same time by the tension of the spring 95. The distributing operation of these multiple threads by the blade of the distributor is effected on the loom by the jacquard which lowers the blade and at the same time actuates a stop piece in such a manner that the blade presents one or the other thread at the height of the distributing gripper. The intermediate piece 99 can be repeated in a longer movable guide and the number of threads can thus be multiplied. Another system of blades for a plurality of pile threads is represented by Figs. 13 and 14. The guide is of similar construction but is no longer movable but is fixed upon the blade. Traversing the two side walls a pin 101 supports the spring 102, 103. This spring gives at 104 and 105 the required pressure for regulating the tension for holding back the pile threads. This system can also be repeated to give several other threads and is operated, like the preceding system, by the jacquard to present its different threads at the height of the distributing gripper. The distributing gripper is characterized by its jaws having penetrating partitions or the like which provide means for a firm retention of the pile thread; and by its length, which allows of placing its center of oscillation above the encumbrance of the mechanism and outside the network of threads extending to the distributor. The small space which it occupies under these different conditions facilitates the

multiplicity of the apparatus in the width of the loom.

Fig. 15 is a front view and Fig. 16 an under side view representing an open distributing gripper with interlocking jaws and circular movement and Figs. 17 and 18 represent the same almost closed. This gripper consists of an outer tube 106 and a rod 107 which can turn in the tube. The tube is provided at the lower end with a jaw 108; the rod 107 has another jaw 109 which jaws being concentric work one within the other; the walls of the jaws can be straight or cut at any suitable angle or even in suitable concave forms or one of the walls can be straight and the other at an angle or concave. These are examples of possible modifications, but the object being to provide a firm retention for the pile thread the angular form indicated by Figs. 16, 18 is preferably adapted as it presents the following advantages: 1. Of bringing back to the top of the angle, that is to say, to a very precise point, the distribution of the pile thread. 2. Of uniting at the same point and also of retaining all the threads composing the pile when the latter consists of many threads. The rotations backward and forward and in a reverse direction of each part of the jaw of the gripper for its opening and for its closure are effected by the levers 110 and 111. Two plates controlled by a cam and actuated in the direction of the width of the loom give the movement through the spindles or screws 112 and 113 to all the grippers of a loom which are constructed in the same manner and have the same levers 110 and 111. The rotation is effected in the collar 114 fixed on the beam 115 indicated in dotted lines. The bore of the collar is sufficiently large to allow the rocking of the gripper for drawing the pile thread. This oscillation is transmitted by the shaft 116 actuated by a cam and on which is fixed, by means of the bearing 117, a ring 118. This shaft causes the oscillation of all the grippers of a single loom.

As examples, the following modifications of construction are given as operating according to the principles and with all the advantages hereinbefore set forth: Fig. 19 shows a gripper composed of a flattened tube 119 serving as a sheath for a blade 120 which slides within it. Fig. 20 is a front view and Fig. 21 a side view showing another gripper composed of two plates sliding one upon the other. The return bend 121 is arranged to seize and hold the pile thread in the recess of the blade. This kind of gripper is actuated by a suitable lifting and lowering movement acting upon one or the other plate to effect the opening or closing of the grippers. The construction of their jaws may comprise any possible combination such as straight or angular walls, etc., as above explained.

We claim as our invention:—

1. A loom of the class described provided with knotting tubes having an oscillatory movement, a rigid frame comprising longitudinal bars upon which they are fixed, said frame being supported at each end at points constituting centers of oscillation of said knotting tubes.

2. Pile thread distributing plates for a loom of the class described comprising a relatively fixed part, a holding device pressing and delivering the thread against said relatively fixed part, and a part movable between said pressing and delivering device and said relatively fixed part adapted to engage the pile thread at its opposite sides respectively.

3. Pile thread distributing apparatus for a loom of the class described, comprising a relatively fixed part, and a holding device yieldingly pressing the thread against said relatively fixed part, and a relatively movable piece between said yieldingly pressing

device and said relatively fixed part and adapted to engage at its opposite sides two pile threads.

4. Distributing grippers for a loom of the class described, said grippers having reciprocating jaws one adapted to enter the other and at least one of said jaws being of angular shape so as to provide an exact point of engagement.

5. A loom of the class described having a looping tool, a cutting device, and an oscillating frame on which said tool and cutting device are both mounted so as to oscillate together during their operation.

In witness whereof, we have hereunto signed our names in the presence of two subscribing witnesses.

CHARLES RENARD.  
ALBERT RENARD.

Witnesses:

GABRIEL BELLARD,  
H. C. COXE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."