

March 15, 1932.

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METHOD OF AND APPARATUS FOR WEAVING KNOTTED PILE FABRICS

Original Filed Nov. 8, 1930 3 Sheets-Sheet 1

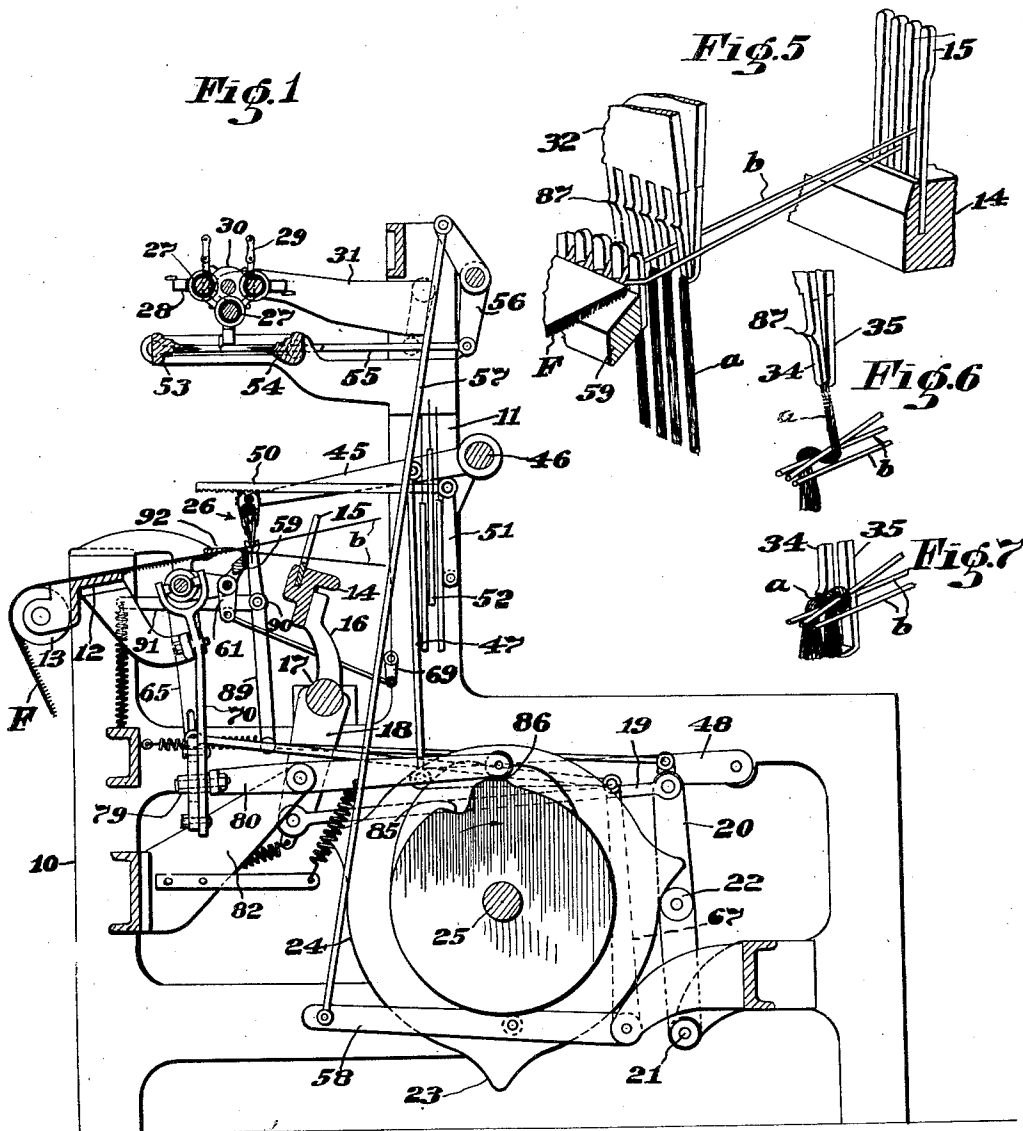


Fig. 5

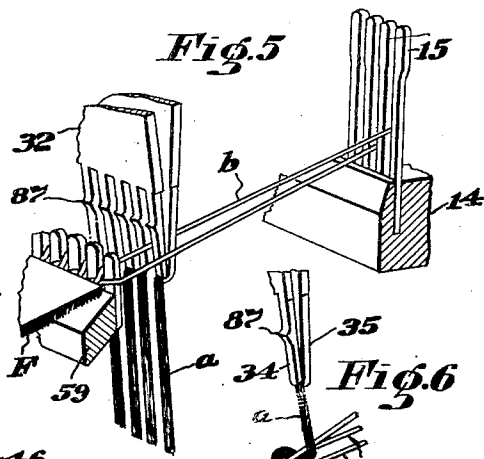


Fig. 6

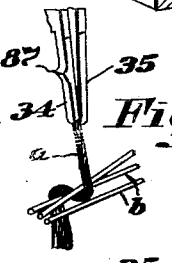


Fig. 7

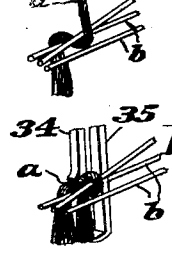
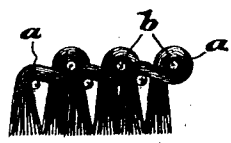


Fig. 8



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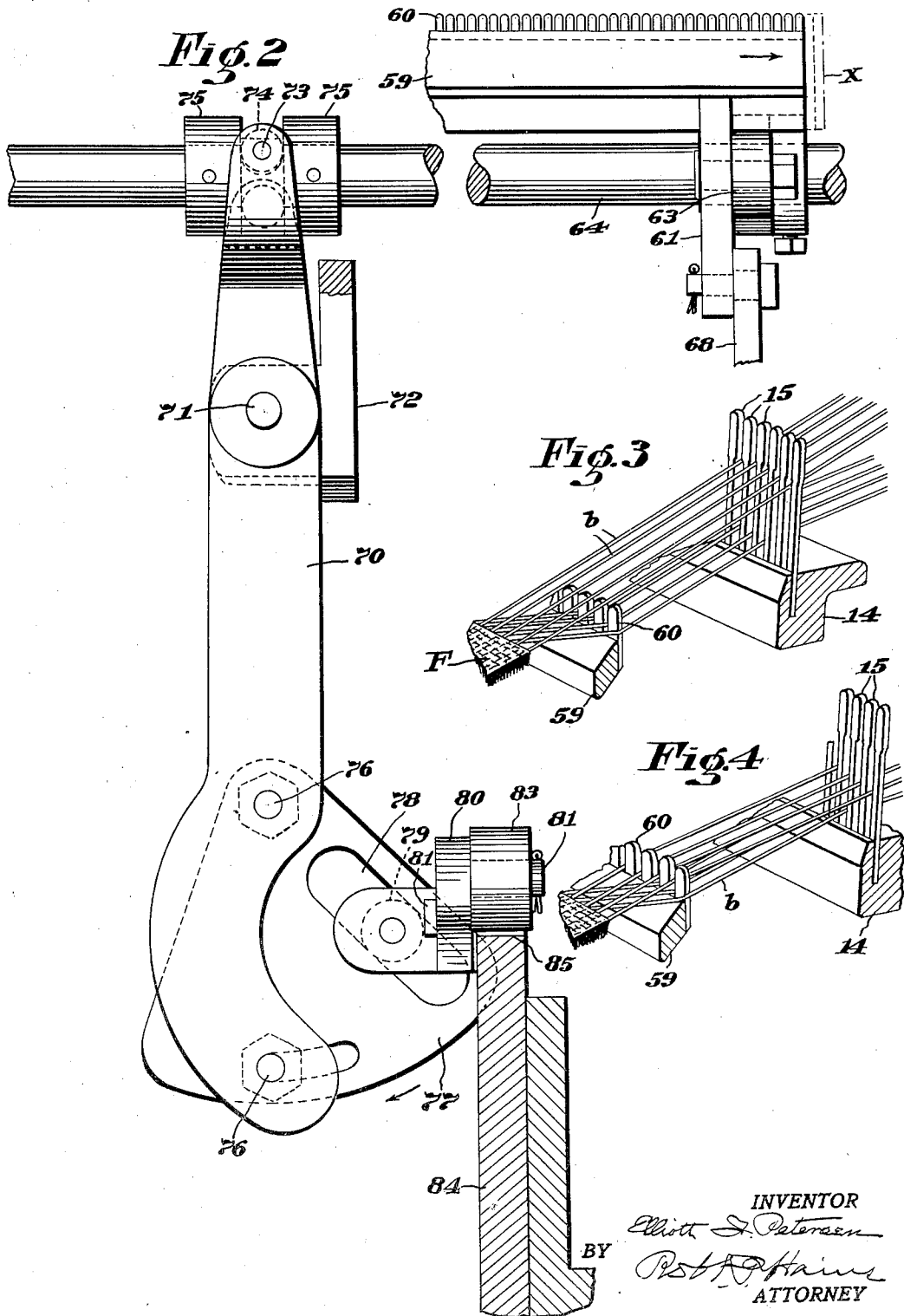
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Original Filed Nov. 8, 1930 3 Sheets-Sheet 2



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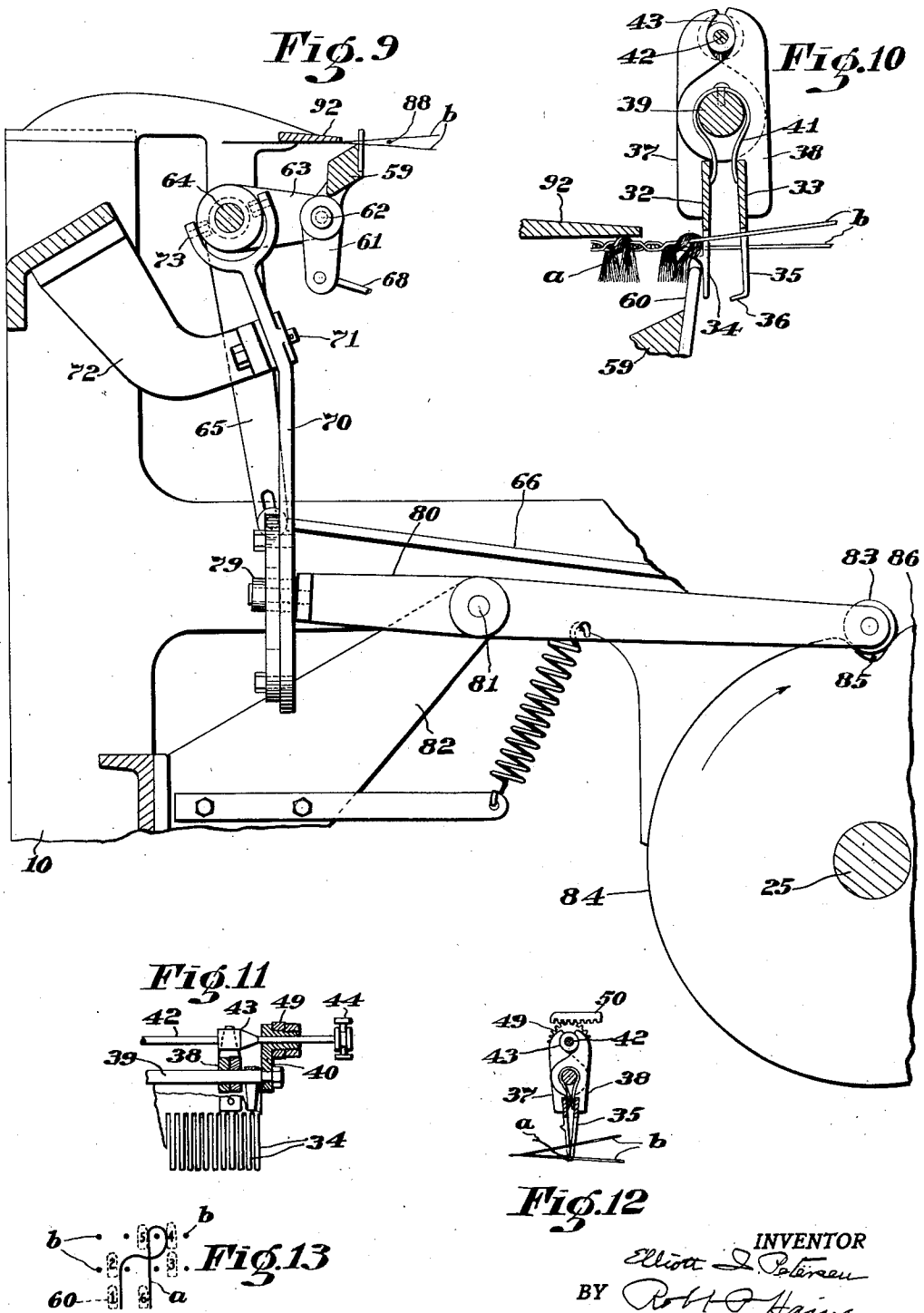
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METHOD OF AND APPARATUS FOR WEAVING KNOTTED PILE FABRICS

Original Filed Nov. 8, 1930 3 Sheets-Sheet 3



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METHOD OF AND APPARATUS FOR WEAVING KNOTTED PILE FABRICS

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This invention relates to a method of and apparatus for weaving tufted pile fabrics having Persian or Senna knots.

Looms for producing pile fabrics having Persian and other oriental knots have been proposed heretofore and some of these prior looms are adapted to form a pile fabric having the pile forming tufts knotted to and extending upwardly from the ground fabric, while in other constructions the pile tufts extend downwardly from the ground fabric.

While various constructions have been proposed heretofore for knotting the pile forming yarns about the warps, difficulty has been experienced in developing a simple construction for tying knots quickly and firmly about the warps without permitting the tufts to become caught or bound in the fabric structure.

The present invention relates to improvements in the construction and operation of a knot forming mechanism associated with a loom to form the pile tufts at the lower face of the ground fabric, and in an improved method of weaving pile fabric.

A primary feature of the present invention resides in a comb provided with warp engaging teeth and in means for manipulating the comb to facilitate the positioning of the warps in the formation of the knots, and for operating the comb to hold the pile forming tufts in place during the removal of the nippers.

A more specific feature of the present invention resides in a comb supported below the fabric and provided with teeth corresponding to the reed or dents, and in means for operating the comb to cause it, (1) to shog the warps preparatory to the formation of the knots, (2) shift the comb forward adjacent the fell of the cloth so that it will be out of the way of the pile yarn inserting nippers; and (3) to cause the comb to hold the pile forming tufts until they are bound in place by filling.

Other features of the invention and novel combination of parts in addition to the above will be hereinafter described in connection with the accompanying drawings which illus-

trate one good practical form of the invention.

In the drawings:—

Fig. 1 is a vertical sectional view through a pile fabric loom provided with the features of the present invention.

Fig. 2 on an enlarged scale is a side elevation with parts in section of mechanism for shifting a comb in the direction of its length, the comb being viewed from the rear of the loom.

Fig. 3 is a perspective view with parts in section showing a comb engaged with the lower warps of a shed and shifted two dents to the right.

Fig. 4 is a view similar to Fig. 3 but shows the comb positioned to hold the lower warps shogged in one direction and the upper warps shogged in the opposite direction.

Fig. 5 is a perspective view showing the comb moved forwardly from its position of Fig. 4 and the nippers projecting between the warps.

Fig. 6 is a perspective view showing a pile yarn as bent by the movement of the warps to their normal position.

Fig. 7 is a perspective view showing the position of the warps and nippers at the completion of the knot.

Fig. 8 is a transverse sectional view of the fabric showing the Persian or Senna knot.

Fig. 9 is a transverse sectional view through the breast beam of the loom and associated parts and illustrates the comb teeth in engagement with the warps.

Fig. 10 is a vertical sectional view through the fabric at the fell of the cloth and shows the position of the comb and nippers at the completion of the knot.

Fig. 11 is a side elevation with parts in section of an end portion of the nippers.

Fig. 12 is a transverse sectional view through the nippers of Fig. 11, and

Fig. 13 is a diagrammatic view showing the successive positions occupied by a tooth of the comb in positioning the warps.

The features of the present invention may be employed in connection with various types of pile fabric looms using either tube frames or nippers to present the pile forming yarns

to the fabric. In the loom construction illustrated in the drawings nippers are provided to transfer the pile yarns from the supply spools to the fabric but it will be apparent that tube frames of well known construction may be employed to this end, the principal difference being that when nippers are employed it is necessary to sever the pile yarns from their source of supply before these yarns are presented to the fabric, whereas if tube frames are employed the pile yarns need not be severed from the source of supply until after the knot is tied.

The construction and operation of the loom illustrated in the drawings is for the most part well known and it has therefore been deemed necessary to show only such features of the general loom construction as are considered necessary to make clear the construction and operation of the knot forming mechanism of the present invention.

The loom illustrated has the usual end frames 10 having extending upwardly therefrom the columns 11 adapted to support the harness mechanism, pile yarn nippers and supply spools. The loom is shown as having a breast beam 12 in front of which is supported the usual spike or take-up roll 13 about which the woven pile fabric F passes. At the rear of the breast beam 12 is supported the lay 14 provided with the reed or dents 15 and the lay is supported for rocking movement towards and from the front of the loom by the lay swords 16 that rock about the supporting shaft 17. Rocking movement may be imparted to the lay swords by the downwardly extending arm 18 the lower end of which is connected by a link 19 to a cam operated lever 20, the lower end of which is pivotally supported at 21. The intermediate portion of the lever 20 is provided with a roller 22 adapted to cooperate with the cam projections 23 formed upon the lay operating cam 24 which cam is mounted upon and operated by the cam shaft 25. The cam 24 is provided with three cam projections 23 which are spaced so as to impart beat up movements to the lay.

In the construction shown the pile forming yarn is supplied to the nippers 26 by a series of spools 27 in accordance with a predetermined pattern. Each spool is rotatively supported by a frame 28 and the series of frames 28 are removably secured to the transporting chains 29 to be advanced step by step to the lower or operative position in a well known manner, and the lower sprockets 30 for the chains 29 are supported by the laterally extending arms 31.

The nippers 26 may comprise a large number of individual nippers arranged side by side transversely of the loom or may comprise a number of nipper fingers extending downwardly from a pair of relatively movable nip-

per plates, the latter construction being shown in the drawings.

The nippers as illustrated are of well known construction and consists of the pair of spaced nipper plates 32 and 33 having the downwardly extending nipper fingers 34 and 35, the fingers 35 preferably being provided with the bent end portions 36. The nipper blades 32 and 33 are supported for rocking movement by the brackets 37 and 38 which are pivotally mounted upon the nipper supporting shaft 39, and the shaft 39 is rockingly supported by the brackets 40. The nippers are normally held in spaced relation to each other as shown in Fig. 10 through the spreading action of the springs 41, and the nippers are held in the yarn gripping position by the nipper operating rod 42 which is supported for sliding movement in the direction of its length. This rod is provided with the enlarged portions 43. The arrangement is such that when the rod 42 is moved axially by the operating means 44 in a direction to force its enlargements 43 between the upwardly extending end portions of the brackets 37 and 38 the nipper fingers will be held in the yarn engaging position as shown in Fig. 12.

The entire nipper mechanism is supported by the arms 45 which are pivotally mounted at 46. The arrangement is such that the arms 45 are periodically raised to present the nippers to the pile yarns extending downwardly from the lowermost spool 27, and after the nippers have engaged these yarns, and the yarns have been severed from the source of supply the arms 45 are lowered as shown in Fig. 1 to present the pile yarns to the fabric. The desired rocking movement is imparted to the arms 45 by the connecting rods 47 which rods in turn are connected to the levers 48 actuated by cams upon the cam shaft 25.

The nippers are rotated about the shaft 42 from the position in which they are shown in Fig. 1 through an angle of approximately 180° to present the nippers to the yarn ends to be gripped, and this is accomplished by providing one of the supporting brackets 40 with the gear 49 adapted to be engaged by the rack 50 which is moved in the direction of its length by the arm 51 that receives the desired rocking movement from any suitable means not shown. The warps are shifted by the usual harness mechanism 52.

After each pair of nipper fingers 34 and 35 has engaged a yarn end *a* supplied by the lowermost spool 27 the nippers 26 are lowered to pull a sufficient length of pile yarn downwardly, whereupon the yarn is severed between the nippers and the supply spool by the cutters 53 and 54 which may be operated in a well known manner from the cam shaft by the connections 55, 56, 57 and 58.

The loom mechanism so far described oper-

ates in a well known manner and has been illustrated and briefly described to make clear the cooperation of the novel mechanism to be described with these well known features of pile fabric looms.

In accordance with the present invention the Persian or Senna knots are formed so that the tufts extend downwardly from the ground fabric to produce the pile tufts at the lower face of the fabric as will be apparent from the drawings, and the Persian knots are formed in accordance with the present invention by shogging the upper and lower warps in opposite direction, then lowering the nippers to pass the pile yarns *a* downwardly between the shogged or laterally displaced warps *b* so that when the laterally displaced warps are released to return to their normal parallel position they will bend an intermediate portion of each yarn end *a* laterally as clearly shown in Fig. 6. The nippers are then again moved downwardly through the shed to loop the second end portion of each yarn *a* about a warp *b* to complete the formation of the knot as will be apparent from Fig. 7.

The shogging of the warps may be produced in part or entirely by imparting the shogging movement to the nippers while in engagement with the warps; but the shogging of both the lower and upper warps of the shed is secured in the embodiment of the invention illustrated through the employment of a comb 59 which is supported below the shed and has the upwardly extending teeth 60 that are positioned to correspond with the dents of the reed 15. The comb 59 in the construction shown is secured near its opposite ends to supporting levers 61 and these levers are pivotally supported intermediate their ends by the pivot pins 62 which pins are carried by the outer ends of the rocking levers 63. The levers 63 are rigidly secured to and extend laterally from the comb operating shaft 64 which shaft is supported by the loom frame for rocking movement and also for sliding movement in the direction of its length. The desired rocking or rotative movement is imparted to the shaft 64 by a downwardly extending arm 65 the lower end of which is connected by a link 66 to a cam operated lever 67. The desired rocking movement is imparted to the comb supporting levers 61 by links 68 each of which has one end connected to a downwardly extended portion of the lever 61 and the opposite end is connected to a rocking lever 69 which receives a desired rocking movement from an operating part of the loom, not shown.

The comb operating shaft 64 is shifted in the direction of its length to impart the desired shogging movement to the comb and this lengthwise movement is imparted to the shaft 64, in the construction shown, through the operating lever 70 the intermediate por-

tion of which is supported by a pivot pin 71 that is carried by a fixed bracket 72. The upper end of the lever 70 is forked as shown and has the inwardly extending lugs 73 which support rollers 74 that are positioned between the spaced collars 75 rigidly secured to the shaft 64. The lower end portion of the lever 70 and adjustably secured thereto by bolts 76 the cam plate 77 in which plate is formed the inclined elongated slot 78 adapted to receive a roller 79 provided at the outer end of an operating lever 80. The lever 80 is pivotally supported intermediate its ends at 81 by the fixed bracket 82 and the opposite end of this lever is provided with a roller 83 adapted to cooperate with a cam 84 secured to the cam shaft 25. The roller 83 is held against the cam 84 by the spring best shown in Fig. 9.

It will be seen that the comb operating mechanism just described serves to impart three distinct movements to the comb in that the rocking levers 63 serve to move the comb teeth in a substantially vertical direction into and out of engagement with the warp. The pivoted levers 61 serve to move the comb teeth towards and from the fell of the cloth, and the lever 70 serves to impart the desired shogging movement to the comb.

As above stated, in the embodiment of the invention illustrated the desired shogging movement is imparted to both the lower and upper warps by the comb 59 and the movement of the comb in the direction of its length is secured by giving the operating cam 84 the construction shown wherein it will be noted that this cam has the form of a circle concentric with the shaft 25 throughout nearly its entire circumference, but is provided with a fairly deep notch 85 and adjacent this notch the cam is provided with the raised portion 86 of slightly greater diameter than the major portion of the cam 84. The construction is such that when the roller 83 of the lever 80 rests in the notch 85 as shown in Fig. 9 of the drawings, the comb 59 will occupy the position in which it is shown in full lines in Fig. 2.

As the cam 84 rotates in the direction indicated by the arrow, the comb 59 which normally occupies the intermediate position indicated by dotted lines in Fig. 2, will be shifted to the position indicated by X in Fig. 2 upon engagement of the raised portion 86 of the cam with the roller 83. The comb is then quickly shifted two dents to the left to the full line position of Fig. 2 as the roller 83 drops into the notch 85, and as the cam 84 continues to rotate the comb is returned to its intermediate position as the roller 83 moves upwardly out of the notch 85. The entire shogging movements imparted to the comb 59 is limited to two dents or ends, and the movement of the roller 79 up and down vertically causes it to cooperate with the slot

78 to impart the proper rocking movement to the lever 70.

It will be seen from the operation of the comb just described that the comb remains throughout the greater portion of the loom operation in the intermediate or dotted line position of Fig. 2. As the raised portion 86 of the cam engages the roller 83 the comb is momentarily shifted to the position X of Fig. 2 and while in this position the comb is raised sufficiently to engage the lower warps but not the upper warps. The comb is then shifted two dents to the left viewing Fig. 2 to the full line position to thereby shog the lower warps two dents to the right viewing Fig. 3; it being understood that the comb of Fig. 2 is viewed from the rear of the loom while the comb of Fig. 3 is viewed from the front of the loom.

The comb 59 while held shogged as shown in Fig. 3 is raised somewhat while at the same time the shed is approximately closed to engage the comb teeth 60 with the upper warps, whereupon the comb is shogged one dent to the left from the position of Fig. 3 to the position of Fig. 4. As a result of first shogging the comb 59 to the right and then to the left in the manner just described the lower warps will be displaced one dent to the right while the upper warps will be displaced one dent to the left as clearly shown in Fig. 4.

While the warps are held by the comb teeth in the position in which they are shown in Fig. 4 the comb is moved forward to the fell of the fabric as shown in Fig. 5. The nippers are then moved downwardly through the shed to carry the pile yarns *a* downwardly entirely through the shed. The nippers are then moved upwardly sufficiently to cause the central or intermediate portion of each yarn *a* to lie between the shogged warps. The comb is then moved downwardly to disengage its teeth from the warps whereupon the tension of the warps will cause them to return to their normal parallel relation to each other. This movement of the warps to their normal position will serve to bend the intermediate position of each yarn *a* as will be apparent from Fig. 6 and will also cause each upper warp to move to the right sufficiently to cause a second end of each yarn to be looped about the upper warp when the nippers are again passed downwardly between the warps as shown in Fig. 7. It will be understood that no shogging movement is imparted to the nippers but that the looping of the second end of the yarn *a* about the warp results from the fact that each upper warp is disposed at one side of a pair of nippers fingers the first time the nippers pass down into the warp and lies to the opposite side of such fingers the next time the nippers pass down through the warp.

The successive movements of the comb 59 throughout one cycle of loom operation will

be further understood upon referring to Fig. 13 of the drawings wherein it will be understood that one comb tooth 60 is indicated in dotted lines as occupying a number of different positions relative to several warps *b*. This figure does not show the opening or closing of the shed which takes place during the shogging of the comb nor does it illustrate the actual lateral displacement or shogging of the warps *b* but it does indicate the successive positions occupied by a tooth of the comb in order to shog the warps *b* to facilitate the tying of the Persian knot.

It will be understood from Fig. 13 that the first step in producing the knot so far as the comb is concerned is to move the comb teeth from the intermediate position indicated by 6, in Fig. 13 to the position indicated by 1, in this figure. The comb tooth is then raised to the position indicated by 2 to engage a lower warp and is then shogged two dents to the right to the position indicated by 3. It is then raised to the position indicated by 4, or approximately to this position since the shed is being closed at this particular time, and is then shogged one dent to the left to the position indicated by 5. The first end of the pile yarn *a* is inserted between the warps while the comb tooth occupies the position indicated by 5. The comb is then withdrawn to the position indicated by 6 and while in this latter position the second end of the yarn *a* is inserted to complete the knot shown in Fig. 13.

As above stated it is important that the knots be tied firmly about the warps and that the tufts be held or otherwise prevented from becoming caught or bound in the fabric construction. This is accomplished in accordance with the present invention by manipulating the nippers so that when they are first lowered through the shed they will carry the pile yarns *a* down through the shed as shown in Fig. 5 so that when the nippers are raised the lower ends of the yarns will extend downwardly from the shed in a relatively straight condition. The comb is then moved downwardly out of engagement with the warps whereupon the lay beats up to drive the first end of each yarn *a* forwardly against the fell of the fabric so that the bent or intermediate portion of the yarn will be held firmly by the warps. The nippers are then again lowered as above pointed out to loop the second end of the yarn about a warp and to carry this second end downwardly through the warp as shown in Fig. 7 and this second end may be pulled as tight as desired by lowering the nippers a sufficient amount and then opening the nippers to release the second end. As soon as this is done the nippers are moved frontwardly towards the fell of the cloth to cause a hump 87 upon each front nipper finger to tuck the second end or tuft frontwardly as shown in Fig. 10. While

the parts are in this position the comb teeth are engaged with the downwardly extending ends of the tuft forming yarns as shown in Fig. 10 to hold these ends or tufts against the fell of the cloth so that all danger of an end or tuft being drawn upwardly towards the ground fabric when the nippers are withdrawn will be avoided.

The shed is crossed during the formation of the row of knots transversely of the fabric and the comb 59 remains in the position in which it is shown in Fig. 10 until the needle 88 (see Fig. 9) is inserted to lay two strands of filling in the shed and they are beaten up to retain the tufts in their proper downwardly extending position, whereupon the comb is lowered, the shed is again crossed and a second shot is inserted by the needle 88 to place two more strands of filling in the shed as will be apparent from Fig. 10. This completes the cycle of operations. The employment of the two shots between each row of knots as herein shown and described is desirable since the completion of each weaving and knot forming cycle brings the shed back to its starting position ready for the next cycle of knot inserting operation.

It is desirable to impart rocking movement to the nippers 26 while they are supported adjacent the shed to facilitate the introduction of the pile yarns *a* in the shed and to force the tufts frontwardly as above described. This rocking movement is imparted to the nippers through the employment of the rocking lever 89 the upper end of which is V-shaped as shown to receive the lower ends of the closed nipper fingers. The lever 89 is pivotally secured at 90 to a lever 91 and the lever 89 receives the desired rocking movement from mechanism, not shown. The arrangement is such that the lever 89 is free to move downwardly to accommodate the movement of the nippers downwardly through the warp. In the construction shown a beam 92 is supported by the loom frame above the fabric adjacent the weaving point to insure proper positioning of the fabric.

It will be seen from the foregoing that the manipulation of the pile yarn *a* during the knot forming operation is such that the first end of each yarn extends downwardly in a straightened condition from the ground fabric, and that as soon as the knot is completed the second end is pushed frontwardly by the hump upon a nipper finger and is held by this hump until the comb is moved into position to hold the tufts in their downward extending position until a shot is inserted to secure the ends in place. It will further be seen that these desirable results are secured through the proper manipulation and cooperation of the comb and nippers.

What is claimed is:—

1. The method of weaving tufted pile fab-

ric having Persian knots, which consists in displacing the upper warps of the shed laterally from their normal position a distance of one dent, displacing the lower warps laterally from their normal position in the opposite direction the distance of one dent, passing the first end of a pile yarn downwardly between the displaced warps, returning the warps to their normal position to cause them to form a bend in the inserted yarn, inserting the second end of this yarn downwardly between the now normally positioned warps to complete the knot, and holding the downwardly extending ends of the tuft adjacent the fell of the fabric during the withdrawal of the pile yarn inserting means.

2. The method of weaving tufted pile fabric having oriental knots, which consists in displacing the upper and lower warps of the shed laterally in opposite directions from their normal positions, passing the first end of a pile yarn downwardly between the laterally displaced warps, returning the warps to their normal position to cause them to form a bend in the inserted yarn, inserting the second end of this yarn downwardly between the now normally positioned warps to complete the knot, and holding the downwardly extending ends or tufts near the fell of the fabric during the withdrawal of the pile yarn inserting means.

3. The method of weaving tufted pile fabric having Persian knots, which consists in displacing the upper and lower warps of the shed laterally in opposite directions from their normal position, passing the first end of a pile yarn between the laterally displaced warps, returning the warps to their normal position to cause them to form a bend in the inserted yarn, inserting the second end of this yarn between the now normally positioned warps to complete the knot, and holding the tuft ends of the completed knot against the fell of the fabric during the withdrawal of the pile yarn inserting means.

4. The method of weaving tufted pile fabric having Persian knots, which consists in displacing the upper and lower warps of the shed laterally in opposite directions from their normal position, passing the first end of a pile yarn between the laterally displaced warps, returning the warps to their normal position to cause them to form a bend in the inserted yarn, inserting the second end of this yarn between the now normally positioned warps to complete the knot, and holding the tuft ends of the completed knot adjacent the fell of the fabric until a shot of filling is laid in the shed and beaten up against the knot.

5. The method of weaving tufted pile fabric having oriental knots, which consists in displacing some of the warps of the shed laterally relative to the other warps, laying the first end of a pile yarn in the shed trans-

versely of said displaced warps, returning the warps to their normal position to cause them to form a bend in the inserted pile yarn, inserting the second end of this yarn between the now normally positioned warps to complete the knot, and holding the tuft forming ends of the completed knot adjacent the fell of the fabric during the withdrawal of the pile yarn inserting means.

6. The method of weaving tufted pile fabric having Persian knots, which consists in displacing the upper and lower warps of the shed laterally in opposite direction from their normal position, passing the first end of a pile yarn between the laterally displaced warps, returning the warps to their normal position to cause them to form a bend in the inserted yarn inserting the second end of this yarn between the now normally positioned warps to complete the knot holding the tufts adjacent the fell of the cloth, crossing the shed during the knot forming operation, inserting a shot of filling and beating the same up against the knot, crossing the shed again, and inserting a second shot of filling to complete the cycle of weaving operations.

7. In a loom for weaving knotted pile fabric, in combination, shed forming mechanism, a lay, a comb supported below the shed and provided with warp engaging teeth, means for engaging the comb with the lower and upper warps of the shed and for shifting the comb in the direction of its length to displace the upper and lower warps laterally in opposite directions from their normal position, a pile yarn carrier, means for operating the carrier to lay the first end of a pile yarn between the displaced warps, means for lowering the comb to release the warps to return to their normal position and bend the pile yarn, means for operating the carrier to lay the second end of the pile yarn between the normally positioned warps to complete the knot, and means for operating the comb to hold the tuft ends of the knot adjacent the fell of the fabric during the withdrawal of the pile yarn carrier.

8. In a loom for weaving knotted pile fabric, in combination, shed forming mechanism, a lay, a comb supported adjacent the shed and provided with warp engaging teeth, means for engaging the comb with the warps of the shed and for shifting the comb in the direction of its length to displace some of the warps laterally with respect to the other warps, a pile yarn carrier, means for operating the carrier to lay the first end of a pile yarn transversely of said displaced warps, means for lowering the comb for releasing the warps to return to their normal position and bend the pile yarn, means for operating the carrier to lay the second end of the pile yarn between the normally positioned warps to complete the knot, and means for operating the comb to hold the tuft ends of the knot

adjacent the fell of the fabric during the withdrawal of the pile yarn carrier.

9. In a loom for weaving tufted pile fabric provided with Persian knots, in combination, shed forming mechanism, a lay, a comb supported adjacent the shed and provided with warp engaging teeth, a pile yarn carrier, means for operating the carrier to lay the first end of a pile yarn between relatively shifted warps of the shed so that when the warps return to their normal position they will bend the pile yarn, means for operating the carrier to lay the second end of the pile yarn between the normally positioned warps to complete the knot, and means for operating the comb to hold the tuft ends of the knot adjacent the fell of the fabric during the withdrawal of the pile yarn carrier.

10. In a loom for weaving pile fabric, provided with oriental knots, in combination, shed forming mechanism, a lay, a comb supported below the shed and provided with warp engaging teeth, a pile yarn carrier, means for operating the carrier to pass the first end of a pile yarn downwardly between the displaced warps so that the return of the warps to their normal position will bend the pile yarn, means for operating the carrier to pass the second end of the pile yarn downwardly between the normally positioned warps to complete the knot, and means for operating the comb to hold the downwardly extending tuft ends adjacent the fell of the fabric.

11. In a loom for weaving tufted pile fabric provided with Persian knots, in combination, shed forming mechanism, a lay, a comb supported below the shed and provided with warp engaging teeth, means for engaging the comb with the lower warp of the shed and for shifting it lengthwise to displace the lower warps two dents and for raising the comb into engagement with the upper warps and for shifting it in the opposite direction one dent to displace the upper and lower warps in opposite directions from their normal position, a pile yarn carrier, means for operating the carrier to pass the first end of a pile yarn downwardly between the displaced warps, means for moving the comb away from the shed to release the warps to return to their normal position and bend the pile yarn, means for operating the carrier to pass the second end of the pile yarn downwardly between the normally positioned warps to complete the knot, and means for operating the comb to hold the tuft ends of the knot against the fell of the fabric.

12. In a loom for weaving tufted pile fabric having Persian knots, in combination, shed forming mechanism, a lay, a comb provided with warp engaging teeth, means for supporting the comb beneath the shed for movements in different planes, mechanism for raising and lowering the comb to move

its teeth into and out of engagement with the warps and also for imparting a shogging movement to the comb to shog the warps and for moving the comb forward to the fell of the fabric, a pile yarn carrier, means for operating the carrier to lay the first end of a pile yarn between the shogged warps so that the return of the warps to normal position will bend the pile yarn, means for operating the carrier to lay the second end of the pile yarn between the normally positioned warps to complete the knot, and means for operating the comb to hold the tuft ends of the knot adjacent the fell of the fabric.

15 In testimony whereof, I have signed my name to this specification.

ELLIOTT I. PETERSEN.

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