No. 822,103. PATENTED MAY 29, 1906.

J. K. DALKRANIAN.

PILE FABRIC LOOM.

APPLICATION FILED DEC. 1, 1904.

4 SHEETS—SHEET 1.

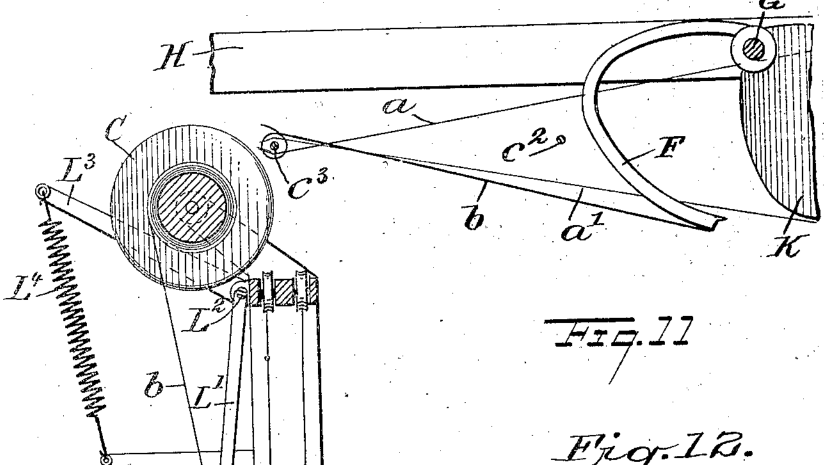
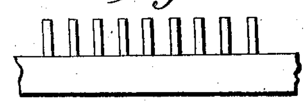


Fig. 11

Fig. 12.



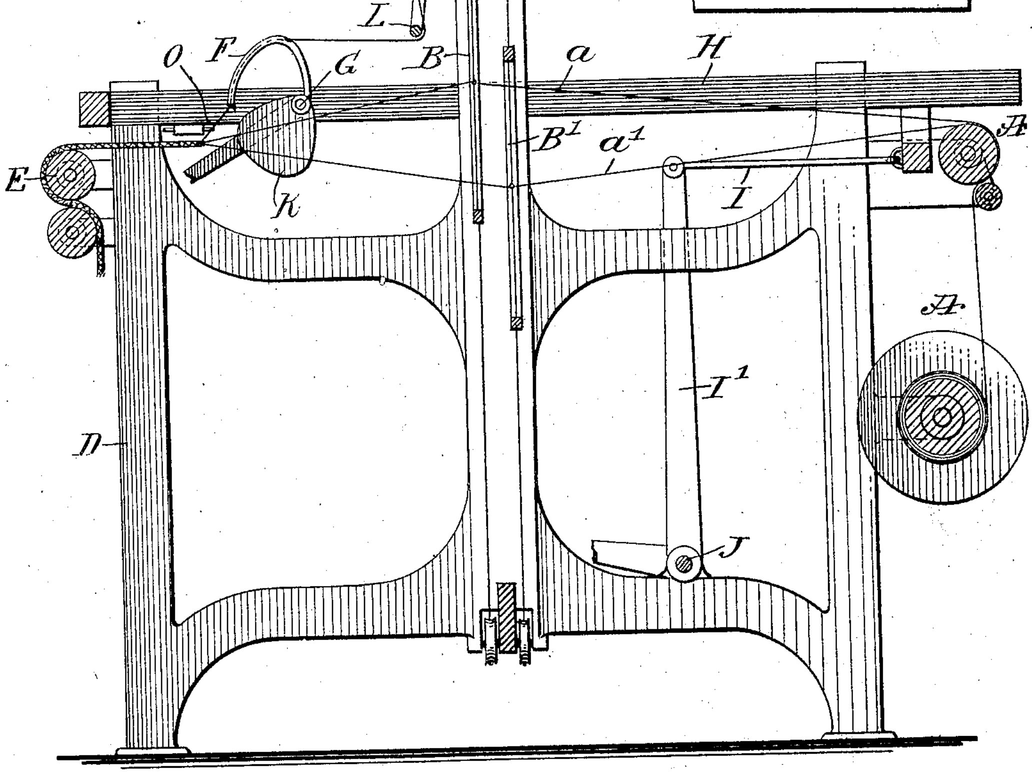


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Fig. 1

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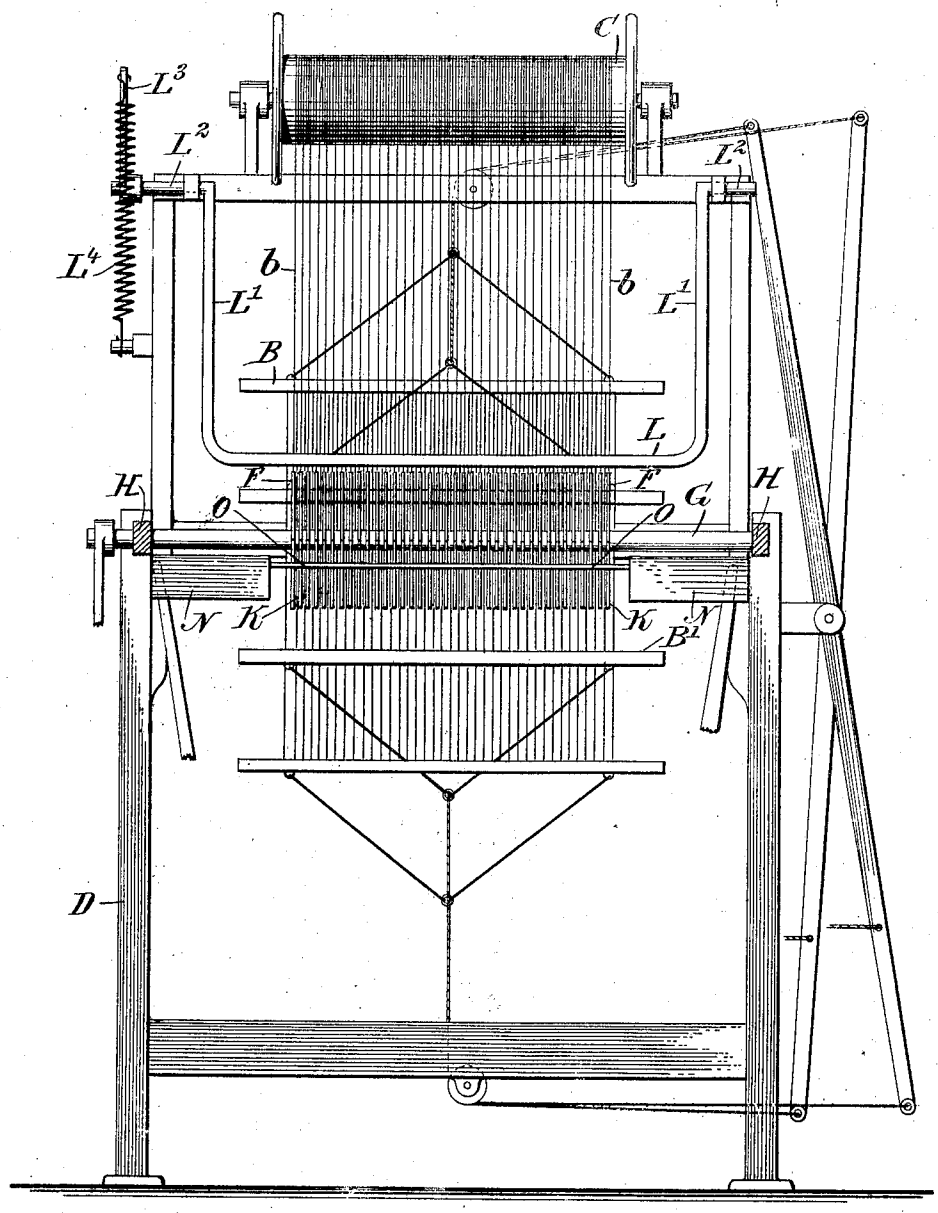

Fig. 2.

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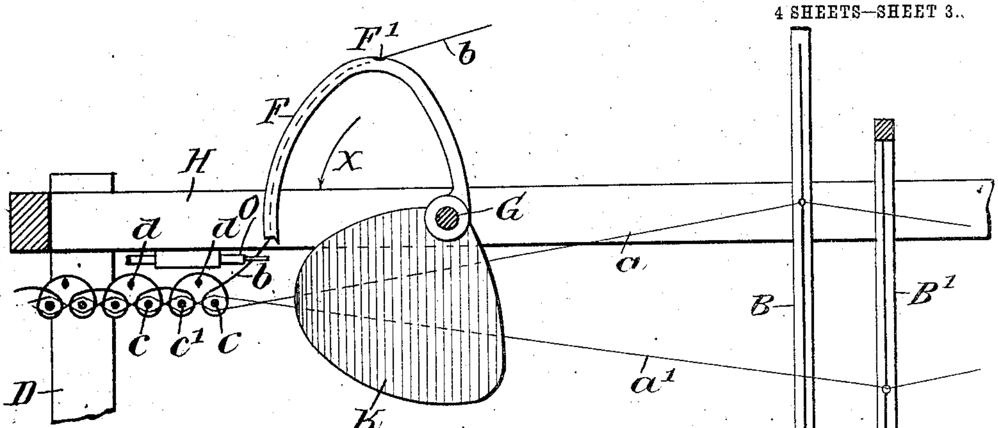

FIG. 3

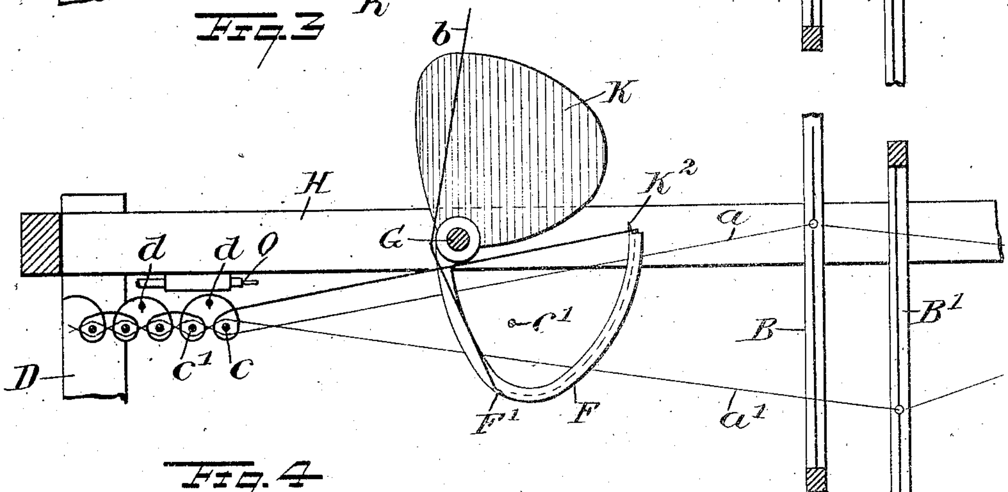

FIG. 4

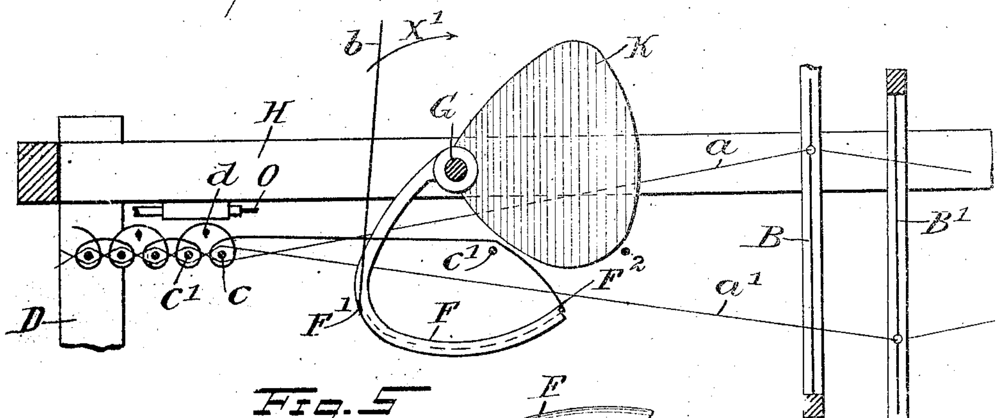

FIG. 5

WITNESSES:

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Theo G. Hostetz

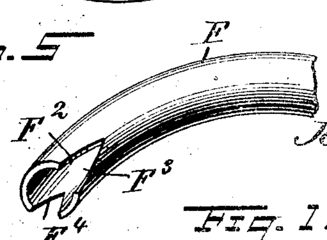

FIG. 10

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4 SHEETS—SHEET 4.

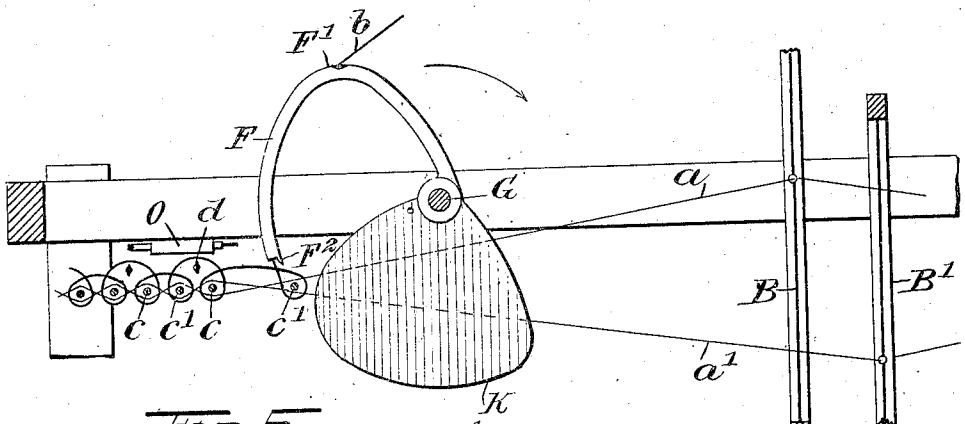

Fig. 6

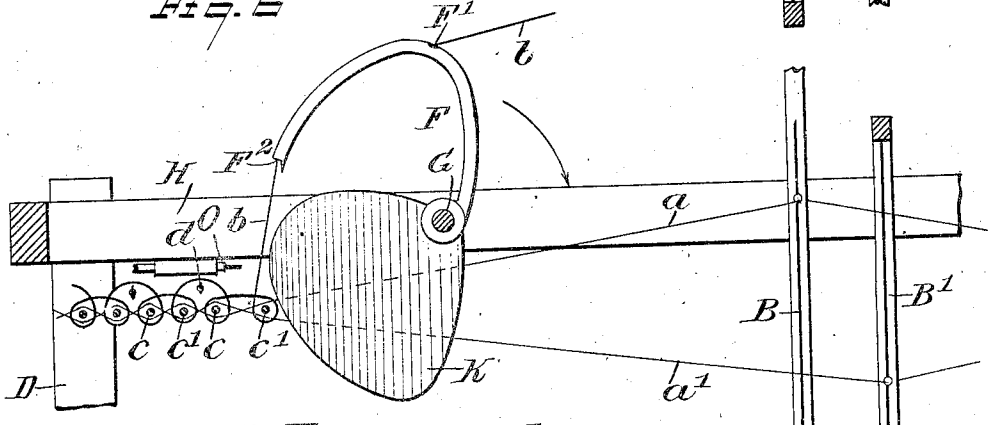

Fig. 7

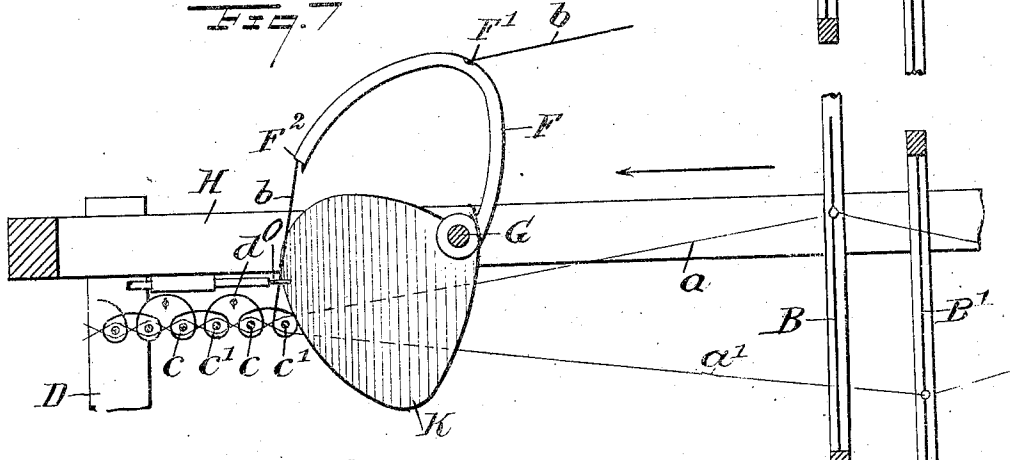

Fig. 8

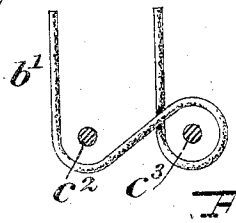

Fig. 9

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Percy Hooker

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James K. Dalkranian

BY

ATTORNEYS

UNITED STATES PATENT OFFICE.

JAMES KARMI DALKRANIAN, OF NEW YORK, N. Y., ASSIGNOR TO NAZAR COSTIKYAN, OF NEW YORK, N. Y.

PILE-FABRIC LOOM.

No. 822,103. Specification of Letters Patent. Patented May 29, 1906.

Application filed December 1, 1904. Serial No. 235,021.

To all whom it may concern:

Be it known that I, JAMES KARMI DALKRANIAN, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Pile-Fabric Loom, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved loom more especially designed for weaving woven pile fabric—such, for instance, as shown and described in the application for Letters Patent of the United States, Serial No. 227,663, filed by me October 8, 1904.

The invention consists of novel features and parts and combinations of the same, as will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a longitudinal sectional elevation of the improvement as arranged for weaving a pile fabric having Turkish knots. Fig. 2 is a transverse section of the same. Fig. 3 is an enlarged sectional side elevation of the knot-forming mechanism, the lay, and heddles. Figs. 4, 5, 6, 7, and 8 are similar views of the same, showing the parts in various positions required for forming the weave. Fig. 9 is a sectional side elevation of a fabric with a Persian knot. Fig. 10 is an enlarged perspective view of one of the needles employed for forming the Turkish knot. Fig. 11 is a sectional side elevation of the knot-forming mechanism for making a Persian knot, and Fig. 12 is a plan view of part of the shogging-comb.

In the fabric to be woven by the loom illustrated in the drawings the ground warp-threads *a a'* are arranged in pairs, and a pile warp-thread *b* passes between the ground warp-threads *a a'* of each pair, and the said pile warp-thread *b* is looped around the weft-threads *c c'* in such a manner as to produce an oriental knot—for instance, a Turkish knot (shown in Figs. 3 and 8) or a Persia knot. (Illustrated in Fig. 9.)

In forming the Turkish knot the pile warp-thread *b* is passed down in front of the weft-thread *c*, then rearward under this weft-thread, then upward in the rear of the weft-thread *c*, then forwardly over the weft-thread *c* and over the next following weft-thread *c'*, then down in front of this weft-thread *c'*, rearward and under this weft-thread and up in the rear of the weft-thread *c'* for the pile warp-thread, then to pass up over a pile-wire *d*, and then down in front of the next weft-thread *c* to repeat the above-described operation. Thus from the foregoing it will be seen that the pile warp-thread *b* is completely looped around a weft-thread in a downward and rearward direction and the pile warp-thread is extended upward twice between each pair of weft-threads *c c'* and passed over a pile-wire *d* between successive pairs of weft-threads, as will be readily understood by reference to Figs. 3 to 8, inclusive.

In order to weave the fabric described, the following arrangement is made: The ground warp-threads *a a'* unwind from the usual warp-beam A and pass through heddles B B', respectively, and the pile warp-thread *b* to be looped around the pairs of weft-threads *c c'* unwinds from a warp-beam C, preferably journaled overhead in the loom-frame D, which also carries a breast-beam E for the finished fabric. The pile warp-thread *b* passes through an opening F' into the hollow portion of a needle F of segmental shape, secured at the end of its solid portion on a shaft G, mounted to rock in suitable bearings carried by a lay H, mounted to slide longitudinally in suitable bearings arranged on the main frame D of the loom. The rear end of the lay H is pivotally connected by a link I with the rock-arm I' of a rock-shaft J, journaled in suitable bearings on the main frame D and receiving the usual rocking motion for imparting a reciprocating motion to the lay H. The pile warp-thread *b* passes through the hollow or free end portion of the needle F to leave the same at the mouth or point F^2 of the needle, and the said needle F is so arranged as to pass between adjacent pairs of ground warp-threads *a a'* when imparting a rocking motion to the shaft G and the needle F, it being understood that the shaft G is rocked in unison with the shaft J, as hereinafter more fully described.

On the shaft G is fastened a pusher K, preferably in the form of a flat plate lying in the

same vertical plane as the needle F, and the peripheral edge of the said pusher K is spaced a distance from the point or mouth F^2 of the corresponding needle F to provide an exit for the weft-thread, as hereinafter more fully described.

In order to impart the desired tension to the several pile warp-threads *b*, a transversely-extending tension-rod L is provided, engaging the several pile warp-threads at the front thereof between the warp-beam C and the needle F, the tension-rod L being approximately in the same horizontal plane through the top of the needle F when the latter is in its uppermost position, as plainly indicated in Fig. 1, so that the pile warp-threads *b* pass approximately into the hollow portion of the needle in a tangential line, as will be understood by reference to Fig. 1. The tension-rod L is supported at its ends on arms L′, having trunnions L^2, journaled in suitable bearings arranged on the main frame D, and on one of the said trunnions L^2 is secured an arm L^3, connected with one end of a spring L^4, attached at its other end to a bracket L^5, secured to or forming part of the main frame D. The spring L^4 exerts a downward pull on the arm L^3 to hold the tension-rod L normally in a rearmost position, but to allow the said tension-rod to yield—that is, to swing forward—when a pull is exerted on the pile warp-threads *b* by the needles F.

The shuttle mechanism N for passing the weft-threads *c c′* through the open shed and the pile warp-loops is of any approved construction, and further description thereof is not deemed necessary.

In order to shift the pile warp-threads *b* transversely every second pick, a shogging device O is provided to bring each pile warp-thread *b* alternately to opposite sides of its needle, so that the pile-arms of each Turkish knot stand to one side of the connecting portion from one loop to the other. The shogging device O is preferably in the form of a comb moved longitudinally in engagement with the pile warp-threads, then shifted transversely to shift the pile warp-threads to one side, and then moved longitudinally back to the starting position.

The mouth of each segmental needle is provided on one side with a long V-shaped cut F^3 (see Fig. 10) and on the other side with a shorter V-shaped cut F^4, the pile warp-thread *b* normally extending through the cut F^3—that is, at the time the shogging device is out of engagement with the pile warp-thread—and when the shogging device is in engagement with the pile warp-threads and shifts the same transversely at the time the needles are up then the pile warp-threads are engaged by the cuts F^4 on the next downward swinging motion of the needles.

The operation is as follows: When the several parts are in the position illustrated in Fig. 3, then each needle F′ is in a raised position, while the corresponding pusher K is in a lowermost position, the pile warp-thread having been looped around the last weft-thread *c* and the ground warp-threads *a a′* having been crossed to open the shed by a corresponding movement of the heddles B and B′. A rocking motion is now given to the shaft G in the direction of the arrow *x*, so that the needle F carries the pile warp-thread *b* downward between adjacent pairs of ground warp-threads *a a′*, the said pairs being held spaced apart by the corresponding pusher K, which now swings into an uppermost position. When the needle F has reached its lowermost or bottom position, as indicated in Fig. 4, then a complete loop is formed by the pile warp-thread *b*, as the latter extends downward in front of the shaft G and passes through the opening F′ and up through the hollow portion of the needle F to the mouth F^2 thereof, to then extend forward to the weft-thread *c* in the fabric already formed. While the parts are in this position the shuttle is sent through the open shed within the loop formed by the pile warp-thread *b* at the needle F, and when the weft-thread *c′* has thus been passed through the several pile warp-thread loops then the shaft G is rocked in the reverse direction—that is, in the direction of the arrow *x′* (see Fig. 5)—the tension of the several pile warp-threads being now taken up by the tension-rod L swinging rearward from the forward position it assumed at the time the needle F swung downward, as previously mentioned in reference to Fig. 3. The weft-thread *c′* is now pushed forward by the pusher K, which now swings downward as the needle F moves upward, (see Figs. 6 and 7,) and when the needle F and the pusher K have returned to their uppermost positions (shown in Fig. 7) then the lay H is caused to slide forward, so that the several pushers K beat in the weft-thread *c′* to a final position, (see Fig. 8,) it being understood that during this first preliminary beating in and the final beating in of the weft-thread *c′* the pile warp-thread *b* is drawn taut by the action of the tension-rod L, so that the pile warp-thread is looped around the said weft-thread *c′* in front of the same and in a downward and rearward direction for the pile warp-thread to pass up in the rear of the weft-thread *c′*. When this has been done, the lay H is immediately returned to its former position, and the heddles B and B′ now change, so as to cross the warp-threads *a a′* in front of the weft-thread *c′*. A pile-wire *d* is then inserted, and the above-described operation is repeated—that is, the needle F is caused to swing downward to draw the pile warp-thread *b* over the pile-wire to then form the loop, after which the shuttle is sent through the loop to pass the next weft-thread *c* through the loop, after which the needle F

is returned, and this weft-thread is beaten in in the same manner as above described relative to the weft-thread c'.

It is understood that the pusher K and the corresponding needle F are so arranged that when the needle swings downward and the pusher upward the pairs of adjacent ground warp-threads a a' are held apart by the pusher until the free end of the needle has passed between the pairs of ground warp-threads, and in a like manner the needle F remains between the said pairs of ground warp-threads on the return movement of the needle until the pusher has passed back between the said pairs of ground warp-threads, so that a proper looping of the pile warp-thread around the weft-threads takes place, the loops being at all times between adjacent pairs of ground warp-threads.

When the segmental needle F swings downward, the opening F′ is below the horizontal plane of the fabric, while the point or exit end of the needle is above the said plane, and as a portion of the pile warp-thread b extends downward from the tension-rod L to the opening F′ and another portion of the pile warp-thread also extends from the free end F^2 to the fabric and a portion of the pile warp-thread is concealed in the hollow portion of the needle it is evident that a complete loop is formed at the needle for the weft-thread to pass through. Now as the needle returns to an uppermost position the loop is drawn around the weft-thread, beginning at the front of the weft-thread, then downward and rearward under the weft-thread, and finally upward in the rear of the weft-thread. By having the needle F swinging in a vertical plane the loop formed on the pile warp-thread b is disposed vertically and its opening is in transverse alinement with the open shed for the ready passage of the weft-thread through the loop and the open shed.

When the needle swings upward on its return stroke, the space or weft-exit between the needle-point and the pusher comes opposite the fabric, so that the weft-thread can readily pass out of the crook of the needle.

It is understood that the loop-forming devices for the pile warp-threads, the tension device for drawing the loops tight around the weft-threads, the beating-in mechanisms, the heddles, and the shuttle mechanism all operate in unison to produce the result above described, and I do not limit myself to any particular means for actuating the parts in unison, as the said means may be varied without deviating from the invention.

A pile-wire d is inserted only after a pair of weft-threads c c' have been looped by the pile warp-thread, so that when the pile-wires are withdrawn and the face-loops are thus cut it is evident that a Turkish knot is had on each pair of adjacent weft-threads.

If a figured pile-face is to be produced in the weave, then the pile warp-thread b used is one that is colored in sections, or what is technically known as "drum-printed warp."

In order to make the Persian knot, (illustrated in Fig. 9,) the first weft-thread c^2 is passed through the open shed in front of the needle F when the latter is in nearly a lowermost position, as shown in Fig. 11, and then the needle F is caused to swing upward to pass the pile warp-thread b under the weft-thread c^2 and up on the right-hand side thereof, and then the heddles are changed and the closed pile warp-thread loop is formed, as above described, and shown in Fig. 4, and the second weft-thread c^3 is then passed through the closed loop, and this weft-thread c^3 is then beaten in, as shown in Figs. 5, 6, 7, and 8, after which the lay is moved rearwardly and the needle F again swung downward to the position shown in Fig. 11.

In order to produce the desired result, it is only necessary to give the lay a longer reciprocating movement to bring the needles into the two positions relative to the shuttle mechanism—that is, for the one weft-thread c^3 to pass through the open shed and loops formed by the needles (see Figs. 4 and 5) and the other weft-thread c^2 to pass through the open shed in front of the needles and above the pile warp-thread, as will be readily understood by reference to Figs. 9 and 11.

For weaving the Persian knot the shogging device O is dispensed with and the needles are provided only with the cut F^3, as the pile warp-thread extends on one side of the needle only.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A pile-fabric loom provided with a reciprocating lay, a rock-shaft mounted thereon, hollow curved needles secured at one end to the said rock-shaft, and pushers secured on the rock-shaft and lying in the same plane as the said needles.

2. A pile-fabric loom provided with a reciprocating lay, a rock-shaft mounted thereon, hollow curved needles secured at one end to the said rock-shaft, and pushers secured on the rock-shaft and lying in the same plane as the said needles, the point of each needle being a short distance from the peripheral edge of the corresponding pusher.

3. A pile-fabric loom comprising a warp-beam for the ground warp-threads, a warp-beam for the pile warp-thread, heddles for the ground warp-threads, a reciprocating lay provided with a rock-shaft, hollow curved needles on the said rock-shaft, a tension-rod intermediate the said needles and the said warp-beam for the pile-warp threads, pushers on the said shaft in the form of flat plates lying in the same plane as the said needles, and means for the insertion of the weft.

4. A pile-fabric loom comprising a warp-beam for the ground warp-threads, a warp-beam for the pile warp-thread, heddles for the ground warp-threads, a reciprocating lay provided with a rock-shaft, hollow curved needles on the said rock-shaft, a tension-rod intermediate the said needles and the said warp-beam for the pile warp-threads, pushers on the said shaft in the form of flat plates lying in the same plane as the said needles, means for the insertion of the weft, and a shogging device for the pile warp-threads.

5. A pile-fabric loom provided with a segmental hollow needle for the passage of the pile warp-thread and mounted to rock, a spring-pressed tension-rod mounted to swing and engaging the said pile warp-thread, a reciprocating lay on which the needle is mounted to rock, means for the insertion of the weft, and means on the said lay, operating in unison with the said needle, for pushing the weft out of the needle and beating in the said weft.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES KARMI DALKRANIAN.

Witnesses:

THEO. G. HOSTER,

EVERARD BOLTON MARSHALL.