G. KOCH.

LOOM FOR WEAVING PILE FABRICS.

APPLICATION FILED JAN. 9, 1919.

1,305,373.

Patented June 3, 1919.

3 SHEETS—SHEET 1.

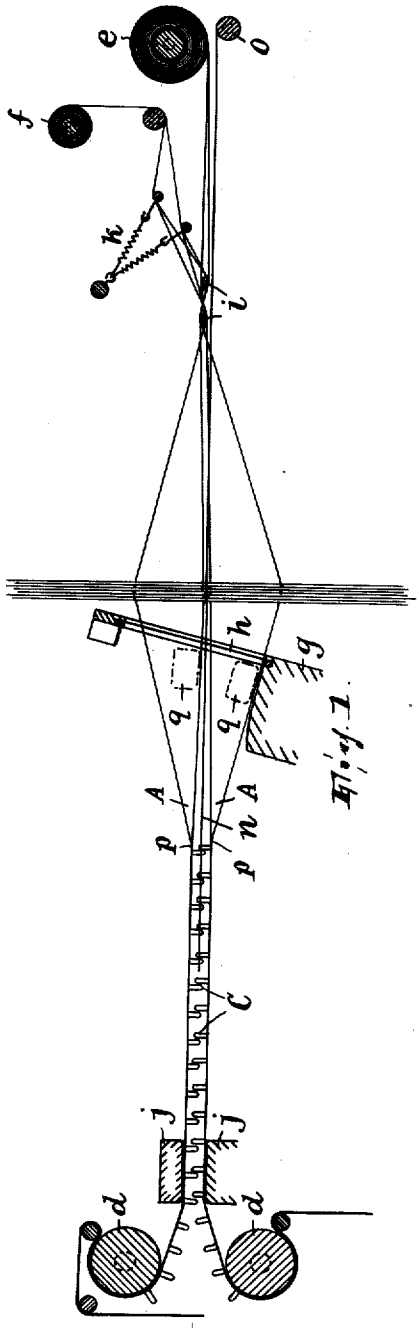


Fig. 1.

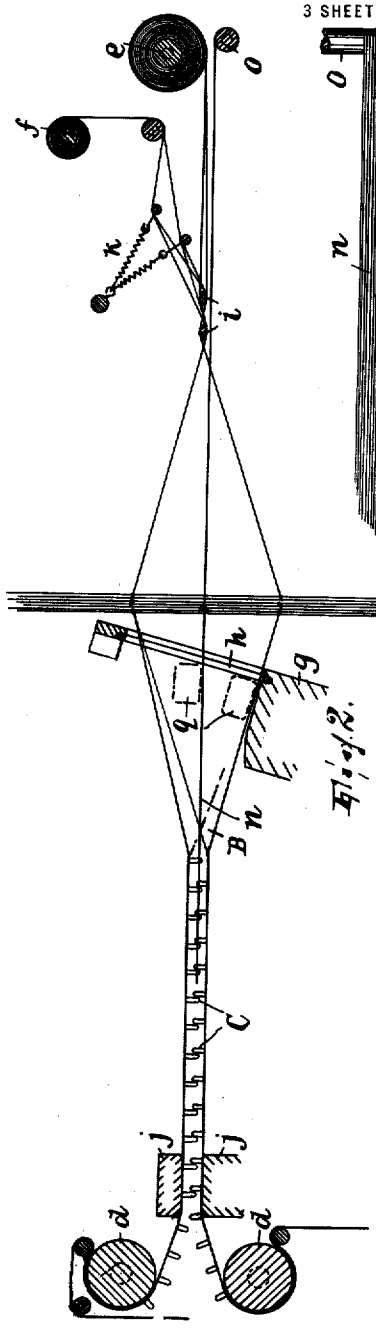


Fig. 2.

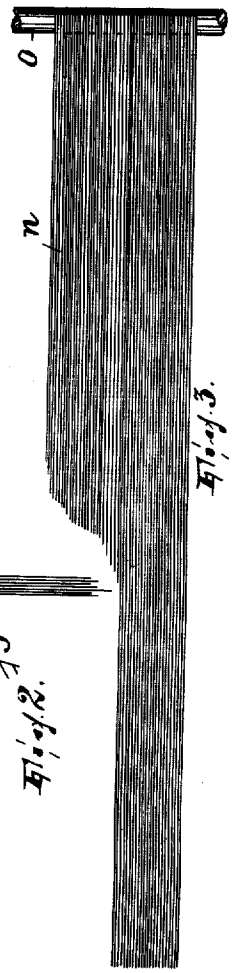


Fig. 3.

WITNESS:

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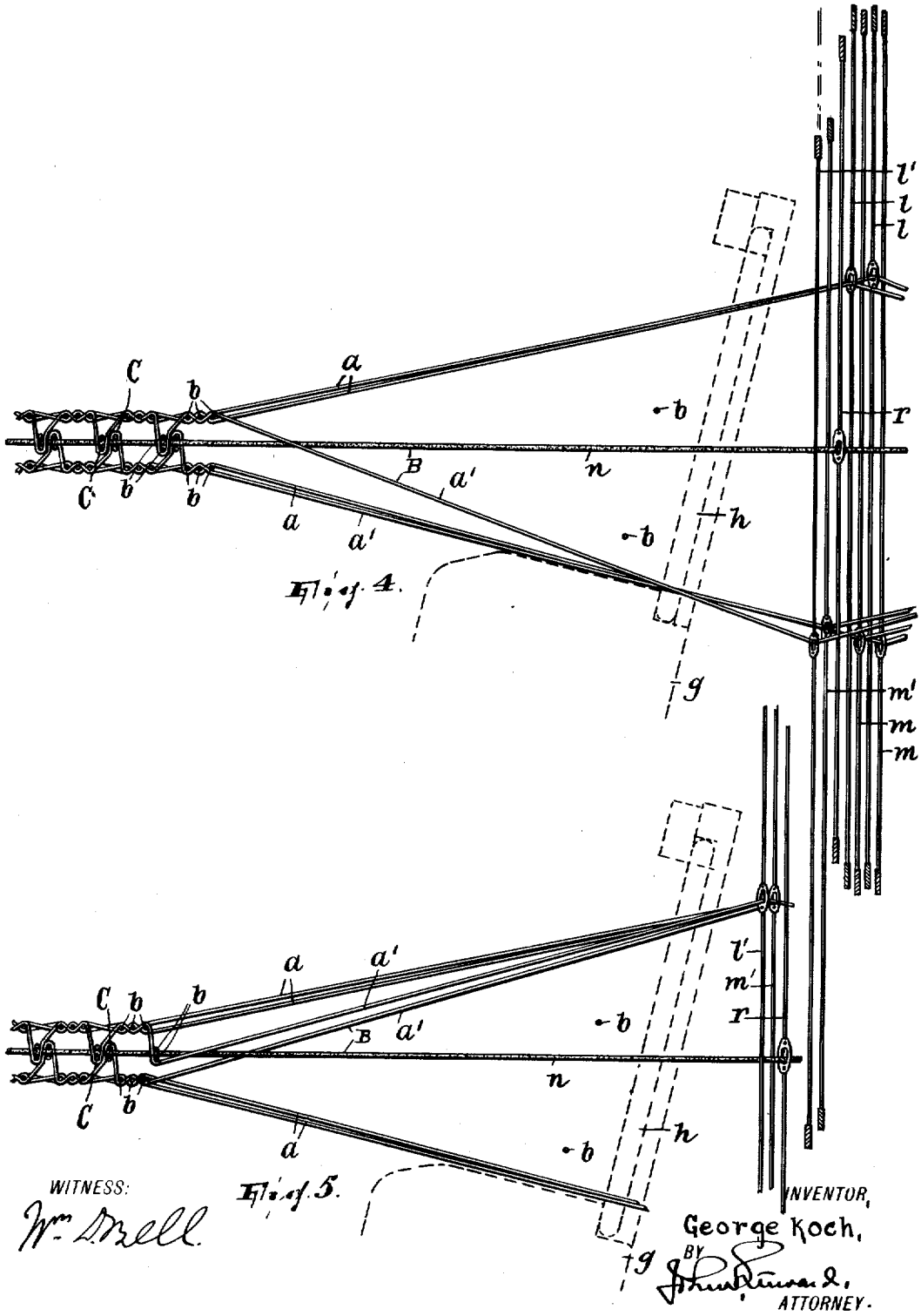


Fig. 4.

Fig. 5.

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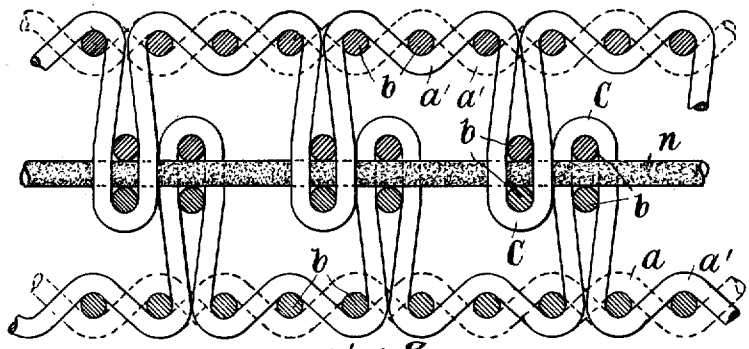


Fig. 8.

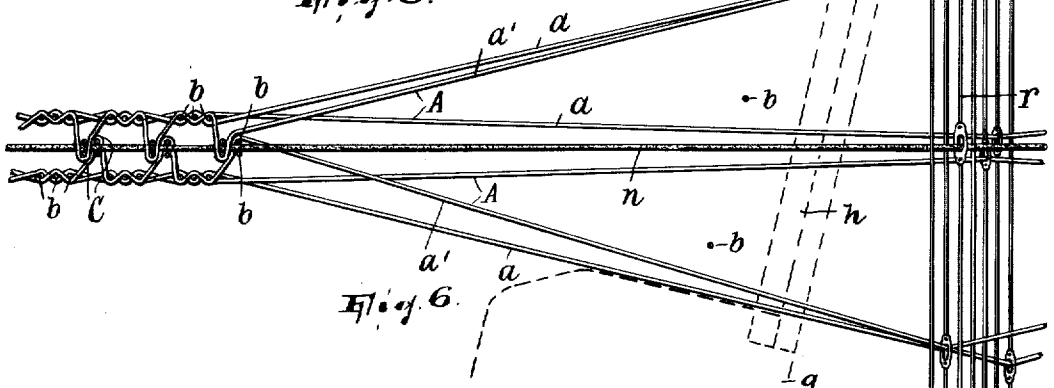


Fig. 6.

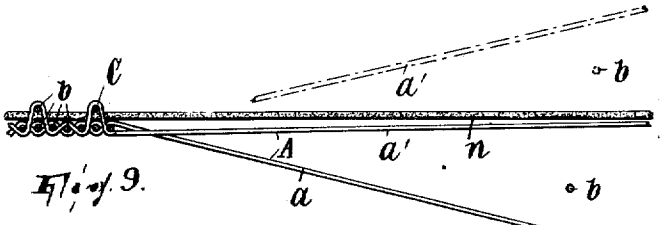


Fig. 9.

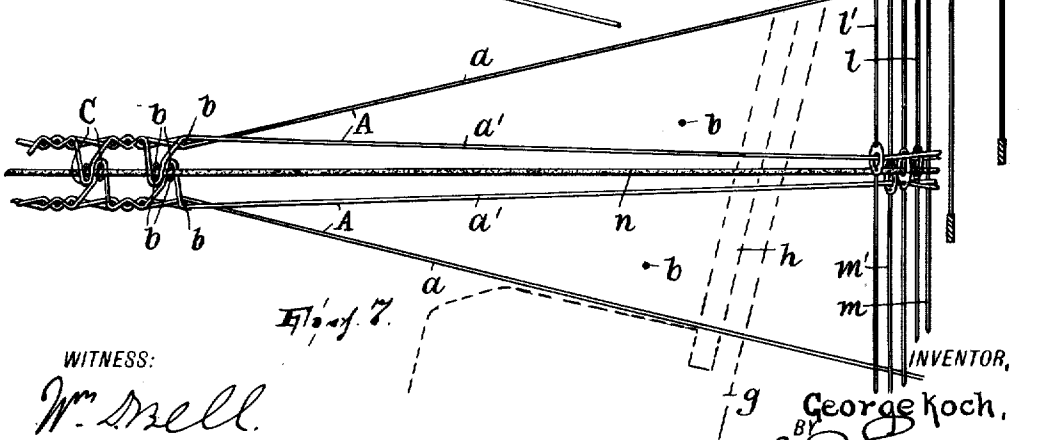


Fig. 7.

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UNITED STATES PATENT OFFICE.

GEORGE KOCH, OF PATERSON, NEW JERSEY, ASSIGNOR TO DR. ERNEST CADGENE AND OLAV BERG, BOTH OF PATERSON, NEW JERSEY.

LOOM FOR WEAVING PILE FABRICS.

1,305,373. Specification of Letters Patent. Patented June 3, 1919.

Application filed January 9, 1919. Serial No. 270,300.

To all whom it may concern:

Be it known that I, GEORGE KOCH, a subject of Germany, residing at Paterson, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Looms for Weaving Pile Fabrics, of which the following is a specification.

This invention consists in a pile weaving loom which has as its most salient feature of novelty attenuated supporting devices or supports having free ends projecting in the direction of advance of the warp as the weaving proceeds, being fixed relatively thereto, and arranged in a series which extends transversely of the warp and each out of the plane thereof, whereby from time to time some of the warp threads may be made to decussate said devices to form therewith, in addition to the sheds which apply to the ground, what I term "pile sheds" to receive filling around which will be formed and which will support (because such filling is itself supported by said devices) pile loops in such warp threads upon the return movement of the latter following their pile-shed-forming movement, it being understood that the function of said devices to support the filling and hence the pile loops is of only temporary nature with respect to each shot of filling because as the weaving proceeds and the warp and finished portion of the fabric advances the successive shots of filling in time pass beyond and clear their free ends. In the best form of the invention there is means to beat up the filling of the fabric to the fell thereof and the free ends of said supporting devices project beyond such fell, *i. e.*, beyond the beating-up limit, so that they continue to perform their function in the forming and temporary support of the pile loops until the pile threads become so well bound in the fabric that the loops will be maintained without support. I have found that I can weave two pile fabrics at once face to face by my invention, the series of aforesaid supports or supporting devices being between their weaving planes and common to both of them. The supports may be flexible or rigid in nature: I have used with good success stout linen threads suitably held at their rear ends.

By my invention I can weave fabrics having much lower pile than is possible by known methods. I can also produce two fabrics having an uncut pile at one operation. I can further produce a pile fabric which, by having filling extended through the pile loops, has certain very desirable qualities over known pile fabrics.

In the drawings,

Figures 1 and 2 are diagrammatic views showing the essentials of the improved loom as adapted for delivering two fabrics at once with uncut pile, Fig. 1 illustrating the sheds appertaining to the ground and Fig. 2 those appertaining to the pile;

Fig. 3 shows in plan the series of attenuated supports;

Figs. 4, 5, 6 and 7 show the heddles, warps, filling and the said supports, diagrammatically and on a magnified scale, at four different stages in the production of two rows of pile loops, one for each of the two fabrics being produced as in Fig. 1;

Fig. 8 is a magnified longitudinal sectional view showing the fabrics being woven and the intervening attenuated supports, the ground warp threads of each fabric being here distinguished from the pile warp threads by dotted lines; and

Fig. 9 is a diagrammatic view illustrating the invention in connection with the weaving of a single fabric.

Referring, first, to Figs. 1 to 8 of the drawings: The threads of the warp which go into the ground of each fabric are designated *a;* those which form the pile are designated *a'*. The filling threads are denoted *b*. The means for supporting and advancing the warp and beating up the filling to the fell of each fabric are shown as well-known instrumentalities, such as take-up means including the take-up rollers *d*, let-off means herein shown as including let-off beams *e* and *f* (one of which is for the ground warp threads and the other for the pile warp threads), the lay or batten *g* carrying a reed *h* and adapted to move forward after each shot of filling in the usual manner, lease rods *i*, and spaced breast-beams *j;* it will be understood that the beam *f* is calculated, in any well known way, to deliver the pile warp threads at the required rate to produce the height of pile desired, and *k* designates a known form of yielding means to keep the pile warp threads in a state of tension. There are two sets of heddles, one appertaining to the upper and the other to the lower fabric; the former are

designated l l l' and the latter m m m', those designated l' and m' being the ones which control the pile warp threads and the rest the ones which control the ground warp threads. The attenuated supports n, here shown as of flexible material, as stout linen thread, are wound on a beam o at the back of the loom and extend forward between the heddles in a plane between the planes of weaving the two fabrics, terminating, preferably, suitably forward of the fells p of the fabrics. I find that the forward end portions of the supports n wear away, wherefore at times the beam o may be turned sufficiently to permit their advance upon cutting away the worn portion. There are two shuttles q for the filling, as is usually the case where two fabrics are woven face to face, adapted to be shot across the warp together one above and the other below the series of supports n from and to their boxes (not shown). Suitable means to keep the supports n from sagging may be provided, as the heddle r, which in the present case has no movement having to do with shed-forming.

The weaving of each fabric in so far as the ground is concerned may proceed in any selected way: for example, in figures 4 to 8 is it assumed that heddles l l (or m m) reciprocate reversely to form a succession of (say three) ground sheds A, Fig. 7, each to receive a shot of filling b, which is beaten up by the reed h in the regular way; heddle l' (m') for the pile threads of either warp is assumed to rise and fall with one of these two reversely reciprocating shafts. Then the heddle l' (m') for the pile threads a' is shifted so that the latter decussate the supports n and form therewith a pile shed B (Fig. 4 or 5), whereupon shots of filling b are passed across the series of supports at opposite sides thereof, one through the shed B, and, upon the return of heddle l' (m') beaten up by the reed. As the weaving proceeds the pile loops C which are formed around and supported by the filling b, in turn supported by supports n (which preferably project forward of the fell p of the cloth), advance beyond said supports and become no longer supported thereby; but by this time the pile threads forming them have become sufficiently well bound in to prevent disturbance of their pile loops C. In weaving two fabrics face to face at the same time it is an advantage, especially if the product is to have an uncut pile, to weave them so that the pile of one will be unconnected with that of the other. This may be accomplished (excepting at the very edges, where the fabrics will be bound together for a reason to be explained) if, as shown in Figs. 1 to 8, the decussatings of the pile threads a' of the two warps are made to occur in alternation (not both at the same time, for then obviously the shots of filling b b which then ensue would interlock the two rows of pile, one for each fabric, formed); and at the time of decussating the pile threads a' of the warp of either fabric with respect to the supports n all the threads, both ground and pile, of the warp of the other fabric are by their heddles brought to a position relatively outside of the path of the adjoining shot of filling, *i. e.*, all above or all below the same, as the case may be (since otherwise they would form a shed through which the shot of filling that is to ensue for the support of the row of pile loops being formed would pass, with the consequence that said row of pile loops would become bound in the ground of said other fabric). Figs. 4 to 7 show four stages in weaving two fabrics face to face according to my invention and so that they will issue with uncut pile and clear of each other (Figs. 1 and 2). Thus, in Fig. 4 the pile shed B for the upper fabric is formed, and all of the threads of the warp of the lower fabric are shifted to a position relatively outside of the path of the shot of filling b which is to enter said shed B to form a row of pile loops for the upper fabric. In Fig. 5 the shots of filling b b in Fig. 4 having occurred and been beaten up, the pile shed B for the lower fabric is formed, and all of the threads of the warp of the upper fabric are shifted to a position relatively outside of the path of the shot of filling b which is to enter said shed B to form a row of pile loops for the lower fabric In Fig. 6 the shots of filing b b in Fig. 5 having occurred and been beaten up, the warps of each fabric are brought to the positions necessary for forming the ground shed A therein, though the pile threads a' do not appear (especially in this mere diagrammatic illustration) in the same plane as the respective ground threads a for the obvious reason that said pile threads have not as yet commenced to be woven into the ground of the fabric. See, however, Fig. 7, where the pile threads a' are now assumed to be in process of being woven into the ground. On beating up the first filling that goes into the ground after forming a row of pile loops there is actually no such space as appears in the diagrammatic views 4 to 7 between such filling and the one next preceding it in the ground, but the fabric is closed more or less as it appears in Fig. 8. Although from one edge to the other the piles of the two fabrics will issue unconnected with each other as shown in Figs. 1 and 2 it will be apparent that they will be bound together at their very edges because, while the alternate arrangement of their rows of pile loops and the bringing of the warp of one fabric to a position relatively outside of the path of the adjoining shot of filling at the time of decussating the pile threads of the warp of the

other fabric with respect to the supports *n* avoid the filling interlocking the two fabrics together across the same, nevertheless each shot of filling alternately passes out of a pile row of one fabric and into a pile row of the other; this slight connection, essentially formed by filling and only at the edges, may however obviously be severed in any way, as by a knife (not shown) entered into the folds in effect produced at the edges.

It will be obvious in view of the foregoing that a single fabric may be woven with uncut pile according to my invention, as in Fig. 9. Here the essential elements of the loom are assumed to be all the same as those for weaving either of the two fabrics shown in the first seven figures, the only difference being that the supports *n* lie in contact with the ground of the fabric and that since there is no occasion to provide against pile loops of another fabric being interwoven with the ground the warps *a a'* can, if desired, form sheds A for the ground uninterruptedly; also that provision is made for the filling which passes through the rows of pile loops (if two filling threads be employed, as herein shown) not being shot across excepting when the pile-forming sheds are formed.

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

1. A pile weaving loom including, in combination, instrumentalities to support and advance the warp longitudinally in a given plane, attenuated relatively fixed filling supports having free ends projecting in the direction of advance of the warp and arranged in a series which extends transversely of the warp and each in another plane, means to form a succession of ground sheds in the warp and at times also decussate some of the warp threads with respect to said filling supports and form therewith pile sheds, and means to pass filling through the ground sheds at the side of said supports corresponding to said first plane and also through the pile sheds at the opposite side of said supports.

2. A pile weaving loom including, in combination, instrumentalities to support the warp in a given plane, means to beat up filling to the fell of the fabric being woven having a definite limit of beating-up movement, attenuated relatively fixed filling supports having free ends projecting in the direction of beating-up movement of said means and past said limit of beating-up movement and arranged in a series which extends transversely of the warp and each in another plane, means to form a succession of ground sheds in the warp and at times also decussate some of the warp threads with respect to said filling supports and form therewith pile sheds and means to pass filling through the ground sheds at the side of said supports corresponding to said first plane and also through the pile sheds at the opposite side of said supports.

3. A pile weaving loom including, in combination, instrumentalities to support and advance longitudinally two spaced warps in substantially parallel planes, attenuated relatively fixed filling supports having free ends projecting in the direction of advance of the warps and arranged between the latter in a series which extends transversely thereof, means to form a succession of ground sheds in each warp and at times also decussate some of the threads of each warp with respect to said filling supports and form therewith pile sheds, and means to pass filling across said series of filling supports at both sides thereof and at each side through the ground and pile sheds as they are formed.

4. A pile weaving loom including, in combination, instrumentalities to support and advance longitudinally two spaced warps in substantially parallel planes, attenuated relatively fixed filling supports having free ends projecting in the direction of advance of the warps and arranged between the latter in a series which extends transversely thereof, means to form a succession of ground sheds in each warp and at times also decussate some of the threads of both warps, first as to one and then as to the other, with respect to said filling supports and form therewith pile sheds, and means to pass filling across said series of filling supports at both sides of such series and at each side thereof through the ground and pile sheds as they are formed.

5. A pile weaving loom including, in combination, instrumentalities to support and advance longitudinally two spaced warps in substantially parallel planes, attenuated relatively fixed filling supports having free ends projecting in the direction of advance of the warps and arranged between the latter in a series which extends transversely thereof, means to form a succession of ground sheds in each warp and at times also decussate some of the threads of both warps, first as to one and then as to the other, with respect to said filling supports and form therewith pile sheds and at each such time also hold the threads of the opposite warp relatively outward of the path of filling, and means to pass filling across said series of filling supports at both sides of such series and at each side thereof through the ground and pile sheds as they are formed.

In testimony whereof I affix my signature.

GEORGE KOCH.