Sept. 7, 1948. R. E. WALLISER 2,448,929

LOOM

Filed Feb. 24, 1945 5 Sheets-Sheet 1

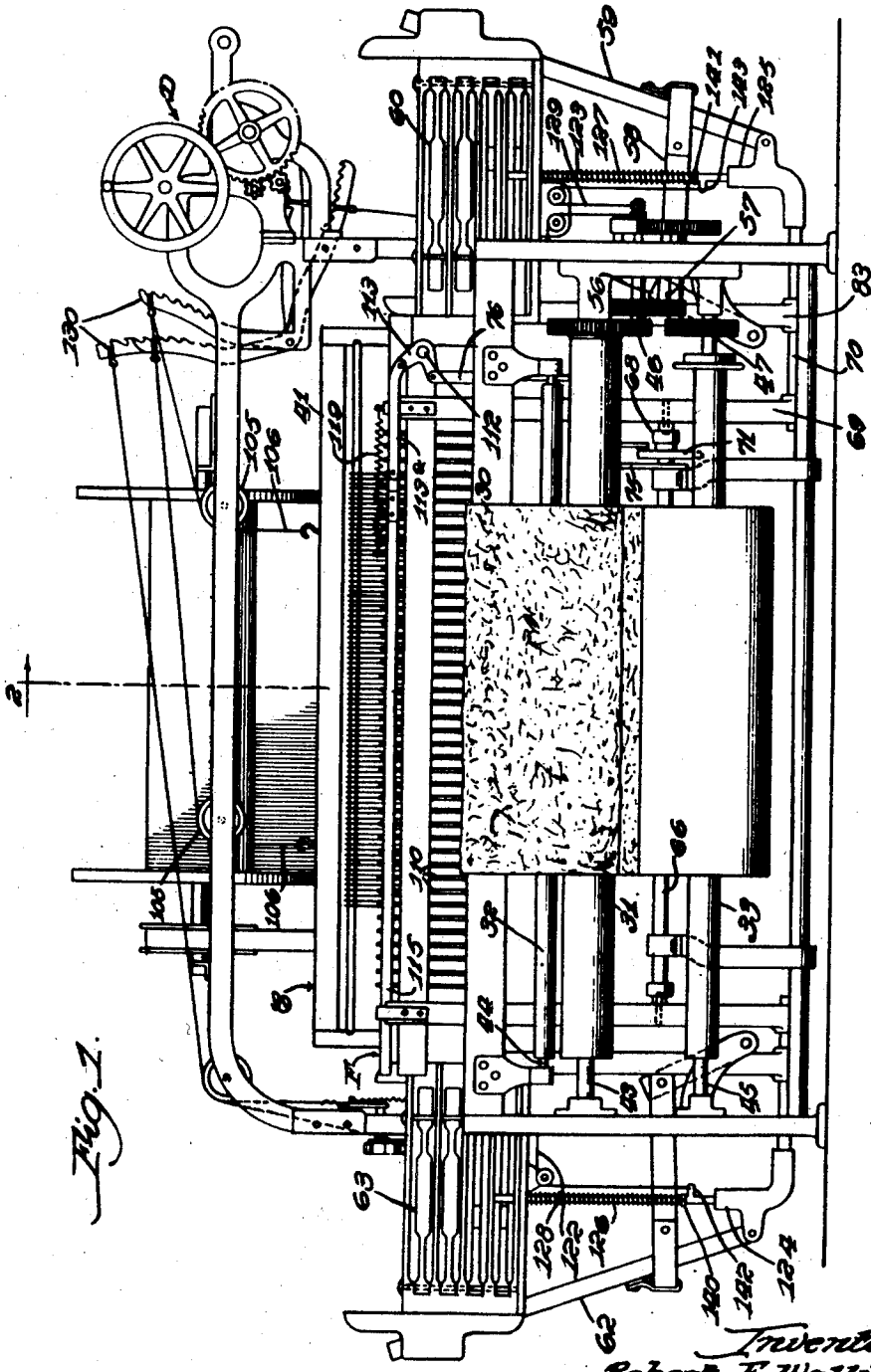


Fig. 1.

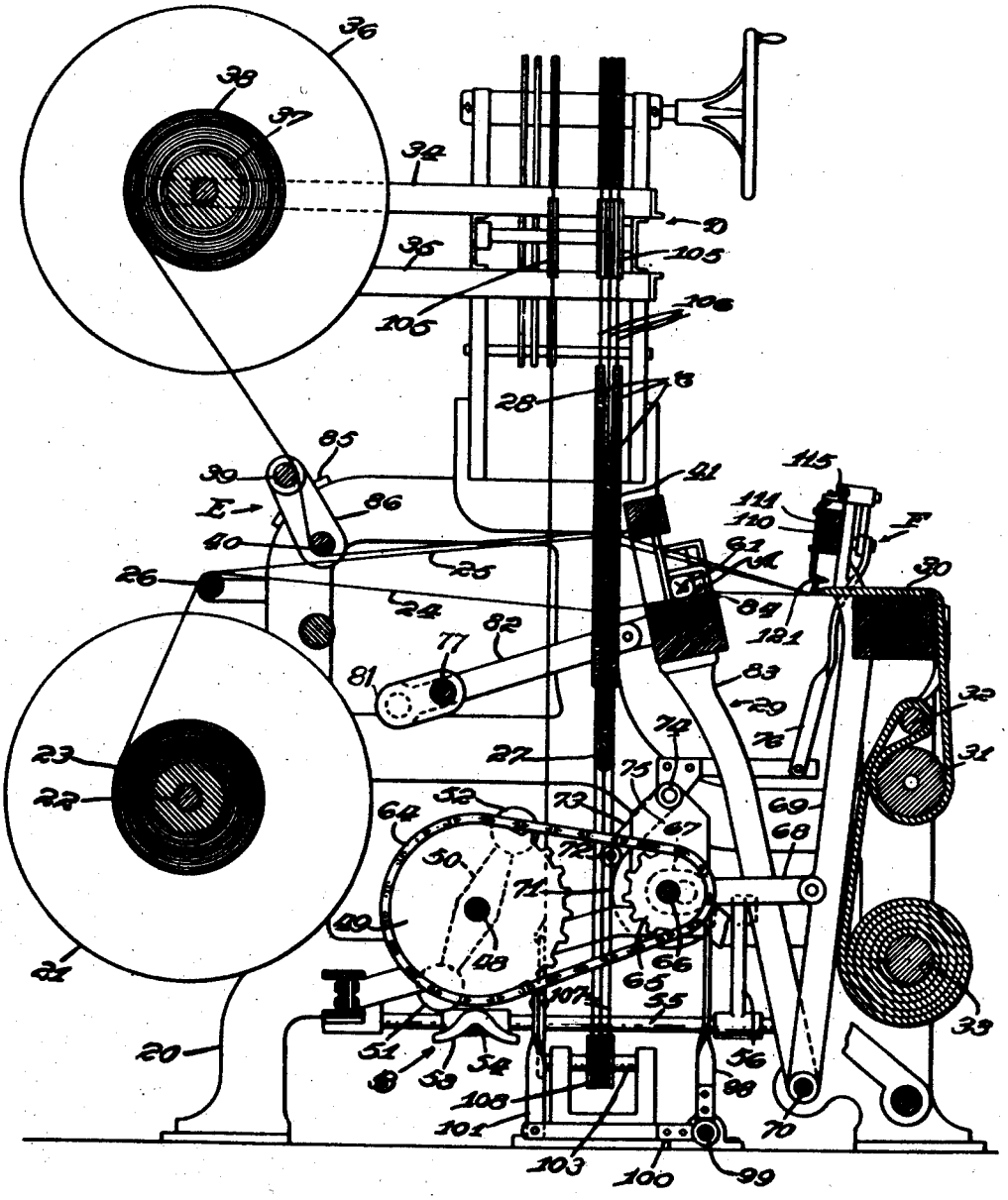
Inventor:
Robert E. Walliser.
By Dawson, Coms & Booth,
Attys.

Sept. 7, 1948. R. E. WALLISER 2,448,929

LOOM

Filed Feb. 24, 1945 5 Sheets-Sheet 2

Fig. 2.



Inventor:
Robert E. Walliser.
By Dawson, Owen & Booth,
Attys.

Sept. 7, 1948. R. E. WALLISER 2,448,929

LOOM

Filed Feb. 24, 1945 5 Sheets-Sheet 3

Fig. 4

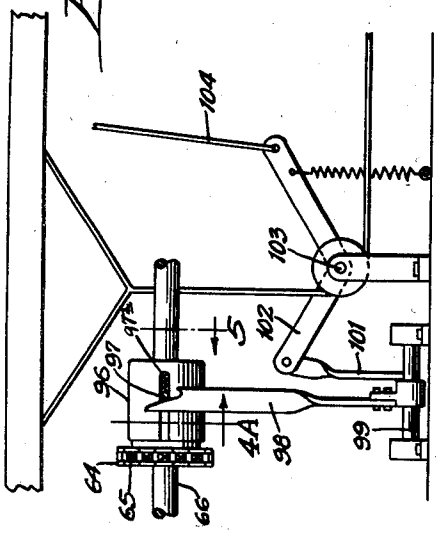


Fig. 5

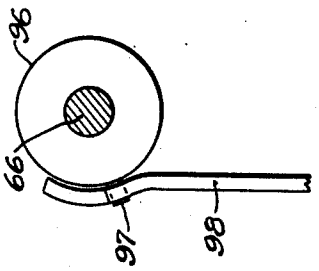


Fig. 4A

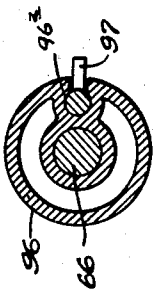
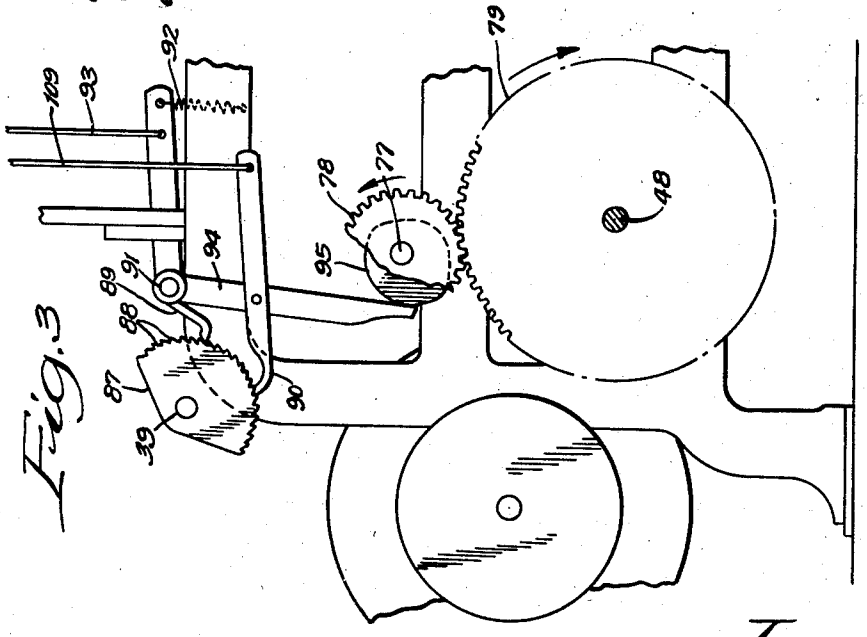


Fig. 3

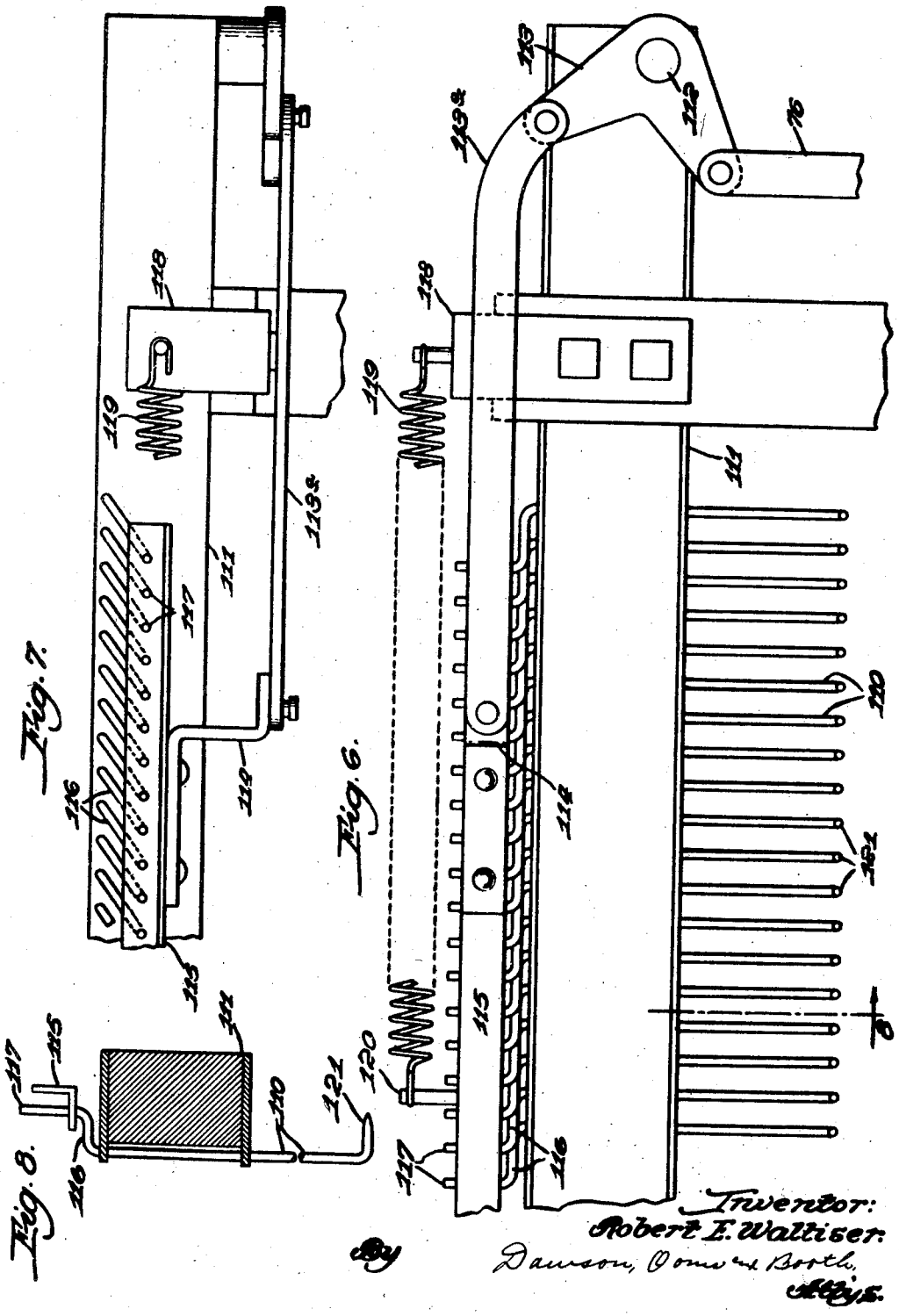


Inventor:
Robert E. Walliser,
By Dawson, Orrick & Booth,
Attorneys.

Sept. 7, 1948. R. E. WALLISER 2,448,929

LOOM

Filed Feb. 24, 1945 5 Sheets-Sheet 4



Sept. 7, 1948. R. E. WALLISER 2,448,929

LOOM

Filed Feb. 24, 1945 5 Sheets-Sheet 5

Fig. 9.

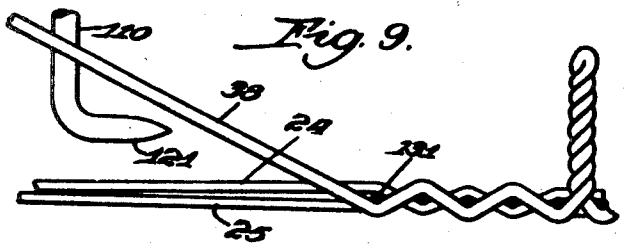


Fig. 10.

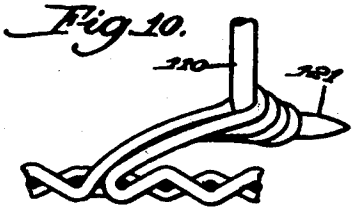


Fig. 11.

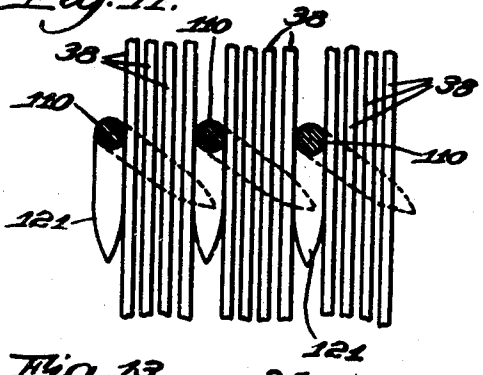


Fig. 12.

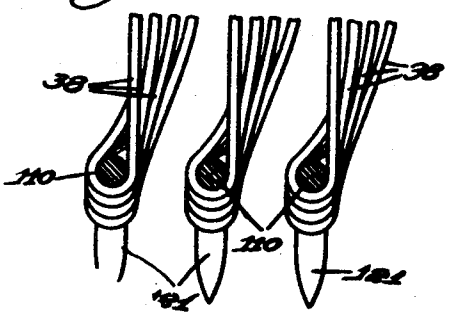


Fig. 13.

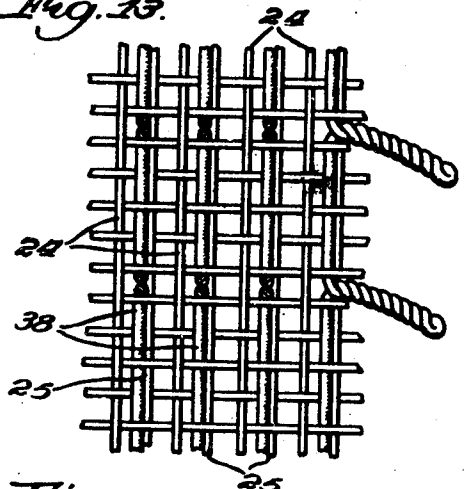


Fig. 14.

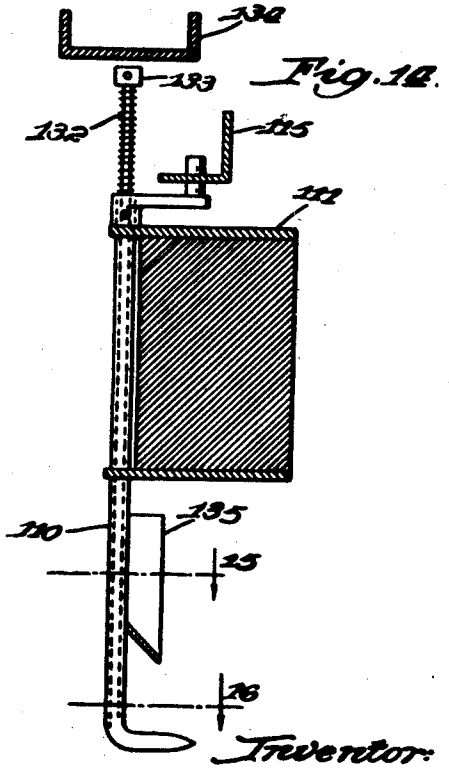


Fig. 15.

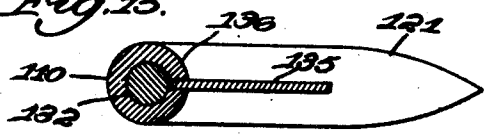
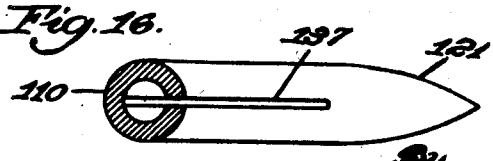


Fig. 16.



Inventor:
Robert E. Walliser.
By Dawson, Andrews Booth,
Attys.

Patented Sept. 7, 1948

2,448,929

UNITED STATES PATENT OFFICE

2,448,929

LOOM

Robert E. Walliser, Libertyville, Ill., assignor, by mesne assignments, to Libertyville Textiles, Inc., Libertyville, Ill., a corporation of Illinois

Application February 24, 1945, Serial No. 579,537

5 Claims. (Cl. 139—38)

1

This invention relates to a loom, and more particularly to a loom for weaving fabric and rugs with projecting loops of thread extending from the surface thereof.

One object of this invention is to provide a mechanism for forming a woven fabric from pile warp and ground warp threads with weft threads woven therebetween, wherein the pile warp threads are periodically projected from the fabric in the form of loops integrally secured to but extending from the fabric.

Another object of the invention is to provide in a loom means for projecting loops in a portion of the warp threads, the loops extending from the woven fabric. Still another object is to provide in a loom a needle arranged to engage the pile warp threads, to advance the same to form loops therein, and thereafter to release the threads. Yet another object is to provide a shuttle mechanism for periodically weaving a weft thread between warp threads, and means for interrupting the operation of the shuttle mechanism for a single period.

Another object is to arrange the shuttle mechanism in cooperation with the loop projecting means whereby the operation of the shuttle mechanism is interrupted when the pile warp threads are engaged for the formation of loops, and the operation is resumed before the pile warp threads are released. A further object is to provide a tension device in a loom for exerting a tension upon the pile warp threads, and means for releasing the tension when the pile warp threads are engaged by a loop projecting member.

Other features and advantages will appear from the following specification and drawings, in which—

Fig. 1 is a front elevational view of the improved loom; Fig. 2 is a vertical sectional view taken along the line 2 of Fig. 1; Fig. 3 is a fragmentary detail view, in elevation, of the mechanism for actuating the tensioning device; Fig. 4 is a fragmentary detail view, in elevation, of the mechanism for controlling the action of the loop projecting member; Fig. 4A is an enlarged sectional detail view, the section being taken as indicated at line 4A of Fig. 4; Fig. 5 is a sectional view taken along the line 5 of Fig. 4; Fig. 6 is a front elevational view, partly broken away, of the loop projecting member; Fig. 7 is a plan view of the same; Fig. 8 is a sectional view taken along line 8 of Fig. 6; Fig. 9 is a longitudinal sectional view of a portion of the woven fabric, showing the loop projecting needle in position

2

adjacent the pile warp thread; Fig. 10 is a similar view of the fabric after the needle has engaged the pile warp thread; Fig. 11 is a horizontal sectional view of the advancing warp threads, with the needle in adjacent position, the dotted lines showing the turning movement of the needle; Fig. 12 is a view similar to Fig. 11, showing the needle in engagement with the threads; Fig. 13 is a fragmentary detail view in horizontal section of a portion of the woven fabric; Fig. 14 is a vertical sectional view of a modification of the loop projecting needle; Fig. 15 is a transverse sectional view taken along the line 15 of Fig. 14; and Fig. 16 is a transverse sectional view taken along the line 16 of Fig. 14.

In standard and conventional loom constructions, the loom is usually provided with means for advancing warp threads through the apparatus and with a shuttle and bobbin construction for passing one or more weft threads back and forth between the warp threads to form the woven fabric. The warp threads are divided into at least two groups which are independently received by heddles.

The heddles move with a reciprocating motion to separate the two groups of warp threads, and then, after the weft thread has been passed between the separated warp threads, the heddles are moved in opposite directions with respect to each other to enclose the weft thread in the fabric and again separate the warp threads. The weaving operation continues by again passing the weft threads between the separated warp threads.

The operation of the heddles and other cooperating elements of the loom structure is controlled by a dobbyhead which serves to synchronize the various elements of the structure.

The structure of the present invention includes these conventional loom elements together with additional mechanism and means for providing cooperation between the elements. In so far as the structure relates to conventional and well-known loom mechanism, it will not be described in detail herein.

The loom mechanism of the present invention is particularly adapted to form a fabric or rug having long twisted loops extending from the surface thereof to form articles similar to bullion fringe. With this apparatus, a bullion twist rug can be formed integrally with the rug body, providing a sturdy and attractive product more pleasing in appearance than rugs of this type heretofore formed.

The fabric or rug is described in detail in

Robert E. Walliser Patent No. 2,308,577, for Rug, which issued January 19, 1943.

In the specific embodiment of the invention described herein, the loom includes a shuttle and bobbin means A driven by a drive mechanism B. The pile warp threads are carried in heddles C, the cooperation of the various elements being obtained by means of a dobbyhead D. The loom is also equipped with a tensioning device E and a loop projecting mechanism F.

Referring particularly to Fig. 2, a frame 20 supports a large roller 21 rotatably mounted on the shaft 22. The roller 21 carries ground warp threads 23, preferably wound on the roller in pairs 24 and 25. The ground warp threads extending from the roller 21 pass over a shaft 26 and are received within the heddles 27 and 28, the heddle 28 receiving the threads 25, and the heddle 27 receiving the threads 24. From the heddles 27 and 28, the ground warp threads extend over the batten 29 and are formed into the fabric 30.

The fabric 30 is received on the roller 31, passes to the small roller 32, and is wound on the roller 33.

The extensions 34 and 35 of the frame 20 support a second large roller 36 rotatably mounted on the shaft 37. The pile warp threads 38 are carried by the roller 36 and are delivered to the tension release shafts 39 and 40 of the tension device E. From the shaft 40, the pile warp threads extend to the heddle 41 across the shuttle supporting member 29 to the loop projecting mechanism F. The pile warp threads 38 are incorporated in the fabric 30, being integrally secured thereto by the shuttle and bobbin means A and having loops formed therein by the loop projecting member F.

Referring now to Fig. 1, the rollers 31, 32 and 33 are carried on shafts 43, 44 and 45 journaled in suitable brackets on the frame 20. Shafts 43 and 45 have rigidly secured thereto gears 46 and 47, by means of which the shafts may be driven by any suitable power means. The roller 32 serves to reverse the position of the pile of the rug so that the pile, although extending from the outer surface of the fabric 30 as it is received on the roller 31, is on the inner surface of the fabric when it is received on the roller 33.

Referring again to Fig. 2, the heddles 27, 28 and 41 are mounted for vertical reciprocating motion in the usual manner and are controlled in their movement by the dobbyhead D. The shuttle and bobbin mechanism is also of conventional construction and will not be described in detail herein.

A main drive shaft 48, driven by any suitable means (not shown), carried a large gear 49 and an arm 50 rigidly mounted thereon. To the ends of the arm 50 are attached a pair of cams 51 and 52, which are arranged to engage the boss 53 on the bracket 54 on the shaft 55. To the shaft 55 is rigidly secured a lever 56.

As seen particularly in Fig. 1, the lever 56 is pivotally joined at 57 to a bar 58 which engages and drives the arm or picker-stick 59. The arm 59 carries a picker block (not shown) which is arranged to strike the shuttle 61 when it is in shuttle box 60 and to drive it across the loom.

On the opposite side of the loom is a duplicate mechanism for driving a similar arm or picker-stick 62, which strikes the shuttle when it is in the shuttle box 63 to pass it back across the loom. When the cam 51 passes the boss or shoe 53, the arm 59 is returned to its original position by conventional means, not shown.

As seen particularly in Fig. 2, the gear 49 carries a chain 64 which drives a smaller gear 65 rotatably mounted on the shaft 66. The shaft 66 carries means for actuating and operating the loop projecting mechanism F. A crank 67 formed in the shaft 66 is pivotally attached to a laterally extending arm 68 of the support 69 for the loop projecting member. The support 69, in turn, is pivotally mounted on the shaft 70 in the frame 20. Rotation of the shaft 66 thus imparts horizontal reciprocating motion to the loop projecting mechanism F.

A cam 71 is also carried by the shaft 66 and is engaged by the roller 72 on the arm 73. The arm 73 is pivotally mounted at 74 on the bracket 75 which is secured to the frame 20. The opposite end of the arm 73 is pivotally connected to another arm 76 which extends to the loop projecting mechanism.

The shaft 66 is brought into drive relation with the gear 65 by a clutch mechanism hereinafter described.

A shaft 77 is driven by a gear 78 (Fig. 3), which in turn is driven by a large gear 79 on the shaft 48. The shaft 77 carries a crank 81 which is pivotally connected to an arm 82 secured at its other end to the batten 29 which in turn is carried by the standards 83. The usual reed structure is housed in the batten.

The standards 83, in turn, are pivotally mounted on the shaft 70 so that rotation of the shaft 77 and crank pin 81 produces a horizontal reciprocating motion in the shuttle-supporting member 29. The standards 83 also support a horizontal plate 84 which extends across the loom under the ground warp threads 24 and supports the shuttle 61 in its passage across the loom on the ground warp threads 24.

The tension device E, which is operated to momentarily release the tension on pile warp 38, includes a bracket 85 in which is journaled the shaft 39. Another bracket 86 extends downwardly from the shaft 39 to support the shaft 40. Rotation of the shaft 39 thus produces a horizontal movement of the shaft 40.

Referring now to Fig. 3, the shaft 39 carries a ratchet 87 provided with teeth 88 along one side thereof. The teeth 88 are engaged by a pair of pawls 89 and 90, the pawl 89 being pivotally mounted on the shaft 91. To the opposite end of the pawl 89 is secured a spring 92 and a lead wire 93 to the dobbyhead D. A depending arm 94 is pivotally mounted on the shaft 91 and serves as a pivotal support for the pawl 90. The lower end of the arm 94 engages a cam 95 on the shaft 77.

As seen particularly in Figs. 4, 4a, and 5, the loop projecting mechanism F is controlled in operation by a clutch mechanism. The shaft 66 supports a drum 96 rigidly mounted thereon. Another shaft 96a is slidably received within the drum, as seen particularly in Fig. 4a. The shaft 96a engages at its end a recess or socket (not shown) in the gear 65 so as to releasably interlock the gear 65 and drum 96 for rotational movement and thus cause the rotation of the gear 65 to produce rotation of the drum 96 and shaft 66.

A pin 97 extends laterally from the shaft 96a and from the drum 96. A spring 97a urges the shaft 96a into the socket in the gear 65 so as to lock the gear 65 and the drum 96 together.

A recess stop member 98 is adapted to engage the pin 97 and prevent the rotation of the drum

96. The stop member is pivotally mounted on the shaft 99 and connected by link 100 with the bar 101. An arm 102, pivotally mounted at 103, connects the bar 101 to a lead wire 104 connected to the dobbyhead D. When the lead wire 104 is lowered, the stop member 98 is drawn away from the drum 96 out of engagement with the pin 97. The spring 97a then causes the drum 96 to be interlocked in drive relation with the gear 65, and the shaft 66 is rotated by rotation of the gear 65. When, on the other hand, the lead wire 104 is raised, the stop member 98 is brought into engagement with the drum 96, and the pin 97 is moved against the urging of the spring 97a longitudinally of the drum 96 and away from the gear 65. This releases the pin 96a from interlocking engagement with the gear 65, and rotation of the drum 96 and shaft 66 ceases. The clutch mechanism for releasably connecting the drum 96 in drive relation with the gar 65 may be any suitabe mechanism and is therefore not described in greater detail herein.

The dobbyhead D, as seen particulary in Figs. 2 and 1, is equipped with a series of pulleys 105 upon which the various lead wires are carried. The lead wires 106 extend to the upper ends of the heddles 27, 28 and 41, while the lead wires 107 pass around the pulleys 108 to the lower ends of the same heddles.

Lead wires 93 and 109 (Fig. 3) are connected to the dobbyhead and control the action of the tension releasing device E. When the lead wires 93 and 109 are lifted, the pawls 89 and 90 are released from the ratchet 87, and the shaft 39 is permitted to rotate in a counter-clockwise direction to release the tension on the pile warp threads 38.

The loop projecting mechanism F, as seen particularly in Figs. 6, 7, 8 and 9, includes a plurality of needles 110, which are rotatably mounted in a channeled bar 111 carried by the support 69 which is pivotally mounted on the frame 20. The bar 111 also supports a pivot 112, on which is mounted a crank 113 pivotally connected at one end to the arm 76 and at the other to a laterally extending arm 113a. The arm 113a is, in turn, secured to a bracket 114 which is riveted to an angle member 115. The upper portions of the needles are turned laterally at 116 and then upwardly to form extensions 117 which are received within the member 115.

The bar 111 supports a bracket 118 to which is secured a spring 119. The other end of the spring 119 is attached to a pin 120 on the member 115, the spring being so arranged as to draw the member 115 and the upper extensions 117 of the needles toward the bracket 118. The needles thus rotate in the channeled bar 111. The lower portion of each needle is provided with a lateral extension 121 which is adapted to engage the pile warp threads.

Referring again to Fig. 1, the shuttle boxes 60 and 63 are connected to the rods 122 and 123, which are slidably received within the sleeves 124 and 125. Springs 126 and 127, resting at one end against collars 140 and 141, respectively, on the rods 122 and 123, support the shuttle boxes 60 and 63, the springs, as shown in Fig. 1, being under sufficient compression to support the shuttle boxes 60 and 63. Wires 128 and 129 are connected to the dobbyhead and to the bosses 142 and 143 on the rods 122 and 123, respectively. The actuation of the appropriate cranks of the dobbyhead causes the shuttle boxes 60 and 63 to be pulled upwardly. When the dobbyhead cranks

are changed in position to release the wires 128 and 129, the shuttle boxes 60 and 63 are lowered by gravity to a position where they are not engaged by the picker-blocks (not shown) on the picker-sticks or arms 59 and 62. The springs 126 and 127 provide an escapement to prevent breakage in the event that the shuttle boxes become jammed.

When the shuttle boxes 60 and 63 are in lowered position, their shuttles are not engaged by the pickers actuated by the arms 59 and 62, and the shuttle 61 is not passed across the loom. As soon as the boxes are lifted by the wires 128 and 129 to normal upward position, the shuttle is engaged by the pickers actuated by the arm 59 and 62.

The dobbyhead mechanism D is of conventional construction and need not be described in detail herein. The usual jacks 130 are connected to the various lead wires and are actuated by any suitable means, such as the well-known pattern chain construction (not shown). The jacks may be of any desired number, and may be arranged so that they are actuated at the appropriate time by adjustment of the conventional actuating means.

Referring now to Figs. 2, 9, 10, 11, 12 and 13, the pile warp threads 38 are advanced through the loom around the needles 110, with the lower lateral extensions 121 of the needles being positioned adjacent groups of the pile warp threads. The normal position of the needles 110 is that shown in Fig. 2 where they are out of the path of the reed. Fig. 9 shows the position of the needles after shaft 66 is revolved 180° in a loop-forming cycle. The loom is so constructed and operated that the ground warp threads 25 normally are shed with the pile warp threads 38, while the ground warp threads 24 are separated therefrom in order to permit the shuttle and the weft thread 131 carried thereby to pass between the warp threads.

As seen in Fig. 13, the weaving operation is carried out in the conventional manner for five successive passes of the weft thread between the warp threads. At this point, the heddle carrying the ground warp threads 25 remains in lowered position, while the ground warp threads 24 are also brought to lowered position. At the same time, the pile warp threads 38 are raised. The normal position of the needles is illustrated in Fig. 2 where they are out of the path of the reed while Fig. 9 shows their position after shaft 66 has revolved 180° in a loop-forming cycle. The lateral extensions 121 of the needles 110 are turned to the position shown in dotted lines in Fig. 11, wherein they engage the pile warp threads adjacent thereto. The loop projecting mechanism F advances the needles to the position shown in Figs. 10 and 12.

In the modification of the loop projecting mechanism F, shown in Figs. 14, 15 and 16, the needle 110 is in the form of a sleeve receiving the rod 132. The arrangements of the bar 111 and member 115 are the same as those already described. The rod 132 is vertically slidable within the needle 110 and is equipped at its upper end with a collar 133 which is adapted to engage the channel member 134. To the lower end of the rod 132 is secured a cutting blade 135 which extends through a slot 136 in the side of the needle. The lateral extension 121 on the lower portion of the needle is provided with a groove 137 for receiving the cutting blade.

The member 134 may be moved downwardly

by any suitable means. Movement of this member causes the cutting blade 135 to be forced downwardly into the groove 137, cutting any pile warp threads which may be carried on the needle. In this manner, the twisted loop projecting from the surface of the fabric may be cut.

While the mechanism provides for five successive passes of the weft thread between successive loops of the pile warp thread, it will be understood that this mechanism may be readily modified or adjusted to provide for any number of passes, as desired.

Operation

The ground warp threads 24 and 25 are advanced from the roller 21 over the roller 26 to the heddles 27 and 28. At the same time, the pile warp thread 38 is passed from the roller 36 across the shafts 39 and 40 of the tension device E to the heddle 41. The heddles are so arranged that the pile warp threads 38 and ground warp threads 25 are maintained in raised position while the ground warp threads 24 are in lowered position. When the heddle 27 is raised, the heddles 28 and 41 are lowered to reverse the position of the threads.

The pile warp and ground warp threads passing through the heddles extend across the batten 29, with the ground warp threads 24 resting on the supporting plate 84. At this point, the shuttle and bobbin 61 are passed across between the warp threads and received within the shuttle box on the opposite side of the loom.

The pile warp threads 38 passing beyond the batten 29 are periodically engaged by the lateral extension 121 of the needles 110, and a loop is formed in each of the threads. The woven fabric is then received on the rollers 31, 32 and 33. The fabric and the threads are advanced through the loom by the driving of the rollers 31 and 33 through the gears 46 and 47.

As the warp threads are advanced through the apparatus, the actuating mechanism of the tensioning device causes the shaft 39 to be turned clockwise, thereby causing a taking up of all of the slack on the pile warp threads 38. This operation is accomplished by the rotation of the gear 79 on the shaft 48, which, in turn, drives the gear 78 and cam 95 on the shaft 77. The movement of the cam moves the arm 94 and causes the pawl 90 to advance the ratchet 87 in a clockwise direction. When the recessed portion of the cam 95 engages the arm 94, the pawl 90 is withdrawn to engage the next adjacent tooth 88. The pawl 89 in the meantime remains in engagement with a tooth 88 of the ratchet 87 and prevents release of the tension.

At the time that the needles 110 engage the pile warp threads 38, the appropriate jacks of the dobbyhead D are actuated to lift the lead wires 93 and 109, releasing the pawls 89 and 90 from the ratchet 87, and thus permitting the shaft 39 to turn in a counter-clockwise direction and release the tension on the pile warp threads 38.

The rotation of the drive shaft 48 also causes rotation of the arm 50 and cams 51 and 52 to drive the shuttle actuating mechanism. The cams 51 and 52 engage the shoe or boss 53 of the bracket 54, rotating the shaft 55 and moving the picker-stick 59 against the shuttle. When the picker actuated by arm 59 engages the shuttle, it drives the shuttle 61 across the loom between the warp threads to the shuttle box 63. After the heddles have changed position, the arm 62 then drives the shuttle from the shuttle box 63 across the loom to the shuttle box 60.

The loop projecting member F is also driven from the drive shaft 48. The gear 49 drives the chain 64 and gear 65 which is rotatably mounted on the shaft 66. The drum 96 provides a clutch for bringing the shaft 66 into fixed relation with the gear 65.

Referring particularly to Fig. 4, when the lead wire 104 is raised by the appropriate jack of the dobbyhead D, the stop member 98 is moved away from the drum 96 and pin 97. This permits the spring 97a within the drum to urge shaft 96a within the drum into driving relation with the gear 65, thus driving the shaft 66.

When the shaft 66 is rotated, the cam 71 causes movement of the roller 72, arm 73, and arm 76, thus turning the lateral extensions 121 of the needles 110. At the same time, the crank 67 on the shaft 66 moves the supporting arm 69 to advance the loop projecting mechanism and form the loops in the pile warp threads 38. Fig. 2 shows the normal position of the needles where they are out of the path of the reed, while Fig. 9 shows their position after the shaft 66 has revolved 180° in a loop-forming cycle. When the needles 110 are brought into engagement with the pile warp threads 38, the dobbyhead causes the wires 128 and 129 to be moved and the shuttle boxes 60 and 63 to be lowered.

The batten 29 and the reed carried thereby are driven by the arm 82, which is connected by a crank 81 to the shaft 77. Accordingly, rotation of the shaft 77 causes the batten 29 to be reciprocated. The shaft 77 is driven by the gear 78, which in turn is driven by the main gear 79 on the main drive shaft 48.

Since the batten 29 and the loop projecting member F are driven by means which are actuated by the shaft 48, the movement of the loop projecting mechanism F is readily synchronized with the movement of the batten 29, so that the mechanism F on the arm 69 moves to its rearward position when the batten 29 and the reed carried thereby are in their rearward position. The loop projecting mechanism F is then advanced to its forward position, as seen in Fig. 2, before the batten 29 is moved forwardly at the time of the beat-up. When the loop projecting mechanism F is in the forward position shown in Fig. 2, the batten 29 and the reed carried thereby may be reciprocated to their forward position without interference from the loop projecting mechanism.

After five passes of the shuttle have been completed, heddle frames 27 and 28 are lowered and heddle frame 41 is raised. At the same time, boxes 60 and 63 are lowered so that the shuttle is removed from the path of the picker-block (not shown) carried by the picker-stick or arm 59. Thus, at this moment the ground warp threads are depressed and out of reach of the needles 110 and the pile warp threads are raised within the operating range of the needles 110. In this position, the shuttle is not engaged by either of the pickers carried by the picker-sticks 59 and 62, and the shuttle does not pass across the loom. The dobbyhead is so arranged that the shuttle boxes are held in this position for only a single movement of the sticks 59 or 62. Thus, in the periodic movement of the shuttle across the loom, only one period is missed.

The fabric contains pile warp threads and ground warp threads disposed in parallel relation to each other. Preferably, there are two

ground warp threads for each pile warp thread. The weft threads 131 extend back and forth across the fabric between the warp threads, the weft thread being alternately above and below each of the warp threads between the loops.

The loops may be spaced apart in the fabric, and, as shown, are formed with five weft threads between adjacent loops. When the last of the five weft threads has been passed across the loom between the warp threads, the heddle on the lower ground warp thread remains in fixed position, while the upper ground warp thread is lowered and the pile warp thread is raised. The needles 110 are thus brought into engagement with the pile warp threads and advanced to form loops in each of the same.

When the needles are brought into engagement with the pile warp threads, the tensioning device is released and the shuttle boxes are lowered to prevent the passage of the shuttle across the loom. By the time that the needle has reached advanced position and the loops have been formed, the pile warp threads have been lowered by the heddle 41 and the ground warp threads 24 have been raised by the heddle 27. The shuttle boxes 60 and 63 are returned to normal raised position, and the shuttle is passed across the loom between the warp threads to continue the weaving operation.

In this fabric, the weft threads are located alternately above and below each warp thread until the loop is reached. At this point, the weft thread is passed twice through the shed on the same side of the warp threads, and then the alternate arrangement is resumed.

When the needles are in advanced position and the loops have been formed in the threads, the needles are then turned to their original angular position and moved rearwardly to release them from the loops. The needles are freed from the loops as a result of their rearward movement for the next loop-forming operation. By referring herein to advancing the needle is meant moving the needle in any direction to draw the pile warp threads into loops.

When the modification of the invention shown in Figs. 14, 15 and 16 is used, the cutting blades 135 engage the loops on the needles 110 when the needles are in advanced position. The cutting blades 135 being slidably supported by the needles 110 may be moved downwardly along the needles until they are brought into engagement with the loops thereon and then passed through the loops to the grooves 137. The loops are then cut by this action.

The pile warp threads used are preferably twisted so that after loops are formed therein, the threads rotate to form twisted loops. When the modification of the invention is used and the loops are cut, this twisting action, of course, becomes less important.

This application is a continuation-in-part of my abandoned copending application Serial No. 367,115, filed November 25, 1940, for Loom.

While there are shown and described certain embodiments of the invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention.

I claim:

1. In a loom of the character set forth, equipped with means for advancing ground warp and pile warp threads, means for raising and lowering said ground warp and pile warp threads, and with shuttle means for periodically weaving a weft thread between said warp threads, a plurality of needles mounted for movement in vertical planes always parallel with vertical planes passing through said warp threads, said needles being also mounted for turning movement, said needles being provided with hooked ends, means for rotating said needles when said pile warp threads are raised to bring said hooks into a position behind a plurality of pile warp threads, and means for advancing said needles as said pile warp threads are lowered to form a loop in each of said pile warp threads.

2. In a loom of the character set forth, equipped with means for advancing ground warp and pile warp threads, means for raising and lowering said ground warp and pile warp threads and with shuttle means for periodically weaving a weft thread between said warp threads, a plurality of needles mounted for movement in vertical planes always parallel with vertical planes passing through said warp threads, said needles being also mounted for turning movement, said needles being provided with hooked ends, means for rotating said needles when said pile warp threads are raised to bring said hooks into a position behind a plurality of pile warp threads, means for advancing said needles as said pile warp threads are lowered to form a loop in each of said pile warp threads, means for rotating said needles after the forming of said loops to bring the hooks thereof into paths parallel with the paths of said warp threads. and means for returning said needles with their hooks in a position parallel with said warp threads and to said initial position below said raised pile warp threads.

3. In a loom of the character described, equipped with means for raising and lowering pile warp threads and alternately for raising and lowering ground warp threads and with shuttle means for periodically weaving a weft thread between said warp threads, a plurality of needles mounted for bodily movement backward and forward in planes always parallel with vertical planes passing through said warp threads, said needles being also mounted for turning movement, said needles being provided with hooked ends, means for bringing said needles into a rear position below said pile warp threads when the same are raised, means for rotating said needles to bring said hooks transversely of said pile warp threads, means for advancing said needles to bring the hooked ends thereof into engagement with said pile warp threads to form a loop in each of said pile warp threads, means for turning said needles after the forming of said loops to bring the hooks thereof into paths parallel with the paths of said warp threads, and means for retracting said needles with the hooks thereof so turned in paths parallel with said warp threads to said initial position below said raised pile warp threads.

4. In a loom of the character described, equipped with means for advancing ground warp and pile warp threads, with heddles for receiving the pile warp threads and ground warp threads, and with means for moving said heddles to raise and lower the pile warp threads relatively to the ground warp threads, a loop projecting bar mounted for movement back and forth in a single path lying in an arcuate surface normal to a vertical plane passing through a warp thread, spaced needles mounted in said bar for rotary movement, said needles being equipped with laterally-extending hooks for engaging said pile warp

threads, means for advancing and overcoming said loop projecting bar in said path, and means for rotating said needles to bring the hooks thereof in a plane transversely of said pile warp threads when said pile warp threads are raised and said needles are advanced, whereby loops are formed in each of said pile warp threads, and for turning said needles into planes parallel with said advancing warp threads when said needles are drawn back to their initial position.

5. In a loom of the character described, equipped with means for advancing ground warp and pile warp threads, means for raising and lowering said pile warp threads alternately and said ground warp threads alternately in timed sequence, shuttle means for periodically weaving a weft thread between said warp threads, a plurality of needles mounted for bodily movement relative to the warp threads and also mounted for turning movement, said needles being provided with hooked ends for engaging the pile warp threads, means for rotating said needles when the same are in retracted position and said pile warp threads are raised to bring said hooked ends in a plane below said pile warp threads and transversely thereof, means for advancing said needles to bring said transversely-disposed hooks against said pile warp threads while the pile warp threads

are being lowered, thereby forming loops in said threads, and means for rotating said needles to bring the hooks thereof into planes parallel with said warp threads while returning said needles to their initial position below said raised pile warp threads.

ROBERT E. WALLISER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
144,077	Ellison	Oct. 28, 1873
353,937	Harrison	Dec. 7, 1886
506,467	Britain	Oct. 10, 1893
608,226	Sargent	Aug. 2, 1898
642,740	Duquesne	Feb. 6, 1900
666,270	Hattersley	Jan. 22, 1901
1,023,537	White	Apr. 16,1912
1,561,282	Sandeman	Nov. 10, 1925
2,353,968	Pedrazzo	July 18, 1944

FOREIGN PATENTS

Number	Country	Date
205,130	Great Britain	Oct. 17, 1923