

July 24, 1928.

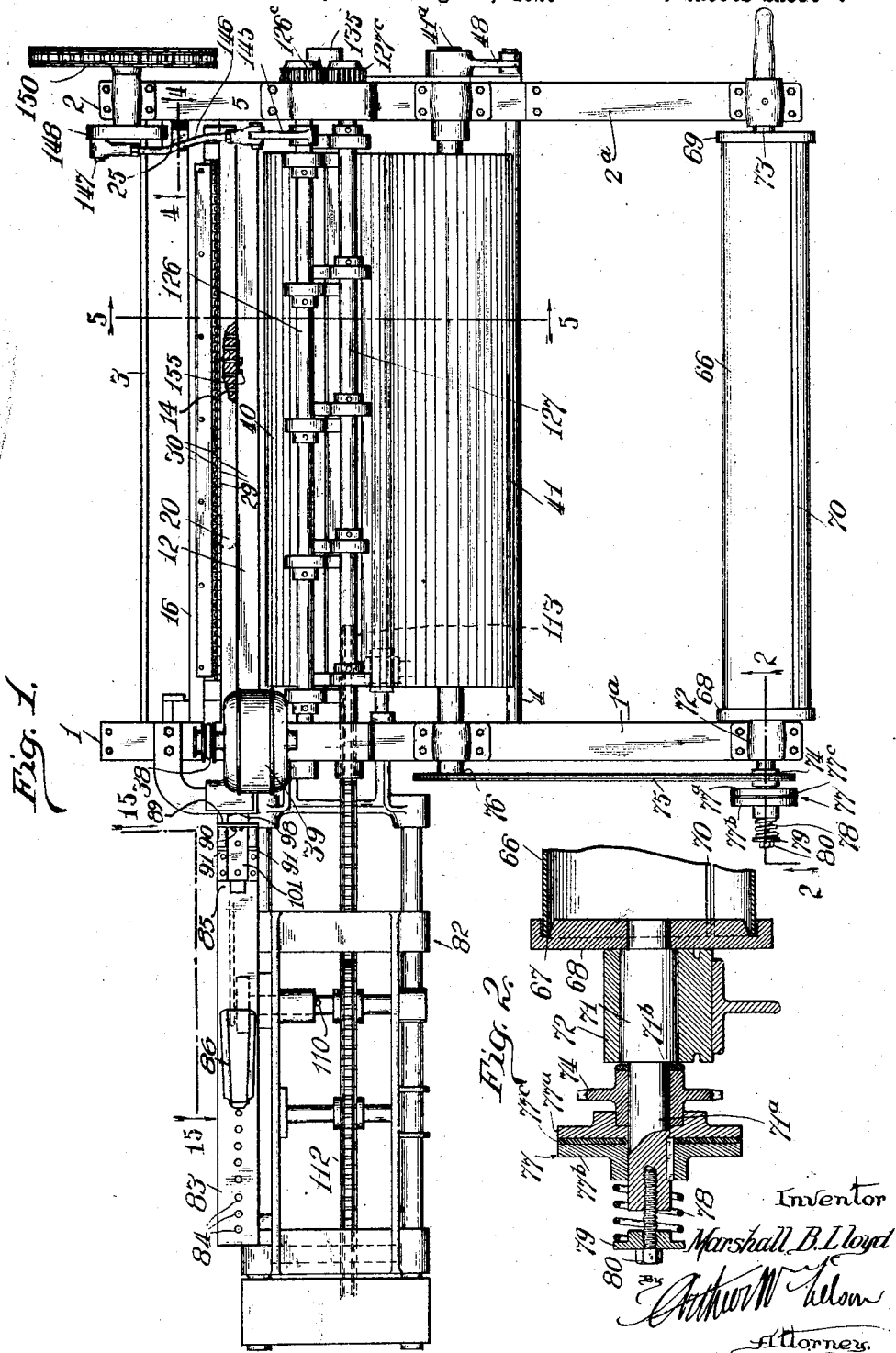
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M. B. LLOYD

REED WEAVING MACHINE

Filed Aug. 29, 1925

6 Sheets-Sheet 1



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July 24, 1923.

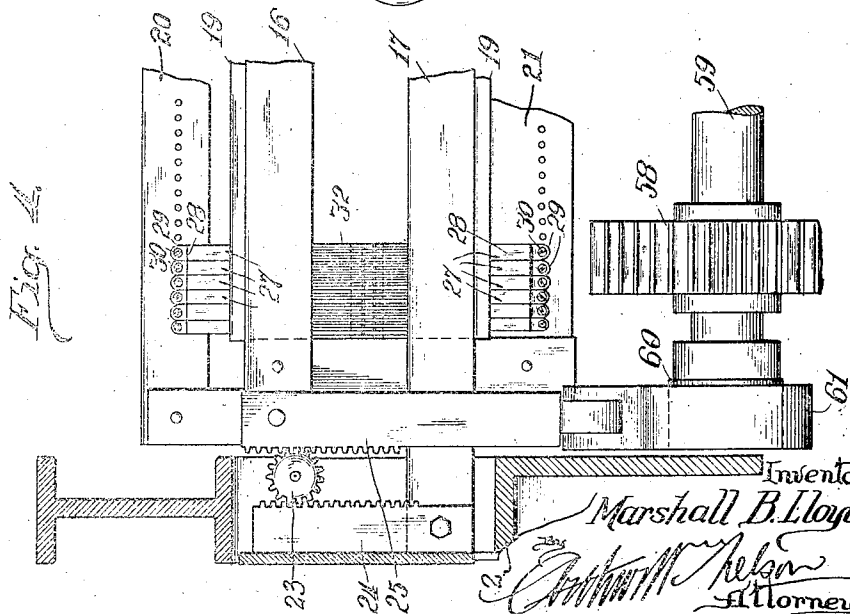
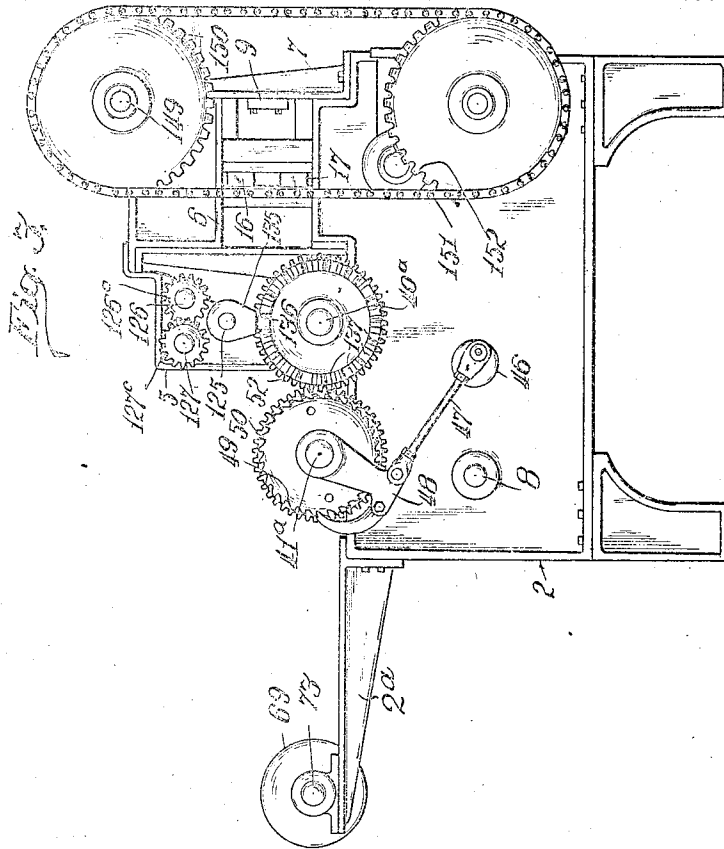
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6 Sheets-Sheet 2



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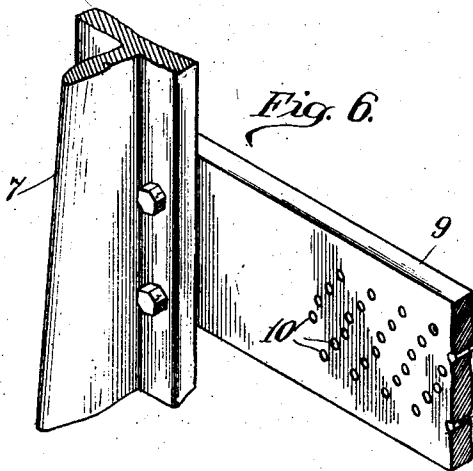
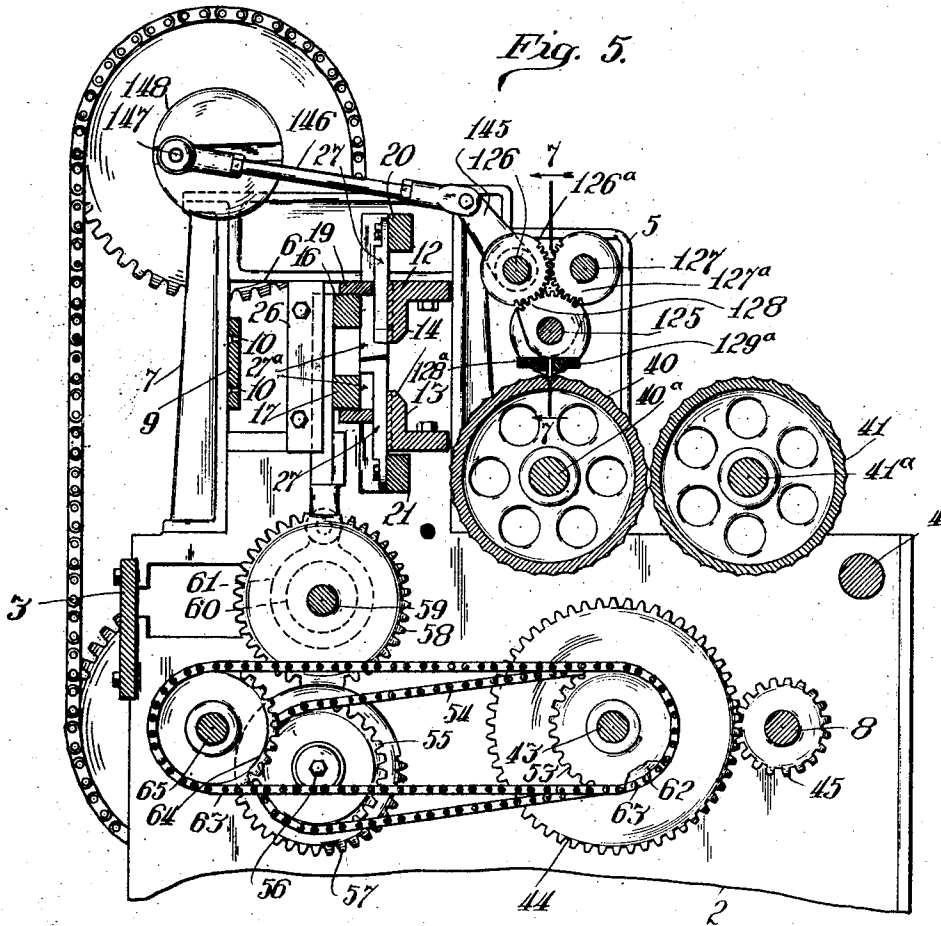
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6 Sheets-Sheet 3



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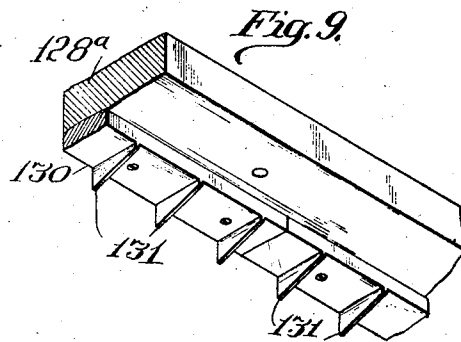
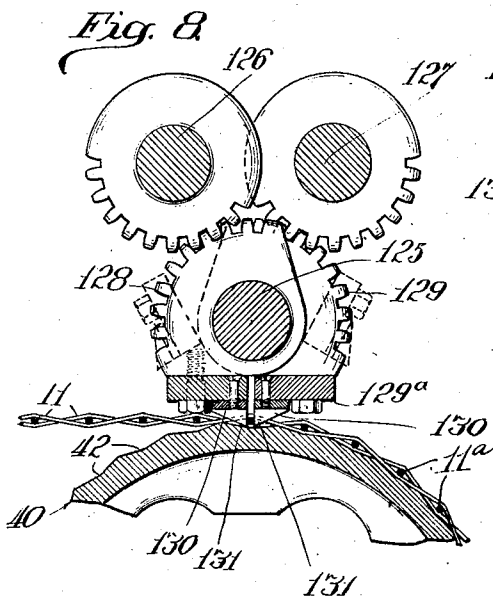
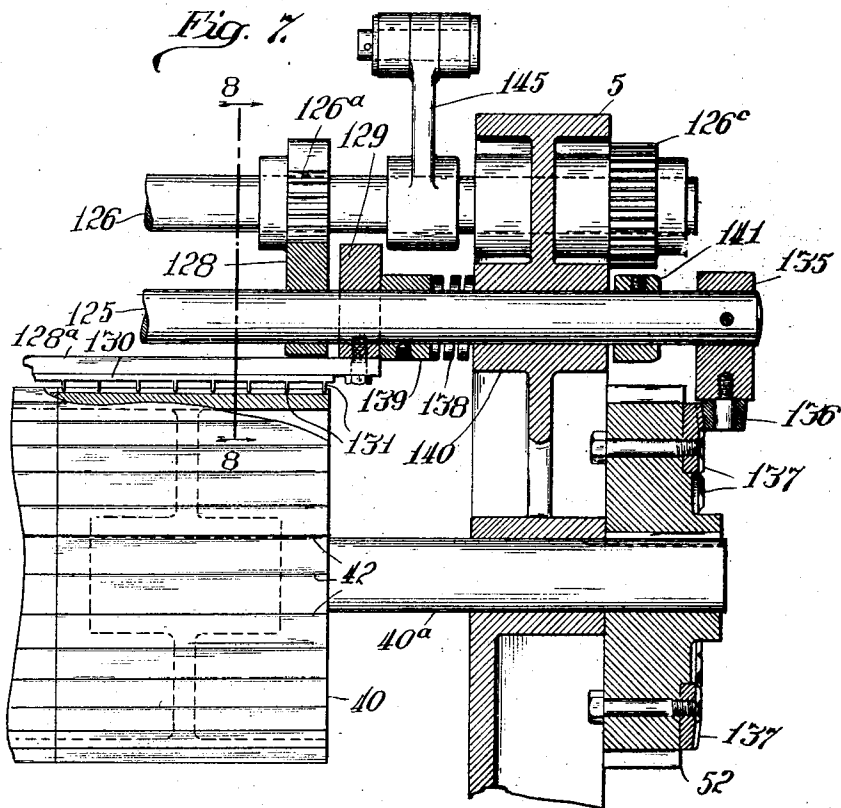
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6 Sheets-Sheet 4



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6 Sheets-Sheet 5

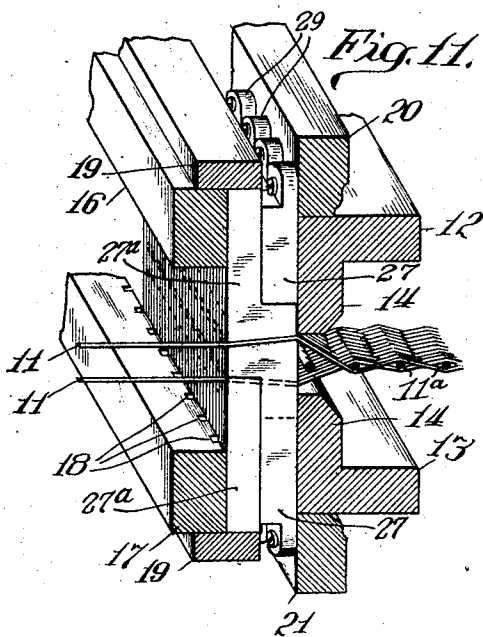
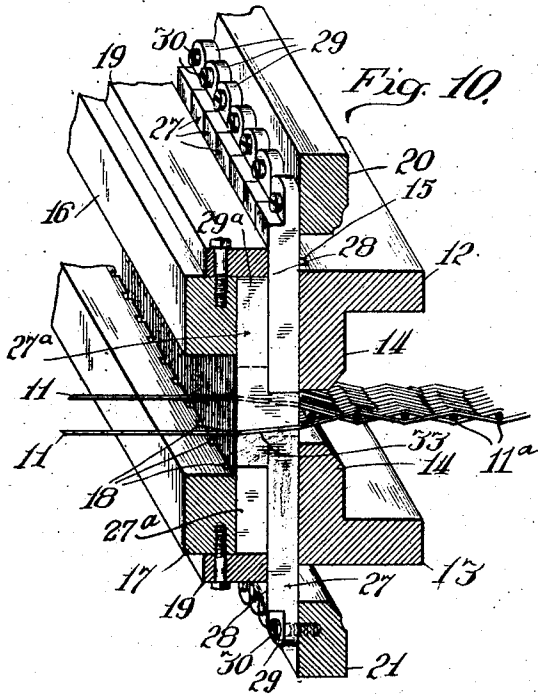


Fig. 12.

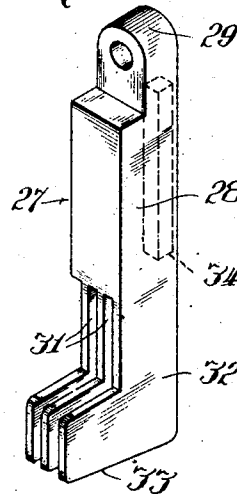


Fig. 13.

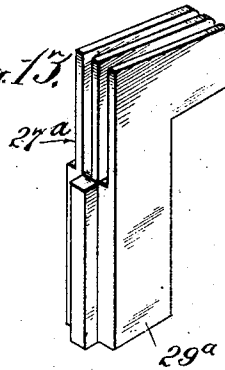
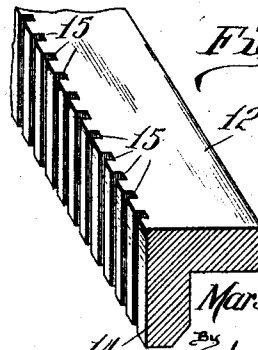


Fig. 14.



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6 Sheets-Sheet 6

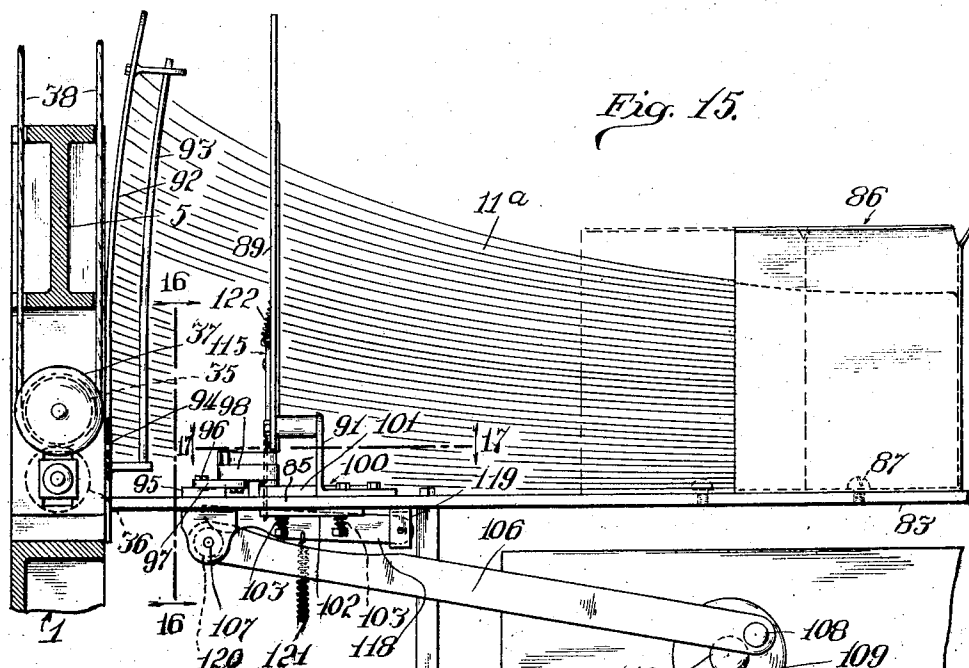


Fig. 15.

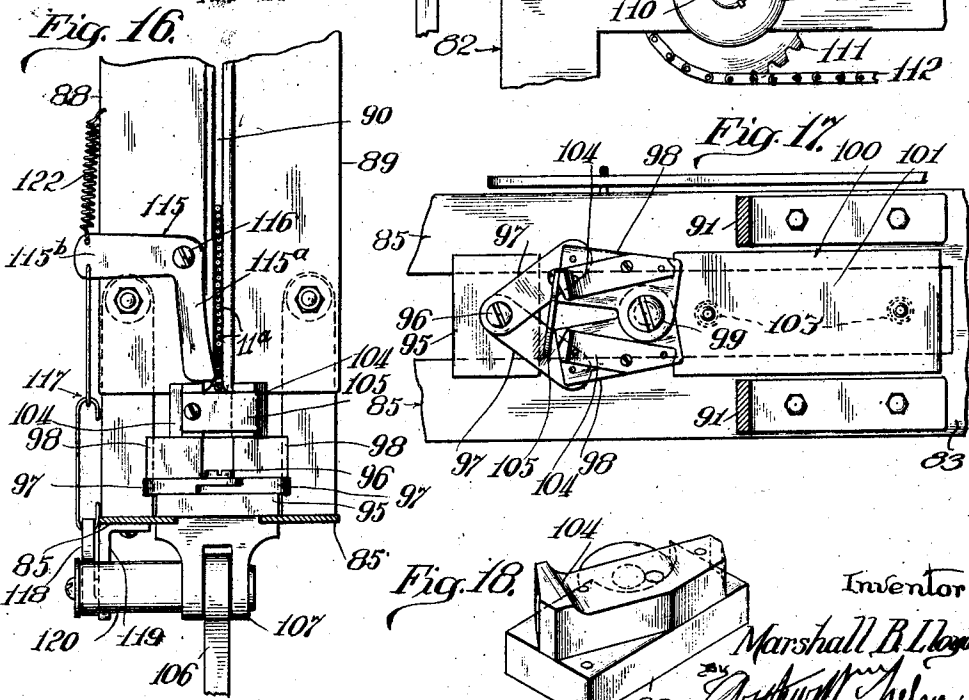


Fig. 16.

Fig. 17.

Fig. 18.

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# UNITED STATES PATENT OFFICE.

MARSHALL B. LLOYD, OF MENOMINEE, MICHIGAN, ASSIGNOR TO HEYWOOD-WAKEFIELD COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

## REED-WEAVING MACHINE.

Application filed August 29, 1925. Serial No. 53,281.

This invention relates to improvements in reed weaving machines and it consists in the matters hereinafter described and more particularly pointed out in the appended claims.

5 One of the objects of the present invention is to provide a machine capable of producing flat reed fabric at a speed greater than heretofore and one wherein uniformity of fabric is insured.

10 Another object of the invention is to provide an improved means for feeding stakes into the shed formed by the filler strands and to straighten said stakes, preferably after insertion into the shed so that the finished  
15 fabric will be of a high quality and good appearance throughout its entire length.

A further object of the invention is to provide a machine which is positive, automatic and continuous in its operation and after  
20 starting, needs no attention from the operator, other than the replenishment of the stake and strand material.

My invention consists generally in a machine of the form, arrangement, construction  
25 and co-operation of the parts whereby the above mentioned objects, as well as others are attainable; and my invention will be more readily understood by reference to the accompanying drawings which illustrate what  
30 I consider at the present time, to be the preferred embodiment thereof.

In the drawings:—

Fig. 1 is a view in top plan elevation of a reed weaving machine embodying my in-  
35 vention.

Fig. 2 is a detail vertical sectional view on an enlarged scale as taken on the line 2—2 of Fig. 1.

Fig. 3 is a view in elevation of that side  
40 of the machine as looked at from the right hand end of Fig. 1.

Fig. 4 is a detail transverse vertical sectional view on an enlarged scale as taken on the line 4—4 of Fig. 1.

45 Fig. 5 is a longitudinal vertical sectional view on an enlarged scale as taken on the line 5—5 of Fig. 1.

Fig. 6 is a detail perspective view of a portion of the machine frame and filler strand guide and spacing bar or plate and will be more fully referred to later.

Fig. 7 is a detail transverse sectional view on an enlarged scale as taken on the line 7—7 of Fig. 5.

Fig. 8 is a detail vertical sectional view  
55 as taken on the line 8—8 of Fig. 7.

Fig. 9 is a perspective view of a fragment of one of the stake straightening members which will be more fully referred to later.

Fig. 10 is a detail sectional perspective  
60 view of parts operating to shift portions of the filler strands to provide a shed for the insertion of the stakes.

Fig. 11 is a view similar to Fig. 10 but with some of the parts shown in a changed  
65 relation.

Fig. 12 is a perspective view of one of the members embodied in the means for shifting portions of the filler strands to form the  
70 shed.

Fig. 13 is a perspective view of another of the members associated with the member shown in Fig. 10 for forming the shed.

Fig. 14 is a detail perspective view of one of the bearings and guide bars for the part  
75 shown in Fig. 12.

Fig. 15 is a detail view in elevation on an enlarged scale, of parts shown in Fig. 1 and as looked at in the direction of the arrows associated with the line 15—15 thereof.  
80

Fig. 16 is a detail vertical sectional view as taken on the line 16—16 of Fig. 15.

Fig. 17 is a detail horizontal sectional view as taken on the line 17—17 of Fig. 15.

Fig. 18 is a perspective view of one of a  
85 pair of stake gripping blocks embodied in my improved weaving machine.

Cross reference is here made to my co-  
pending application Serial No. 56,139 filed  
Sept. 14, 1925, wherein certain matter herein  
90 shown but not claimed, is shown and claimed therein.

In general, in the improved machine shown herein the filler strands are arranged in side by side contact and pass through  
95 means which engage successive portions of the strands and alternately depress and elevate said portions to provide a shed. A gripper member removes a stake from a magazine and advances it to a means which  
100 inserts it in the shed. This means is so arranged that even though the stake be slightly bent or crooked, it will insert the stake into the shed and in the forward movement of the fabric, the stake is straightened so that  
105 the fabric is regular. Thereafter the fabric passes between coacting rolls having longitudinally extending angular corrugations

which accurately form the strands upon the stakes after which the finished fabric is wound upon a roll or mandrel.

Referring now in detail to that embodiment of the invention illustrated in the accompanying drawings; the machine includes upright spaced side plates or frames 1 and 2, respectively, of suitable form. Said side plates are held in the desired spaced relation by means of a front plate 3 and a rear tie rod 4 and if desired other members may be arranged between said front plate and the tie rod to assist the same as is apparent. The side plates or frames include near their forward ends, upright extensions 5—5 and in each of said extensions is formed a rectangular opening 6, closed at its front end by a standard 7. Journalled in the rear portions of the said side frames is the main drive shaft 8 which is driven by suitable belting (not shown) and from which the associated mechanisms of the machine are driven, as will later appear.

Fixed to the rear sides of both standards, in the median plane of the rectangular openings 6, is an edgewise disposed plate 9. This plate is provided with a plurality of holes or openings 10—10 therein (see Fig. 6) arranged in different horizontal and vertical planes so as to bring them all into closely spaced adjacent planes, longitudinally of said plate. The warps of the finished fabric on the filler strand members 11—11 and said warps or strands are passed through said openings 10 and to prevent undue abrasion on said strands, the front ends of said openings taper outwardly (see Fig. 6). After said warps or filler strands proceed beyond said plate they occupy closely adjacent vertical planes as is apparent.

At the rear of the opening 6 of each side frame member, are fixed top and bottom cross bars 12 and 13, respectively, of angle bar cross section with their vertical flanges 14 at the front and in alignment with each other. In the front face of each vertical flange is provided, longitudinally spaced, vertically disposed grooves 15 as best shown in Fig. 14. Spaced forwardly of said cross bars 12 and 13, are top and bottom transverse bars 16 and 17, respectively, which are rectangular in cross section and are vertically reciprocable toward and away from each other. In the rear surface of the transverse bars 16 and 17 are formed longitudinally spaced vertically disposed grooves 18—18 and on the top surface of the top transverse bar 16 and in the bottom surface of the bottom transverse bar 17 is fixed a shoulder plate 19, each having a portion projecting rearwardly beyond the plane of the rear face of the associated bar. 20 and 21 indicate, respectively, top and bottom transverse bars arranged above and below the frame connecting cross bar 12 and 13 in

the plane of the vertical flanges 14 thereof. Said bars 20 and 21 are vertically reciprocable toward and away from each other and in this instance the bars 17 and 20 are cross connected and move together in one direction while the bars 16 and 21 are cross connected to move together in the opposite direction.

The extreme ends of the bar 17 extend into the openings 6 in the side frame members 1 and 2 and are each there provided with an upstanding rack bar 24 (see Fig. 4) while the ends of the bar 16 terminate short of said openings 6 and are each there provided with a rack bar 25 facing in opposition to the rack bar 24. A gear 23 suitably journalled in the machine frame side members meshes with and operatively connects said rack bars together so that they move in opposition to each other. Each rack bar 25 has sliding bearing against a guide bar 26 arranged vertically of the associated opening 6 (see Fig. 5).

Secured to the bars 20 and 21 respectively, is a plurality of filler strand manipulating members 27, one of which is best shown in perspective in Fig. 12. Each member 27 is in the form of an L-shaped block like body 28 having a head 29 at its top end by means of which it is attached to the bar 20 by screws 30. The bottom end of said member has a right angular extension and in said extension and part way up said body portions are grooves or recesses 31 which define spaced plate like parts 32. The grooves and plate like parts are so relatively disposed as to provide a plate-like part on one side of the body and a groove like part on the other side of the body. The bottom edges 33 of said plate like parts are finished off on an angle less than a right angle and is inclined upwardly from the rear side of the body 28 toward the front and on said rear side of the body part is formed a tongue or rib 34 which has sliding guiding bearing in one of the grooves 15 in the cross bar 14. Mounted on the bar 21 is a plurality of filler strand manipulating members 27 which occupy a position reversed end for end with respect to those on the bar 20. Associated with the bars 16 and 17 are filler strand manipulating members 27<sup>a</sup> which are identical with respect to the members 27 with the exception that they have no head parts 29 but have a flat end 29<sup>a</sup> as shown in Fig. 13. The members 27<sup>a</sup> associated with the bar 16 occupy a position reversed end for end with respect to those associated with the bar 17 and the flattened end parts 29<sup>a</sup> thereof engage against the overhanging parts of the shoulder bars 19—19. When all of said members 27—27<sup>a</sup> are in their respective positions, the plate parts 32 of said members associated with the bar 20 are located in the same plane as the plate parts 32 of the



members 27<sup>a</sup> associated with the bar 17, which plane is the plane of the recesses 31 of the other members 27 and 27<sup>a</sup> associated with the bars 21 and 16, respectively. Like-  
 5 wise the plate parts 32 of the last mentioned members 27 and 27<sup>a</sup> are arranged in those planes which are coincident with the planes of the recesses 31 in the first mentioned member 27 and 27<sup>a</sup> associated with the bars  
 10 20 and 17 respectively. In "threading" the filler strands through the block of the manipulating device, said strands are disposed between the angular ends 33 of the plate portions of the respective manipulating  
 15 members and in the reciprocation thereof, the strands are free to follow said plates which are movable in the grooves 31 of the associated plates as before described. With the ends 33 of said blocks disposed in a plane  
 20 less than a right angle to the body parts thereof, at no time will all of said ends be arranged in the same common plane but said ends will overlap one another so that the strands are at no time in a position wherein  
 25 they may become displaced laterally or pinched or otherwise engaged by the laterally adjacent plate parts. As alternate strands are moved in one direction, the intermediate strands are moved in the opposite  
 30 direction, so as to form a shed into which a stake 11<sup>a</sup> is inserted and after insertion of one stake said strands receive a reverse movement to lock said stake in place and to form a new shed into which another stake  
 35 is inserted and so on as best shown in Figs. 10 and 11 respectively.

The stakes indicated by the numeral 11<sup>a</sup> and which are the wefts in the finished fabric are fed into the sheds as they are  
 40 formed by continuously rotating top and bottom rollers 35 and 36 (see Fig. 15) suitably journaled in the opening 6 of the side frame member 1, and geared together. The top roller has a pulley 37 associated with it  
 45 which is driven by a belt 38 from a motor 39. The sole function of said motor which is mounted on the extension 5 of said frame member 1 is to drive the stake feeding mechanism and stakes are delivered to said feed  
 50 rollers from a suitable hopper or magazine as will later appear.

The preformed fabric passes over the top of a transversely extending horizontal roll  
 40 with which a second and similar roll 41 is associated, the fabric following about a  
 55 portion of said roll 40 and then in between both said rolls and is led off the bottom of the roll 41 to a winding roll or mandrel at the rear of the machine. The rolls 40 and  
 60 41 which are fixed on associated shafts 40<sup>a</sup> and 41<sup>a</sup> respectively, journaled in the side frame members 1 and 2, have longitudinally extending corrugations 42 (see Fig. 8) on their peripheries which corrugations have  
 65 angularly disposed surfaces as distinguished

from the usual undulating surfaces and said surfaces on both rolls are so correlated that when the fabric passes downwardly between them, said surfaces will conform to the con-  
 70 tours of both faces of the fabric. Said drums are rotated step by step in timed relation with the insertion of the stakes and as the fabric passes the common horizontal plane of said rolls said surface will coact to  
 75 more securely "set" the strands upon the stakes. Step by step rotative movement is imparted to said rolls as follows:—In the horizontal plane of the main drive shaft 8 but forwardly thereof and parallel there-  
 80 with is a driven shaft 43 suitably journaled in the side frame members 1 and 2. On said shaft adjacent the inner surface of the side frame member 2 is a gear 44 which meshes with a pinion 45 on the main drive shaft. On that end of the shaft 43 without the side  
 85 frame member 2 is provided a crank disc and arm 46 and upon said crank arm is journaled one end of a connecting rod 47 (see Fig. 3). The other end of said rod is operatively connected to a swinging arm 48  
 90 loosely mounted on the shaft 41<sup>a</sup> associated with the corrugated roll 41. Fixed to the end of the shaft 41<sup>a</sup> adjacent the swinging arm 48 is a ratchet wheel 49 and adjacent said ratchet wheel is a gear 50 which meshes with and drives a similar gear 52 on the  
 95 corresponding end of the shaft 40<sup>a</sup> associated with the corrugated roll 40. The swinging arm 48 carries a pawl 48<sup>a</sup> normally engaged with the ratchet. When the shaft 43 is driven it is apparent, a step by step rotative movement is imparted to the shafts 40<sup>a</sup> and  
 100 41<sup>a</sup> and to the rolls thereon.

Secured to the shaft 43 adjacent the gear 44 is a sprocket 53 which through a chain  
 105 54 drives a similar sprocket 55, journaled on a stud 56 fixed to the side frame member 2, arranged in the vertical plane of but below that of the rack bar 25. Rotative with said sprocket 55 is a mutilated gear 57  
 110 and said gear meshes with an associated mutilated gear 58 fixed on a horizontal shaft 59 arranged vertically above the stud 56 and journaled at its ends in the side frame members 1 and 2. The gears 57 and 58 are so  
 115 formed that for each revolution of the gear 57 the gear 58 receives a half of a revolution. Fixed to the ends of the shaft 59 are eccentrics 60 and associated straps 61 and said straps are pivotally connected to the rack bars 25 of the strand manipulating and shed forming devices to impart the desired movement thereto, as before described. Also  
 120 fixed on the shaft 43 is another sprocket 62 which through a chain 63 drives a similar sprocket 64 secured to a horizontal shaft 65 arranged in the horizontal plane of the shaft 43, but located at the front end of the machine, the shaft 65 being suitably journaled  
 125 in said side frame members 1 and 2.

As before mentioned, after the formed fabric leaves the corrugated roll 41 it passes to a winding roll at the rear end of the machine. 66 indicates said winding roll which is in the form of a tubular sleeve mounted at its ends in the grooves 67 of end plates 68 and 69, respectively, said sleeve being split longitudinally to provide a slot 70 therein. The end plate 68 is fixed to a stub shaft 71 journalled in a suitable bearing 72 fixed on an extension 1<sup>a</sup> on the rear end of the side frame member 1, while the end plate 69 is fixed on a similar stud shaft 73 journalled in a suitable bearing fixed on an extension 2<sup>a</sup> on the rear end of the side frame member 2. The purpose of the slot 70 is to permit the insertion of the free end of the formed fabric to operatively connect it to the winding roll so that in the formation of the fabric, the same will be wound upon said roll. The stub shaft 71 includes an extension 71<sup>a</sup> of reduced diameter and loosely mounted on the same adjacent the shoulder 71<sup>b</sup> formed by the parts of different diameters of said stub shaft is a sprocket 74. Said sprocket is driven by a chain 75 from a similar sprocket 76 mounted on that end of the shaft 41<sup>a</sup> which extends beyond the side frame member 1. Also mounted on the reduced end 71<sup>a</sup> of the stub shaft 71 is a friction slip clutch 77 which includes a plate 77<sup>a</sup> loose on said reduced end and a second plate 77<sup>b</sup> keyed to said reduced end 71 but capable of a limited endwise movement thereon, a disc 77<sup>c</sup> of fiber or the like being interposed between said plates. Said plates are held in close engagement with the fiber disc by an expansion spring 78 which surrounds the extreme end of said reduced portion 71<sup>a</sup> and abuts at one end against the plate 77 and at its other end against a member 79 mounted on a bolt 80 threaded into said end portion 71<sup>a</sup>. It is apparent that in the step by step rotation of the shaft 41<sup>a</sup> a similar movement is imparted to the winding roll and as the material wound thereon increases in diameter, the clutch 77 will slip to accommodate this increasing diameter. The winding roll is so constructed that when a sufficient amount of fabric has been wound thereon, said sleeve 66 may be removed from the end plates 68 and 69 and another one substituted in its stead.

In connection with the means for inserting a stake into the shed, which means includes the rolls 35 and 36, I provide a means for feeding the stakes 11<sup>a</sup> one at a time from a magazine or holder in proper timed relation to the forming of the successive sheds and such means are as follows: Projecting laterally from the end frame member 1 near its forward end is a frame extension 82 (see Fig. 1) which includes along its forward portion a horizontal flat plate 83 having screw threaded openings 84 therein. That part of said plate adjacent the frame member 1 is formed to provide spaced rails or guides 85. On said plate is mounted a magazine or holder 86 in the form of a relatively high, upright, comparatively narrow box open at its top and at that end facing said frame member 1. A bolt 87 (see Fig. 15) is employed to secure said magazine to said plate the desired distance away from said end frame member 1, said bolt also passing through the proper hole 84 so that the position of the magazine may be easily adjusted to the length of the stakes to be used, which, of course, also approximates the desired width of the finished fabric. A plurality of stakes 11<sup>a</sup> are placed with their outer ends in bunched relation in said magazine and the forward portions thereof passed between two vertical plates 88 and 89 which plates are spaced apart a distance to provide a slot 90 equal to substantially the diameter of the stakes employed. Said plates are located nearer the inserting rolls 35—36 than the magazine 86 and are supported from the rails or guides 85—85 by brackets 91, with the bottom ends of said slot forming plates 88—89, spaced above the guides 85. When said stakes are in the magazine with their forward portions positioned in the slot 90, one above the other, they will assume a fan shape-like formation. The extreme forward ends of the stakes engage with a guide plate 92 of curved form and suitably supported in a substantially vertical position adjacent the frame member 1, said guide plates having guide rods 93 which prevent said extreme ends of the stakes from flexing laterally, thus holding them in the desired plane. In the bottom end of said guide plate 92 is formed a round opening 94 (see Fig. 15) which is located in the horizontal plane of the peripheral meeting parts of the stake inserting rolls 35—36, which plane is substantially coincident with the plane of the bottom ends of the slot (90) forming plates 88 and 89, respectively. Means are provided for gripping the bottom-most stake in the slot 90 and for inserting its inner end through the opening 94 into and between the rollers 35—36 to be fed into the shed formed by the strands and such means are as follows:—Slidable on the rails or guides 85 between the slot forming plates 88—89 and the guide plate 92 is a reciprocating block 95 and pivoted on said block as at 96 is a pair of outwardly extending and normally diverging links 97—97. Said links are pivotally connected to link blocks 98—98, one of which is shown in perspective in Fig. 18 which blocks are pivoted on a common vertical axis 99 mounted on the inner end of a carriage 100 slidable on said rails or guides 85. Said carriage comprises top and bottom plates 101 and 102, the longitudinal marginal parts of

which embrace opposed inner portions of the rails 85—85 and said plates are secured together by coacting bolts and springs 103 which act to draw said plates together and provide a frictional clamping action on said rails. Each link block 98 carries a gripper jaw 104 and on the inner end of one jaw is secured a transverse bridge or guard plate 105. The top edge of said guard plate terminates short of the plane of the top surface of the jaw block so that when said jaws close they can only grip one stake at a time.

Reciprocating movement is imparted to the block 95 by a connecting rod 106, one end of which is pivoted at 107 to an extension on the bottom of said block and the other end of which is connected to a crank pin 108 on a disc 109 fixed on a horizontal shaft 110 journalled in and extending transversely of and below the extension frame 82. Said shaft is provided with a sprocket 111 driven by a chain 112 from a sprocket 113, which chain passes over suitable idler sprockets carried by said extension frame. In the rotation of the shaft 110 a reciprocating movement toward the rollers 35—36 will be imparted to the block 95. Said movement of said block is resisted somewhat by the frictional engagement of the carriage 100 with the rails 85—85 with the result that the inner ends of the links 97—97 are caused to move toward each other imparting a similar movement to the inner ends of the jaw blocks 98. As said jaw blocks carry the gripping jaws 104, said jaws will grip that stake resting on the guard plate 105 and in the further forward movement of said block 95 will overcome the frictional resistance of the carriage 100 so that said stake is fed through the opening 94 in the guard plate 92 into and between the feed rolls 35—36 to be inserted thereby into the shed formed by the strands, as before mentioned. In the rearward reciprocation of the block 95, the links 97 and jaw blocks 98 will open up due to the resistance offered by the carriage 100 and in the further movement of said block, the resistance of the carriage is overcome so that all parts are returned to their normal starting position.

In the forward movement of the block 95 means are provided to engage the stakes near the bottom end of the slot 90 between the plates 88—89 so that no more than a single stake is engaged by the jaws 104 and fed to the rolls 35—36. Said means includes an inverted bell crank lever 115 which is pivoted to the plate 88 as at 116. The vertical arm 115<sup>a</sup> is adapted to swing toward and away from the slot 90 and is so formed as to normally engage the next to the bottom stake in said slot so that it cannot descend in the outward withdrawal of the bottom-most stake. The horizontal arm 115<sup>b</sup> of said

lever projects laterally beyond the plate 88 where it is connected by links 117 with the free end of a lever 118. Said lever is located below the rearmost rail 85 which carries a depending bracket 119 to which the other end of the lever 118 is pivoted. The free end of said lever which is rounded off normally engages upon a roller 120 coincident with the connection 107 between the block 95 and connecting rod 106. A spring 121 (see Fig. 15.) which is connected at one end to a part of the machine frame and at its other end is connected to said lever, normally urges said lever into engagement with the roller 120. However, when said block 95 is moved towards the rollers 35—36 as before described, the lever 118 is left unsupported so that it moves downwardly, thus rocking the bell crank lever 115, the vertical arm of which will act on the stakes as before described. In the reverse movement of the block 85 the roller 120 will again engage the lever 118 and will move it upwardly against the action of the spring 121 when the vertical arm of the bell crank lever 115<sup>a</sup> swings away from the slot 90 under the action of a spring 122 connecting the horizontal arm of the bell crank with the plate 88 so that the now bottommost stake is presented to the gripper jaws 104, the link 117 being made in two parts to provide enough latitude in movement.

In many instances, the stakes are not perfectly straight but are slightly bent and some times said stakes are slightly oversize or undersize and if inserted into the shed in its bent condition it is apparent that an irregular fabric will result which will not meet the requirements of a first class fabric. To overcome such a condition I provide means to straighten the stakes and preferably at a time after insertion into the fabric and such means are as follows:—Above the roll 40 and in vertical alignment with the axis of its shaft is provided a non-rotative but endwise movable shaft 125 and above said shaft and spaced equal distances on each side of the plane thereof are rock shafts 126 and 127, respectively, which are journalled at their ends in the upright extensions 5 of the side frame members 1 and 2. Fixed on said rock shafts are segmental gears 126<sup>a</sup> and 127<sup>a</sup>, respectively, which are offset with respect to each other. The gears 126<sup>a</sup> mesh with sets of segmental gears 128 and 129, respectively loose on the non-rotative shaft 125. Fixed to and connecting the gears 128 is a plate 128<sup>a</sup> while a similar plate 129<sup>a</sup> is fixed to and connects the gears 129 and said plates are so arranged that in one position of said gears 128—129 they substantially meet in the vertical plane of the axis of the shaft 125, as best shown in Fig. 8. On the under side of each plate is a strip member 130 which carries depending fingers 131. Said

fingers extend transversely of said plates and are spaced suitable longitudinal distances apart. As the woven fabric reaches the plane of the shaft 125 said blocks 128<sup>a</sup> and 129<sup>a</sup> are rocked toward each other, the fingers 131 entering the spaces between alternate strands on the top surfaces of the stake to engage the stake from opposite sides and bring all parts thereof into the same plane so as to straighten the stake after which the blocks are rocked in the other direction into an open position as shown in dotted lines in Fig. 8. Of course, as it will be understood, this stake straightening operation is carried on when the roll 40 is at rest which period is on the back stroke of the pawl 48<sup>a</sup> before mentioned.

A short endwise movement is imparted to the shaft 125 so that said fingers may operate upon each successive stake, the endwise movement being equal to the diameter of a filter strand. This endwise movement is essential because it must be borne in mind that said fingers operate in the plane of the strands and that the strands pass over one stake and under the next and if said endwise movement was not provided for said fingers they would directly engage portions of filler strands passing over said stakes. Endwise movement in one direction is imparted by means of an arm 135 secured on the extreme end of said shaft outside the frame member 2 and this arm carries a roller 136 adapted to be engaged by radial cam teeth 137 fixed to the face of the gear 52. Movement in the other direction is imparted to said shaft by a helical expansion spring 138 (see Fig. 7) which is interposed between a collar 139 fixed on said shaft and a bearing sleeve 140 forming a part of the end frame extensions 5 and through which said shaft has sliding bearing. Movement in this last direction is limited by a second collar 141 fixed to the shaft 125 between the arm 135 and said bearing sleeve 140. The gears on the various shafts are of such length as to still maintain their meshing engagement in the reciprocation of the shaft 125.

Rocking movement is imparted to the shafts 126 and 127 which carry meshing gears 126<sup>c</sup> and 127<sup>c</sup> at their extreme ends (see Fig. 3) as follows:—Secured to the shaft 126 near the end frame member 2 is an arm 145 to which is connected the rear end of a connecting rod 146. The other end of said rod is connected to a crank pin 147 adjustably mounted in a slotted disc 148 carried on the inner end of a short horizontal shaft 149 journalled at the front top and of that extension 5 associated with the side frame member 2. On the outer ends of the shaft 149 is a sprocket 150 which is driven by a chain 151 from a sprocket 152 on the associated end of the shaft 65. As the disc 148 is thus driven a rocking movement in

one direction is imparted to the shaft 126 which by reason of the gears 126<sup>c</sup> and 127<sup>c</sup> imparts an opposite rocking movement to the other shaft 127.

The machine may be operated to produce a fabric of a width substantially equal to the length of the roll 40 or less than that when so desired. Should a much narrower fabric be desired, the number of strands employed are reduced accordingly and the length of the stakes will be made in proportion and an L-shaped stop member 155 fixed to the portion 14 of the frame member 12 is provided, as best shown in Fig. 1, against which the ends of the stakes will engage as they are inserted into the shed.

As the operation of the parts, as well as their construction has been clearly described, it is not thought necessary to again go into a detailed description of said operation because the same will be indeed apparent to those familiar with the art.

The machine is fast and positive in its operation so that production is attained without sacrificing the quality of the product. The stakes need not be carefully positioned for feeding into the sheds, and even if said stakes are bent when fed into the sheds, they are straightened while in the fabric.

While in describing my invention I have referred to certain details of mechanical construction as well as form and arrangement of the parts thereof, I do not wish to be limited thereto except as may be pointed out in the appended claims.

I claim as my invention:

1. A reed weaving machine embodying therein, means for forming a plurality of strands into a shed, means for introducing stakes into said shed, and means for straightening each stake when in the fabric and at a plane spaced from that of its introduction into the shed.

2. A reed weaving machine embodying therein, means for forming a plurality of strands into a shed, means for introducing stakes into said shed, and coating devices adapted to engage portions of the stakes between spaced strands to straighten said stakes after their introduction into the shed.

3. A reed weaving machine embodying therein, means for forming a plurality of strands into a shed, means for introducing stakes into said shed, coating devices rockable about a common axis and adapted to engage portions of the stakes between spaced strands to straighten said stakes after introduction into the shed.

4. A reed weaving machine embodying therein means for forming a plurality of strands into a shed, means for introducing stakes into the shed, coating devices adapted to engage portions of the stakes between spaced strands to straighten each stake, and means providing a relative lateral movement

between said strands and said devices so that said devices will engage the next succeeding stake.

5 5. A reed weaving machine embodying therein means for forming a plurality of strands into a shed, means for introducing stakes into the shed, coacting devices adapted to engage portions of the stakes between spaced strands to straighten each stake, 10 said devices being capable of a lateral movement with respect to the strands to engage the next succeeding stake, and means for imparting said lateral movement to said devices.

15 6. A reed weaving machine embodying therein means for forming a plurality of strands into a shed, means for introducing stakes into the shed, coacting devices adapted to engage portions of the stakes between spaced strands to straighten each stake, said devices being capable of a lateral reciprocating movement with respect to said strands so as to engage each succeeding stake, and means for imparting a lateral reciprocating 20 movement to said devices.

25 7. A reed weaving machine embodying therein, means for forming a plurality of strands into a shed, means for introducing stakes into said shed, a support extending transversely of the fabric, coacting straightening devices mounted on said support and rockable thereon to engage portions of said stakes between the strands, and means for rocking said devices.

30 8. A reed weaving machine embodying therein, means for forming a plurality of strands into a shed, means for introducing stakes into said shed, a support extending transversely of the fabric, coacting straightening devices mounted on said support and rockable thereon to engage portions of said stakes between the strands, means for rocking said devices, and means for imparting a reciprocating movement to said support transversely of said strands.

35 9. A reed weaving machine embodying therein, means for forming a plurality of strands into a shed, means for introducing a stake into the shed, a shaft arranged transversely of the strands, stake straightening devices mounted on said shaft and rockable thereon to engage portions of the stakes between the strands, each device including gears spaced on said shaft, rock shafts arranged above the first mentioned shaft and including intermeshing gears, and gears meshing with those on said first mentioned shaft.

40 10. A reed weaving machine embodying therein, means for forming a plurality of strands into a shed, means for introducing stakes into the shed, a shaft arranged transversely of the strands, devices mounted on said shaft and rockable thereon to engage portions of the stakes between the strands, 65

each device including gears spaced on said shaft, rock shafts arranged above the first mentioned shaft and including intermeshing gears, gears meshing with those on said first mentioned shaft, and means for imparting a reciprocating movement to said first mentioned shaft without disengagement of the gears thereon from those on the rock shafts. 70

11. A reed weaving machine embodying therein, means for forming a plurality of strands into a shed, means for introducing stakes into the shed, a shaft arranged transversely of the strands, loose gear members arranged in spaced relation upon said shaft and arranged in sets, a bar connecting each set of gears and rockable toward and away from each other, stake engaging fingers mounted on said bars to engage portions of the stakes between the strands, and oppositely rocking shafts with gears thereon, the gears on one rock shaft meshing with the set of gears on the first mentioned shaft and the gears on the other rock shaft meshing with the other set of gears on said first mentioned shaft. 75 80 85 90

12. A reed weaving machine embodying therein, means for forming a plurality of strands into a shed, means for introducing stakes into the shed, a shaft arranged transversely of the strands, loose gear members arranged in spaced relation upon said shaft and arranged in sets, a bar connecting each set of gears and rockable toward and away from each other, stake engaging fingers mounted on said bars to engage portions of the stakes between the strands, oppositely rocking shafts with gears thereon, the gears on one rock shaft meshing with one set of gears on the first mentioned shaft and the gears on the other rock shaft meshing with the other set of gears on said first mentioned shaft, and means for reciprocating said first mentioned shaft without disturbing the meshing relation of the gears thereon with those on the rock shaft. 95 100 105 110

13. A reed weaving machine embodying therein means for forming a plurality of strands into a shed, means for introducing stakes into said shed to form the fabric, means for feeding the fabric step by step and including coacting rolls with longitudinally extending angular corrugations thereon conforming to the contour of the fabric, and means for engaging the stakes while the fabric is one one roll for straightening said stakes. 115 120

14. A reed weaving machine embodying therein means for forming a plurality of strands into a shed, means for introducing stakes into said shed to form the fabric, means for feeding the fabric step by step and including coacting rolls with longitudinally extending angular corrugations thereon conforming to the contour of the fabric, and coacting devices adapted to engage por- 125 130

tions of the stakes between the strands from opposite sides of the stakes while the fabric is on one roll for straightening said stakes.

15. A reed weaving machine embodying therein means for forming a plurality of strands into a shed, means for introducing stakes into said shed to form the fabric, means for feeding the fabric step by step and including coacting rolls with longitudinally extending angular corrugations thereon conforming to the contour of the fabric, coacting devices capable of both a reciprocating movement transversely of said strands and also a rocking movement to engage portions of the stakes between the strands from opposite sides of the stakes while the fabric is on one roll for straightening the same, and means actuated in the step by step movement of said roll for imparting a reciprocating movement to said devices.

16. A reed weaving machine embodying therein, means for forming a plurality of strands into successive sheds, means for holding a plurality of stakes, means associated with said holding means for arranging portions of said stakes in a vertical stack, one above the other, means for inserting stakes endwise into said sheds, and a reciprocating device operative to engage the bottommost stake portion in said arranging means when moving in one direction and to present it endwise to said stake inserting means, said reciprocating device being inoperative with respect to said stake portions when moving in the other direction.

17. A reed weaving machine embodying therein, means for forming a plurality of strands into successive sheds, means for holding a plurality of stakes, means associated with said holding means for arranging portions of said stakes in a vertical stack, one above the other, means for inserting stakes into said sheds, a reciprocating device arranged in advance of said stake arranging means, and coacting gripping jaws movable with said device and operable in one direction to grip the bottommost stake and present it to said stake inserting means, said jaws opening up in the return movement of said reciprocating device.

18. A reed weaving machine embodying therein, means for forming a plurality of strands into successive sheds, means for holding a plurality of stakes in bunched relation, means including upright spaced plates defining a slot the width of a stake to receive end portions of all the stakes and to

arrange them in a vertical stack, means for inserting a stake endwise into the sheds, a reciprocating device to engage the bottommost stake portion to present it endwise to the stake inserting means and a movable member mounted on one of said plates and operative in one movement of said reciprocating device to engage said stake portions just above the bottom of said slot to hold the same therein.

19. A reed weaving machine embodying therein means for forming a plurality of strands into successive sheds, means providing a slot in which portions of stakes are held, one above the other, means for inserting stakes into said sheds, a reciprocating device, gripper jaws actuated in the forward movement of said reciprocating device to engage the bottommost stake and to present the same to said stake inserting means and a bridge plate associated with said gripper jaws preventing the same from engaging more than said bottommost stake portion.

20. A reed weaving machine embodying therein means for forming a plurality of strands into successive sheds, means providing a slot in which portions of stakes are held, one above the other, means for inserting stakes into said sheds, a reciprocating device, a carriage associated therewith, said reciprocating device and carriage moving together, but being capable of a limited independent movement, gripper blocks including jaws mounted on the carriage, links mounted on said reciprocating device and operatively connected to said jaws, said block when reciprocated in one direction moving a limited distance independently of the carriage to cause said jaws to engage the bottommost stake and to present said stake to said stake inserting means.

21. A reed weaving machine embodying therein, means for forming a plurality of strands into successive sheds, means for holding stake portions in a vertical stack, one above the other, a device adjacent said stake inserting means and engaged by the ends of said stakes, said device having an opening in line with said stake inserting means and means for engaging the bottommost stake portion in said stack and passing it through said opening and presenting it to said stake inserting means.

In testimony whereof, I have hereunto set my hand, this 24th day of August, 1925.

MARSHALL B. LLOYD.