

No. 761,800.

PATENTED JUNE 7, 1904.

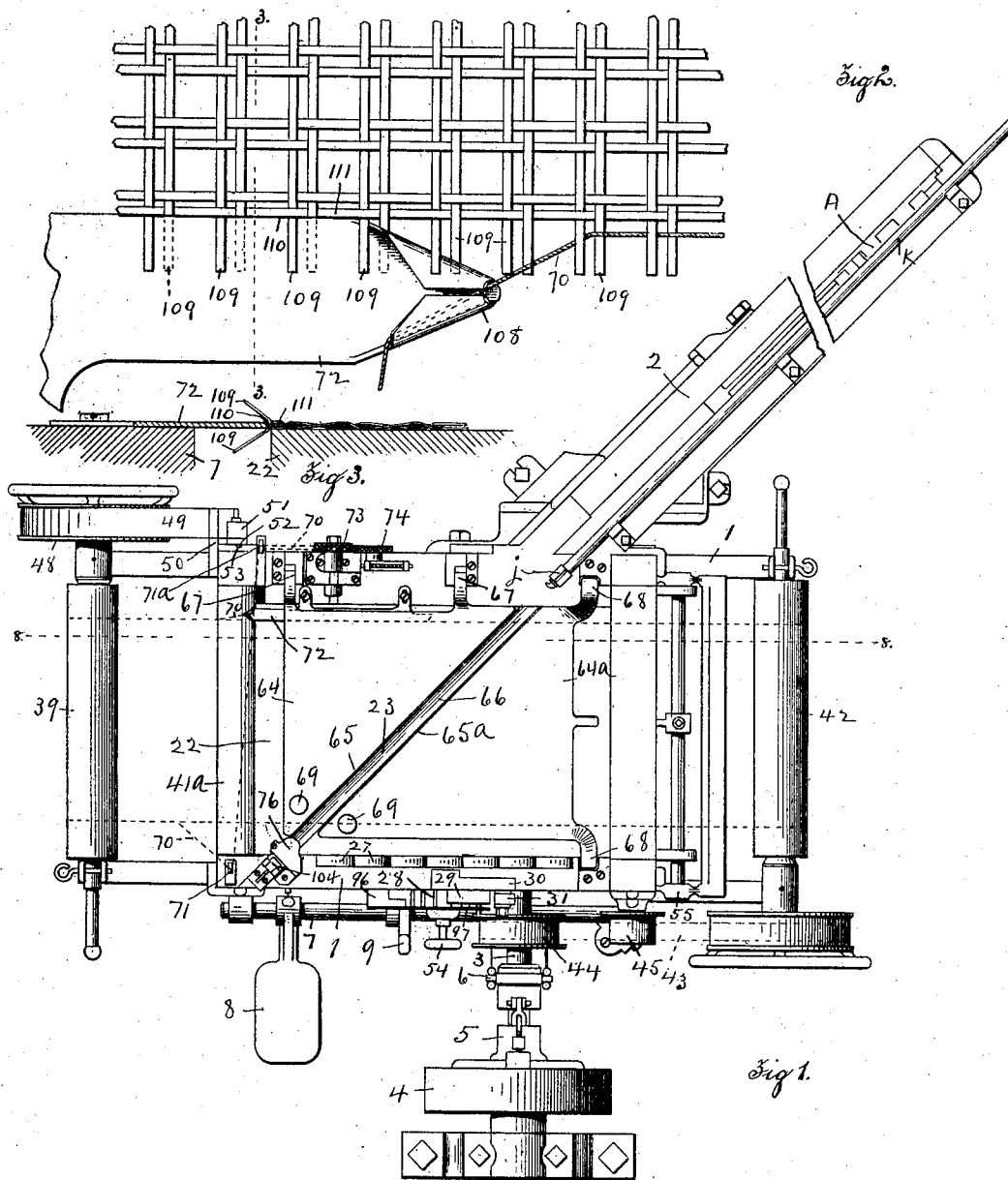
E. G. WATKINS.

MACHINE FOR INSERTING DIAGONAL STRANDS IN WOVEN CANE FABRIC.

APPLICATION FILED AUG. 22, 1900.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses:

W. M. Rugg.

McPhee

Inventor:

Edward E. Watkins.

By Rufus B. Fowler Atty.

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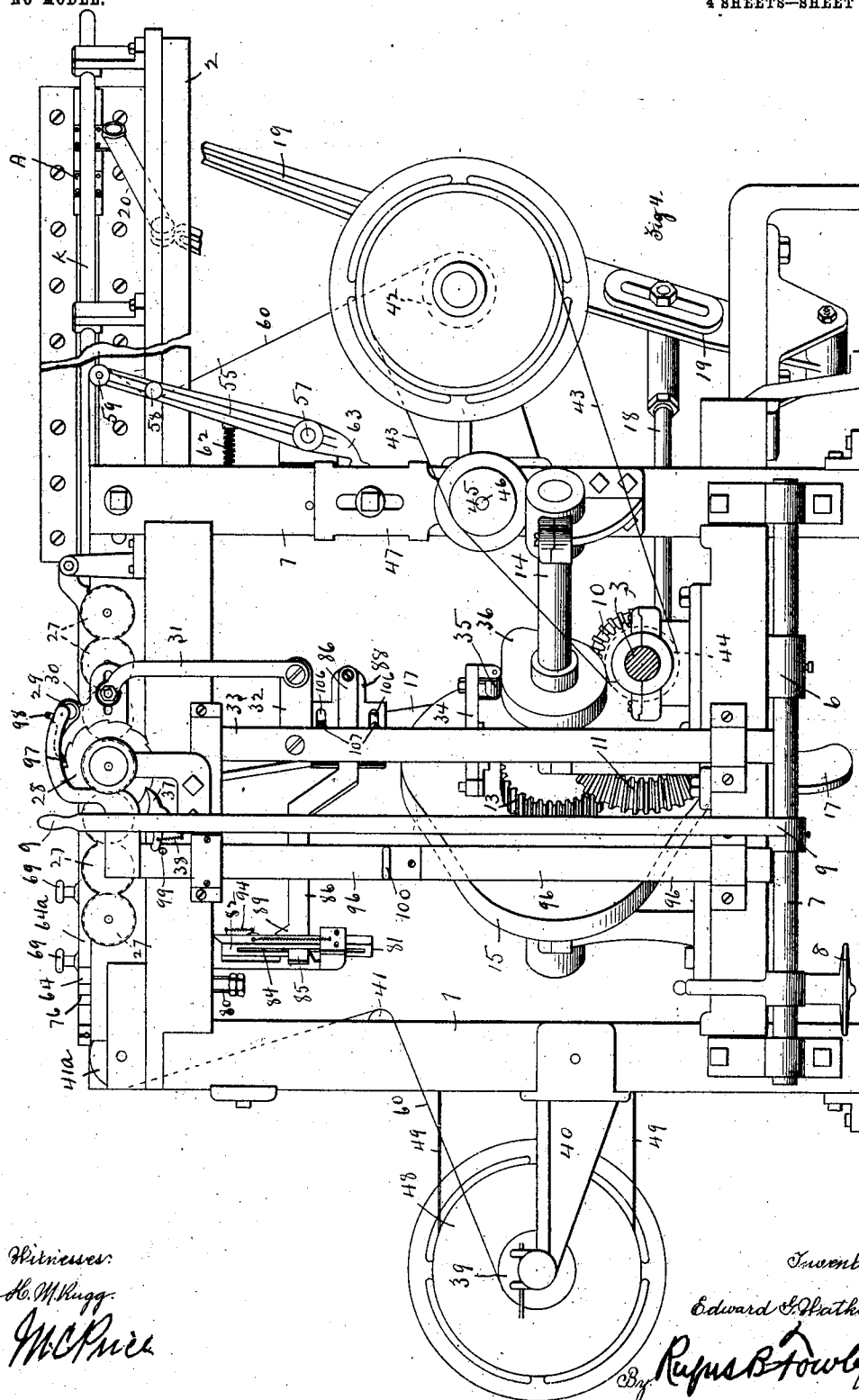
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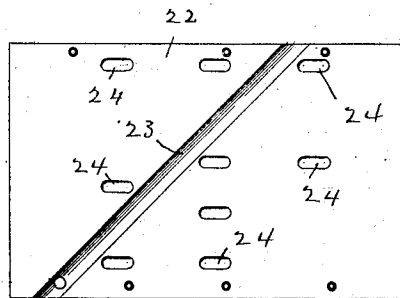
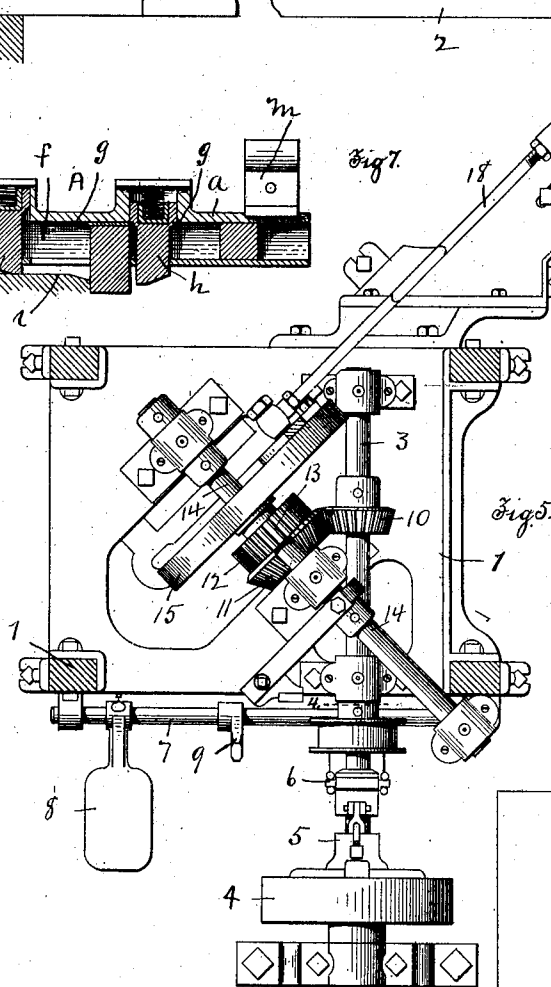
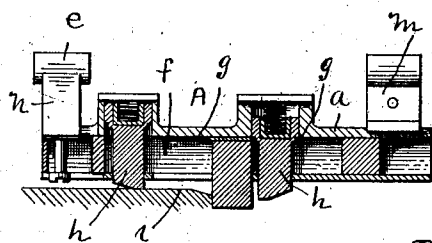
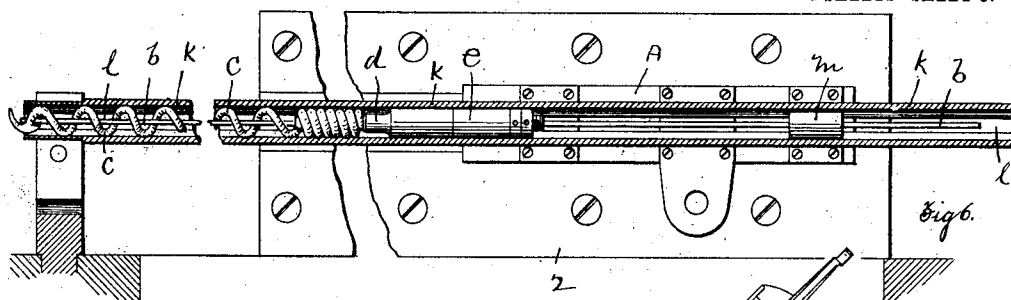
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Witnesses:

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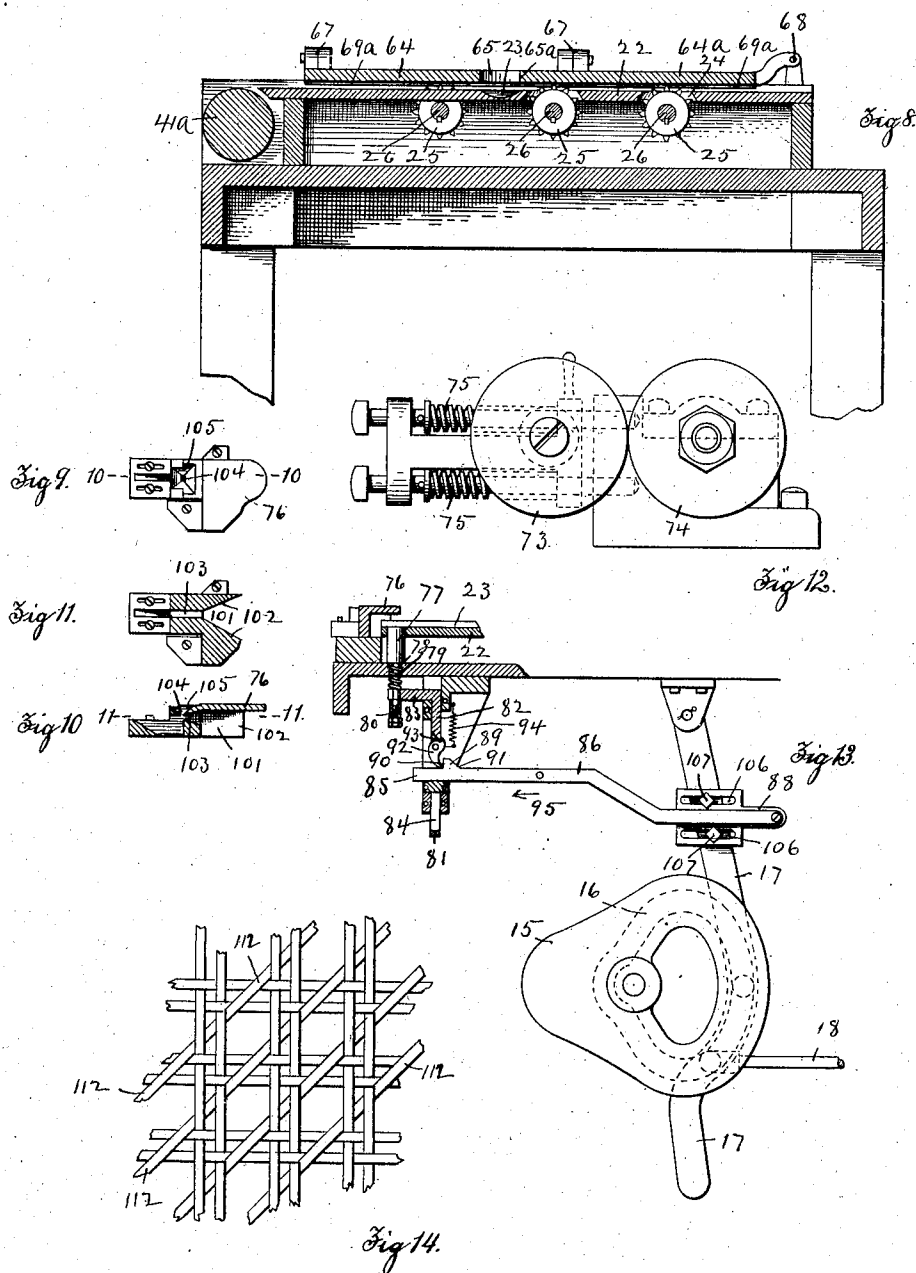
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W. C. Price

Inventor:
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UNITED STATES PATENT OFFICE.

EDWARD G. WATKINS, OF GARDNER, MASSACHUSETTS, ASSIGNOR TO THE
HEYWOOD BROTHERS AND WAKEFIELD COMPANY, OF GARDNER,
MASSACHUSETTS, A CORPORATION OF NEW JERSEY.

MACHINE FOR INSERTING DIAGONAL STRANDS IN WOVEN CANE FABRIC.

SPECIFICATION forming part of Letters Patent No. 761,800, dated June 7, 1904.

Application filed August 22, 1900. Serial No. 27,658. (No model.)

To all whom it may concern:

Be it known that I, EDWARD G. WATKINS, a citizen of the United States, residing at Gardner, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Machines for Inserting Diagonal Strands in Woven Cane Fabric, of which the following is a specification accompanied by drawings forming a part of the same, in which—

Figure 1 represents a top view of a machine for inserting diagonal strands in a woven cane fabric and embodying my invention. Fig. 2 represents a piece of woven cane fabric, showing the position of the guide-plate for pushing the selvage-strand. Fig. 3 is a sectional view on line 3 3, Fig. 2. Fig. 4 is a side elevation, the main driving-shaft shown in section on line 4, Fig. 5. Fig. 5 is a horizontal sectional view of the framework with the table or upper part of the framework removed. Fig. 6 is a side view, on a larger scale, of the reciprocating shed-former and strand-carrier with a tube or sheath inclosing the same shown in sectional view. Fig. 7 represents the two-part sliding block by which the shed-former and strand-carrier are reciprocated, the outer part being shown in sectional view in order to disclose the inner part and the spring-actuated latches by which the inner part is engaged. Fig. 8 is a longitudinal sectional view of the work-supporting table on line 8 8, Fig. 1. Fig. 9 is a top view, on a larger scale, of the guide-block for receiving the end of the shed-former and strand-carrier. Fig. 10 is a vertical sectional view on line 10 10, Fig. 9. Fig. 11 is a horizontal sectional view on line 11, Fig. 10. Fig. 12 is an enlarged view of the rolls for withdrawing the strings from the selvages of the woven fabric. Fig. 13 represents the mechanism for clamping the strand for the purpose of withdrawing it from the eye of the strand-carrier, a portion of the mechanism being shown in sectional view. Fig. 14 represents a piece of woven cane fabric with the diagonal strands in one direction inserted therein. Fig. 15 is a top view of the work-supporting table.

Similar letters and reference-figures refer to similar parts in the different figures. 50

My present invention relates to a machine for inserting diagonal strands in a woven cane fabric by means of a reciprocating shed-former and strand-carrier such as is shown in Letters Patent No. 539,601, granted to me May 21, 1895, to which reference may be had for a more detailed description of the shed-former and strand-carrier and their mode of operation. 55

My present invention relates more particularly to the operating parts of the machine by which the fabric is controlled during the operation of inserting a diagonal strand and by which the shed-former and strand-carrier are reciprocated; and it consists in the novel construction and arrangement of parts, as hereinafter described, and set forth in the annexed claims. 60

Referring to the accompanying drawings, 1 denotes the framework of the machine, in which are mounted the main driving-shaft and its connected actuating mechanism. Upon one side of the framework 1 is an overhanging bracket or arm provided with a longitudinal raceway for a reciprocating two-part block A, the outer part *a* carrying a strand-carrier *b*, consisting of a needle having an eye in its free end to receive a strand of cane, which is inserted in the woven fabric by the reverse movement of the strand-carrier. The strand-carrier *b* is held concentrically within a spiral shed-former *c*, having a pitch corresponding to the diagonal distance of the squares in the cane fabric. The shed-former *c* is attached to a spindle *d*, capable of rotating in a bearing *e*, which is carried by a bar *f*, forming the inner part of the block A and capable of a limited sliding motion within the outer part *a*. The sliding-bar *f* is provided with notches *g g*, which are alternately engaged at each end of its sliding movement in the part *a* by one of the spring-actuated latches *h h*, which are alternately disengaged by fixed tracks arranged in the paths of the latches as the block A is reciprocated. One of said tracks is shown at *i*, Fig. 7, which represents the block A, with 65 70 75 80 85 90 95

the outer part *a* shown in sectional view to disclose the sliding part *f* and the spring-actuated latches *h h*. As the shed-former is pushed in a diagonal line across the fabric it coils about the several junctures of the warp and weft, forming a shed and passing a strand-carrier between the strands of the fabric and inserting a diagonal strand upon the reverse movement of the strand-carrier. As the shed-former is advanced through the fabric it is preferably pushed through a stationary nut *j*, Fig. 1, adapted to engage its spiral turns and impart a rotary motion, thereby causing it to enter the fabric at the proper point with a corkscrew movement and relieving the strands of the fabric of the strain required to rotate the shed-former. The shed-former and strand-carrier form no part of my present invention, and they are fully described in the Letters Patent aforesaid, No. 539,601, to which reference may be had for a more detailed description. In my present machine, however, the shed-former when withdrawn from the fabric is preferably inclosed in a sheath *k*, provided on one side with a slot *l* to receive an arm *m*, carrying the strand-carrier and projecting from the outer part *a* of the reciprocating block, and an arm *n*, provided with a bearing for the spindle *d* and projecting from the inner part *f* of the reciprocating block A.

Journalled in the framework 1 is a main driving-shaft 3, carrying a revolving belt-pulley 4, receiving motion through a clutch mechanism 5, suitably connected by a fork 6 with a rocking shaft 7, to which a foot-plate 8 and a hand-lever 9 are attached, by either of which the shaft 7 may be rocked by an attendant to engage and disengage the clutching mechanism 5. The driving-shaft 3 carries a bevel-gear 10, engaging a bevel-gear 11, which turns loosely on a stud held in the frame of the machine, and attached to the bevel-gear 11 is a spur-gear 12, engaging a spur-gear 13 on a cam-shaft 14, which is placed obliquely to the driving-shaft 3 and carries a cam 15 provided with a cam-groove 16, inclosing a cam-pulley carried by a reciprocating lever 17.

The reciprocating lever 17 is pivoted at its upper end to the framework of the machine and is connected near its lower end by a link 18, a reciprocating lever 19, which is pivoted at its lower end to the framework of the machine and is connected at its upper end by a link 20 to a sliding block A, which carries the shed-former *b* and strand-carrier C, thereby imparting a reciprocating motion to the shed-former *b* and strand-carrier in a diagonal line across a work-supporting table 22, supported upon the framework 1 and provided with a diagonal groove 23 to form a passage-way for the shed-former in its movement through the cane fabric. The table 22 is also provided with a series of openings 24, arranged on opposite sides of the diagonal groove 23 or passage-way for the shed-former

to receive the toothed feed-wheels 25, which are carried upon shafts 26, journaled beneath the table 22 and connected by gears 27 with a ratchet-wheel 28, to which an intermittent motion is given by means of a pawl 29, carried upon a plate 30, which is pivoted concentrically with the ratchet-wheel 28 and is capable of being rocked by means of a link 31, connecting the plate 30 with an arm 32, attached to a vertically-sliding bar 33, which carries an arm 34, supporting a cam-roll 35, which rests upon the periphery of a cam 36, carried upon the cam-shaft 14, thereby causing an intermittent rotary motion in one direction to be imparted to the ratchet-wheel 28 and the feed-wheels 25. The ratchet-wheel 28 is held from reverse movement by a retaining-pawl 37, pivoted on the framework of the machine and held in engagement with the teeth of the ratchet-wheel by a spring 38. The cane fabric to be operated upon is carried upon a roll 39, supported in brackets 40 at the side of the framework, and is carried around rolls 41 and 41^a and across the table 22 to a take-up roll 42. The take-up roll 42 is connected by a belt 43 with a pulley 44 on the driving-shaft 3, and the tension of the belt 43 is regulated by a tightening-pulley 45, turning loosely on a stud 46, held in a plate 47, which is adjustably attached to the framework of the machine. The shaft of the roll 39 is provided with a friction-wheel 48, carrying a belt 49, having one end connected to an arm 50, which is attached to the frame of the machine, and its opposite end is connected to an arm 51, carried by a lever pivoted on the frame of the machine and having a tooth 52 engaging a stationary notched plate 53, allowing a tension to be imparted to the friction-belt 49 to restrain the roll 39 from turning.

The tension of the driving-belt 43 causes the fabric to be stretched across the table 22; but it is not sufficient to move the fabric thereon, and the feeding of the fabric is accomplished by the intermittent motion of the toothed feed-wheels 25, which project through the openings 24 of the table and engage the meshes of the fabric, causing the fabric to be fed along with an intermittent motion at the withdrawal of the shed-former and strand-carrier in order to draw a new row of diagonal meshes over the passage-way 23 of the table in position to be engaged by the shed-former and strand-carrier at their next forward movement. As the toothed feed-wheels 25 engage the fabric upon opposite sides of the diagonal groove 23 the fabric is moved bodily over the passage-way for the shed-former, and the strain exerted by the feed-wheels upon the fabric is applied equally upon both sides of the passage-way, thereby preventing the meshes which are to be engaged by the shed-former from becoming distorted.

In case an imperfect insertion of the diagonal strand should occur provision is made

for drawing back the cane fabric on the table 22 by means of a hand-wheel 54 on the shaft of the ratchet-wheel 28 and by interposing a "take-up" between the table 22 and the take-up roll 42, consisting of a swinging frame 55, pivoted to the framework of the machine at 57 and provided with a rod 58 and a roll 59 parallel with the axis of the take-up roll 42. The fabric 60 is taken from the table 22 around the roll 59 and rod 58 to the take-up roll 42.

A spring 62 is inserted between the framework of the machine and the swinging frame 55, with its tension applied to normally hold an arm 63 of the swinging frame 55 against the framework of the machine. The woven fabric as it passes from the table 22 is held in contact therewith by the pressure of weighted covers, consisting of the triangular plates 64 64^a, having parallel edges 65 65^a, separated by a space 66 sufficient to allow the passage of the shed-former. The plate 64 is hinged at 67, and the plate 64^a is similarly hinged at 68 to stands supported on the framework of the machine, and the plates are provided with knobs 69, by which they may be raised to disclose the fabric on the table 22, and the under side of the plates 64 64^a are provided with grooves 69^a to receive the tips of the teeth of the feed-wheels 25, as shown in Fig. 8.

The cane fabric is usually woven upon the loom with strings or cords 70 interwoven in its weft-stands on opposite edges of the fabric to form a selvage, which it is desirable to remove before inserting the diagonal strands, and I accomplish this result by passing one of the cords 70 through holes in fixed pins or studs 71 and 71^a, projecting upwardly from the frame of the machine on each side of the fabric, and the opposite cord 70 is taken through a guide-plate 72 and stud 71^a.

From the pins 71 71^a the two cords 70 are carried between the two rotating milled rolls 73 and 74, by which the cords are taken up as fast as the fabric is fed along. The milled roll 73 is driven by one of the shafts of the feed-wheels 25, and the milled roll 74 is supported by a sliding bearing which is acted upon by a spring 75 to pinch the cords 70 between the milled edges of the rolls.

When the strand-carrier, with a strip of cane, looped through its eye, has drawn the diagonal strand through the meshes of the fabric, as described in Patent No. 539,601, the strand is removed from the eye of the strand-carrier by holding the strand from longitudinal movement while the strand-carrier is completing its return movement by a clamping mechanism consisting of a fixed plate 76, overhanging the path of the strand-carrier and extending over the upper end of a clamping-bar 77, capable of a vertical sliding movement, by which the strand is clamped between the end of the clamping-bar and the fixed plate 76. The clamping-

bar 77 is moved upward at the proper period 65 to seize the diagonal strand by means of a lifting-bar 81, having a vertical arm 82 capable of sliding in fixed ways, and a horizontal arm 83, provided with a forked end, inclosing the clamping-bar 77. The vertical arm 82 of the lifting-bar is provided with a vertical slot or mortise 84 to receive the end 85 of a link 86, pivoted at its opposite end 87 to an arm 88, attached to the reciprocating lever 17, by which the link 86 is given a reciprocating movement through the mortise 84 of the lifting-bar 81. The link 86 is provided on its upper side with a projection 89, having on one side a vertical surface 90 and on its opposite side an inclined or cam-shaped surface 91.

Pivoted to the lifting-bar 90 and within the mortise 84 is a curved latch 92, with its lower end extending into the path of the projection 89 and having its upper end provided with a shoulder 93, which is normally held against the lifting-bar 81 by means of a spiral spring 94. As the link 86 moves forward in the direction of the arrow 95 the vertical wall 90 of the projection 89 strikes the latch 92 and rocks it upon its pivot, thereby allowing the projection 89 to pass the latch and allow it to be returned to its normal position by the action of the spiral spring 94. Upon the return movement of the link 86 the cam-surface 91, acting against the curved end of the latch 91, serves to raise the lifting-bar 81. Between the forked end of the horizontal arm 83 of the lifting-bar and the shoulder 78 on the clamping-bar 77 a spiral spring 79 is inserted, against which the lifting-bar bears in raising the clamping-bar 77, causing the strand to be clamped with a yielding pressure between the clamping-bar 77 and the fixed plate 76. When the projection 89 on its return movement has passed the latch 92, the lifting-bar 81 falls by its own weight and the horizontal arm 83, bearing against a nut 80, carries the clamping-bar downward and insures the release of the diagonal strand.

When it is desired to draw the fabric back a short distance owing to any irregularity in the insertion of a diagonal strand or for other cause, the pawls 29 and 37 are disengaged from the ratchet-wheel 28 and the feeding movement of the fabric is reversed by means of the hand-wheel 54, thereby rocking the swinging frame 55 and compressing the spring 62. The release of the pawls 29 and 37 is accomplished by means of a vertically-sliding bar 96, held in ways at the side of the machine and provided with a curved plate 97, which extends beneath a stud 98 on the pawl 29, and with a pin 99, which projects beneath the pawl 37, so that the lifting of the bar 96 will disengage both pawls 29 and 37.

The bar 96 has attached thereto in a convenient position to be engaged by the knee of the

operator an arm or bracket 100, enabling the bar to be raised and leave the hands free to draw back the fabric.

As the shed-former is pushed through the fabric it is liable to be slightly deflected from its direct diagonal course, and I form a tapering recess 101 beneath the clamping-plate 77, provided with converging sides 102 102, which contact with the end of the shed-former and center it, so that the end of the strand-carrier will be brought in registration with a narrow slot 103.

When the shed-former has reached the limit of its forward motion, the strand-carrier is advanced by the independent movement of the outer part *a* of the reciprocating block A moving the end of the strand-carrier into the slot 103 and bringing its eye into registration with a hole 104 at the bottom of a tapering recess 105. The end of a cane-strand is then inserted through the eye of the strand-carrier, so that it will be drawn through the fabric in the return movement of the strand-carrier and shed-former, the operation of these parts being described in Letters Patent No. 639,601 aforesaid.

The clamping-bar 77 is raised at the proper period in the return movement of the strand-carrier to hold the cane-strand from movement and cause it to be withdrawn from the eye of the strand-carrier, and I have found in practice that it is desirable to vary the time of clamping the strand relatively to the movement of the strand-carrier according to the quality and condition of the cane-strands, and I accomplish this by adjustably attaching the arm 88 to the lever 17 by means of slots 106 and bolts 107, enabling the clamping mechanism to be adjusted to clamp the strand at the desired point of time in the return movement of the strand-carrier.

As the shed-former is pushed forward and rotated by the fixed nut *j* it is desirable that the first juncture of the crossed strands of the fabric should lie in proper position to allow the tip of the shed-former to coil around them, and this is secured by means of the guide-plate 72, which is shown in Fig. 1 and on a larger scale in Figs. 2 and 3, not only serves to withdraw the selvage-cord 70 from one edge of the fabric, as shown in Fig. 2, but it separates the ends of the weft-strand by its pointed end 108, causing the ends of the weft-strands 109 to pass alternately over and under the guide-plate, while the edge 110 of the guide-plate serves to crowd the first cane strand 111 of the warp toward the fabric and in position to be engaged by the tip of the rotating spiral shed-former.

The cane fabric as it comes from the weaving-loom is shown in Fig. 2 and consists of a series of rectangular meshes, and in Fig. 14 a portion of the cane fabric is shown with diagonal strands 112 inserted in one direction.

The operation of my machine is as follows:

A cane fabric like that represented in Fig. 2 is wound upon the roll 39, which is held from turning too freely by the friction-belt 49. From the roll 39 the fabric is carried around rolls 41 and 41^a across the table 22 with the meshes of the fabric engaged by the teeth of the feed-wheels 25. From the table 22 the fabric passes around the roll 59 and rod 58 of the swinging take-up frame 55 and is wound upon the take-up roll 42, having a belt connection with a rotating pulley on the driving-shaft 3 by which a constant strain is exerted upon the fabric, but not sufficient to move it across the table 22. A reciprocating motion is imparted to the shed-former and strand-carrier, carrying them through the fabric by means of the cam 15, carrying the tip of the shed-former into the tapering recess 101, causing the shed-carrier to be restored to its true alinement by the converging sides 102. The strand-carrier then advances to bring its eye beneath the hole 104, through which it receives a cane-strand, which is drawn into the fabric by the return movement of the strand-carrier. An intermittent feeding motion is given to the fabric by the toothed feed-wheels 25, actuated by a pawl-and-ratchet mechanism upon the withdrawal of the strand-carrier and shed-former. As the fabric is advanced it is drawn past the edge of the guide-plate 72, which restores the outer cane warp-strand in case it has been displaced, while the cords 70 70 are withdrawn and taken up by the milled rolls 73 and 74.

By exerting a constant strain upon the fabric by the belt 43 I reduce the strain upon the fabric exerted by the teeth of the feed-wheels. In other words, the pulling strain required to move the fabric along is divided between the strain exerted by the take-up roll 42 and the teeth of the feed-wheels, thereby preventing the displacement of the fabric which would be liable to occur if the feeding motion were to be accomplished entirely by the feed-wheels or by the movement of the take-up roll.

By inclosing the shed-former in a sheath *z* it is held from buckling when the resistance to the entrance and advance of the shed-former is unduly increased by its lack of proper registration with the meshes of the fabric or for any other cause.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a machine for inserting diagonal strands in a woven cane fabric, the combination of a work-supporting table, means for feeding the cane woven fabric across the table, a reciprocating strand-carrier for drawing a cane-strand through the fabric, and a pair of weighted plates on opposite sides of the line of motion of said strand-carrier, arranged to rest upon the fabric and hold it in contact with the table, substantially as described.

2. In a machine for inserting diagonal strands in a woven cane fabric, the combina-

tion with a work-supporting table and a reciprocating strand-carrier and means for moving said carrier across said work-supporting table, of a series of feed-wheels arranged to engage the fabric on opposite sides of the path of the reciprocating strand-carrier and means for imparting an intermittent motion to said feed-wheels, substantially as described.

3. In a machine for inserting diagonal strands in a woven cane fabric, the combination with a work-supporting table provided with a series of openings, of a series of feed-wheels journaled beneath the table and provided with teeth projecting through said openings to engage the fabric, means for imparting an intermittent motion to said feed-wheels and a pair of weighted plates arranged to rest on the fabric and provided with recesses to receive the teeth of the feed-wheels, substantially as described.

4. In a machine for inserting diagonal strands in a woven cane fabric, the combination with a reciprocating strand-carrier for drawing a cane-strand through the fabric and a series of feed-wheels arranged to engage the fabric on opposite sides of the path of the strand-carrier, means for imparting an intermittent motion to said feed-wheels, and means for imparting a constant pulling strain to the fabric, substantially as described.

5. The combination of a work-supporting table provided with a passage-way for a reciprocating strand-carrier, a roll journaled at one side of the table and carrying the fabric to be operated upon, a take-up roll upon which the fabric is wound, journaled upon the opposite side of the table, a rotating pulley, a belt connecting the take-up roll with said rotating pulley by which a constant pulling strain is imparted to the fabric, a series of feed-wheels engaging the meshes of the fabric and arranged on opposite sides of the passage-way for the strand-carrier and means for imparting an intermittent motion to said feed-wheels, substantially as described.

6. The combination with a work-supporting table having a series of openings, of rolls 39 and 42 journaled on opposite sides of said table between which the fabric is stretched, means for applying a constant pulling strain to the fabric between said rolls, a swinging spring-actuated take-up frame between said table and one of said rolls, and a series of feed-wheels journaled beneath the table and provided with teeth projecting through the openings in the table and means for imparting an intermittent motion to said feed-wheels, substantially as described.

7. The combination of a work-supporting table provided with a passage-way for a reciprocating strand-carrier, a series of feed-wheels having teeth engaging the meshes of the fabric, said wheels being arranged on opposite sides of the passage-way for the reciprocating strand-carrier, a pawl-and-ratchet

mechanism for imparting an intermittent motion to said feed-wheels and comprising actuating and retaining pawls and a sliding bar arranged to simultaneously disengage said pawls, substantially as described.

8. The combination with a work-supporting table, of a series of feed-wheels provided with teeth to engage the meshes of the fabric and operatively connected with a ratchet-wheel shaft, a shaft carrying a ratchet-wheel, pawls for actuating and retaining said ratchet-wheel, means for disengaging said pawls, a hand-wheel by which the motion of said feed-wheels is reversed and a yielding take-up for holding the fabric taut, substantially as described.

9. The combination with a work-supporting bed, of a pair of weighted plates arranged to rest upon the work on said table, each of said plates being hinged at one side with a space between said plates for the passage of a reciprocating mechanism for inserting a diagonal strand in the fabric and means for feeding the fabric across said table, substantially as described.

10. The combination with a reciprocating strand-carrier having an eye to receive a cane strand, of a sliding block placed in the path of the free end of the strand-carrier and provided with converging walls arranged to restore the strand-carrier into alinement with its line of motion diagonally through the fabric and a guide for a cane strand provided with converging walls for bringing the strand into registration with the eye of the strand-carrier, substantially as described.

11. The combination with a reciprocating strand-carrier having an eye to receive a cane-strand, of a strand-clamping mechanism for clamping the cane-strand withdrawing it from the eye of the strand-carrier, means for actuating said clamping mechanism and means for varying the time of action of said clamping mechanism relatively to the movement of the strand-carrier, substantially as described.

12. The combination with a reciprocating strand-carrier having an eye to receive a cane strand of a strand-clamping mechanism consisting of a plate projecting over the path of the strand-carrier, a vertically-moving clamping-bar below the path of the strand-carrier, an actuating-cam for periodically raising said bar synchronously with the movement of the reciprocating strand-carrier and intermittent connecting mechanism between said cam and said clamping-bar by which the movement of said clamping-bar is varied relatively to the movement of said strand-carrier, substantially as described.

13. The combination with a work-supporting table and means for moving the fabric across said table, of a guide-plate arranged to press against the outer cane strand of the warp, substantially as described.

14. The combination with a work-supporting table and means for moving the work

across said table, of a guide-plate at the side of the fabric having one end pointed to enter between and separate the alternate weft-strands and crowd the outer warp-strand toward the fabric, substantially as described.

15 In a machine for inserting diagonal strands in a woven cane fabric having cords in its selvages, of a plate at the side of the fabric having a pointed end adapted to enter between the weft-strands, and a hole to receive one of the selvage-cords, whereby said weft-strands are separated and conducted alternately above and below said plate and means for moving the fabric forward, substantially as described.

16 In a machine for inserting diagonal strands in a woven cane fabric having cords woven in its selvege, the combination with means for feeding the fabric forward, of mechanism for exerting a longitudinal pulling strain upon the selvage-cords at an oblique angle to the movement of the fabric whereby they are withdrawn therefrom, substantially as described.

17. The combination with a work-supporting table and means for moving the fabric across said table of a pair of rolls for withdrawing the cords from the selvages of the fabric and means for conducting the selvage-cords to said rolls, substantially as described.

18. The combination with a reciprocating spiral shed-former of a tube or sheath inclosing the coils of said shed-former when withdrawn from the fabric and means for moving said shed-former out of said sheath into the fabric, substantially as described.

19. The combination of a sliding block, a shell, or tube, having a longitudinal slot on one side, arms projecting from said sliding block and entering said slot and a spiral shed-former and a strand-carrier held by said arms concentrically with said shell, or tube, substantially as described.

Dated this 16th day of August, 1900.

EDWARD G. WATKINS.

Witnesses:

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THATCHER B. DUNN.