No. 764,290. PATENTED JULY 5, 1904.

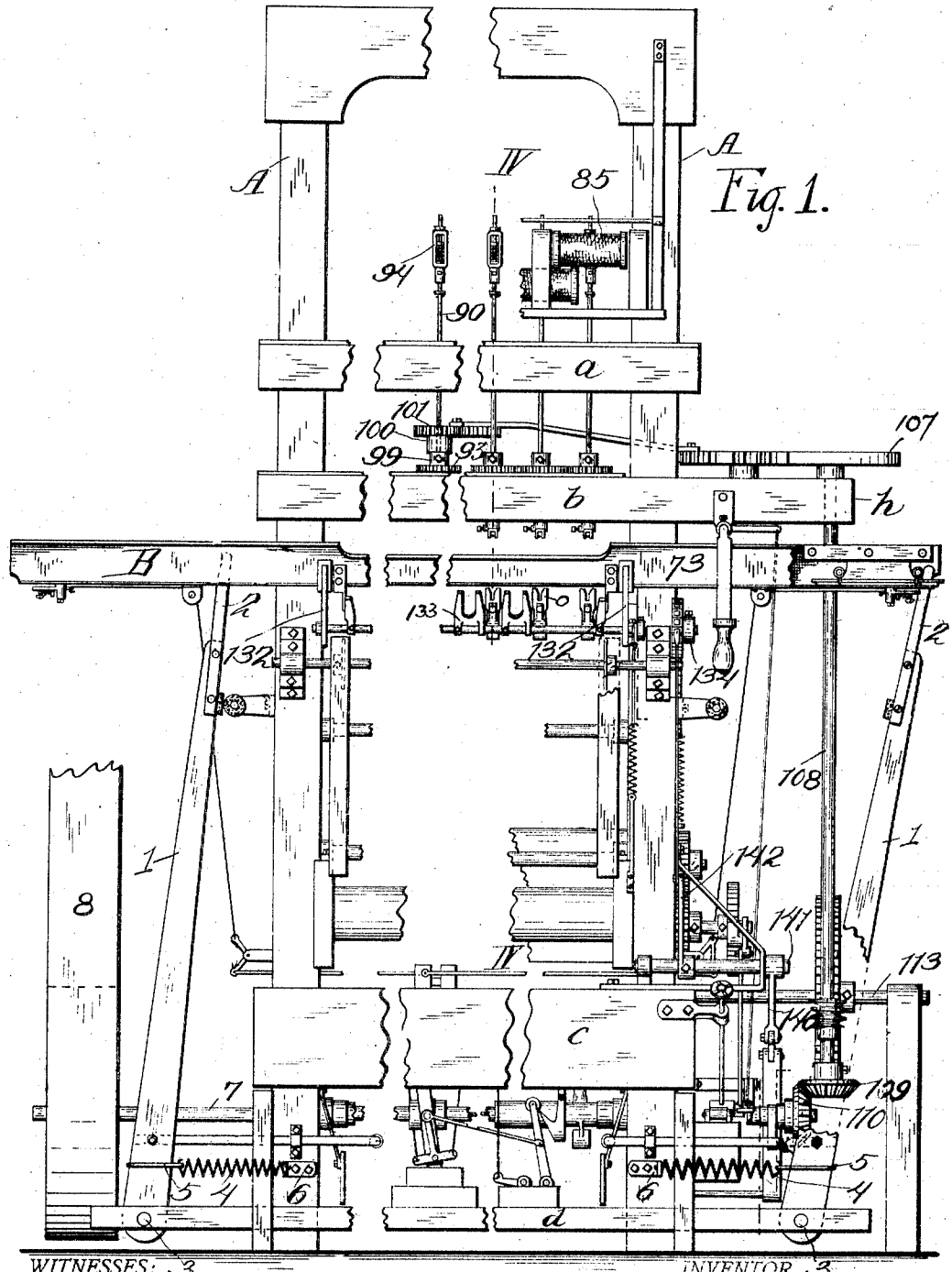
A. C. HOUGH.

LOOM FOR WEAVING SLAT BLINDS.

APPLICATION FILED OCT. 16, 1901.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.



WITNESSES: 3

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NO MODEL. 5 SHEETS—SHEET 2.

Fig. 2.

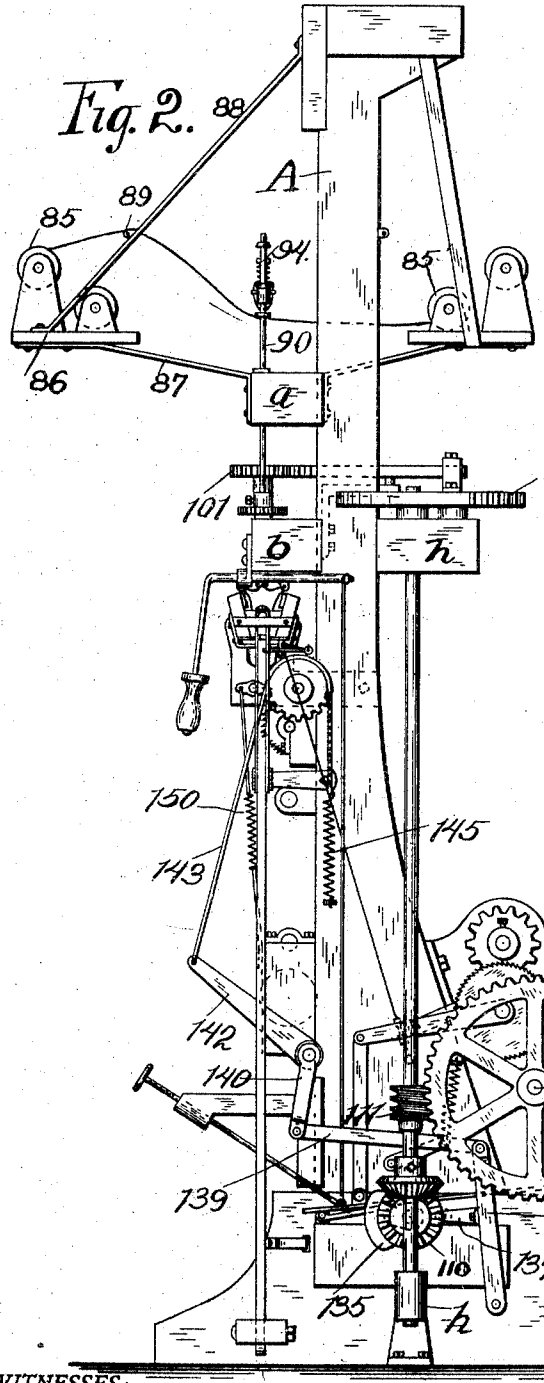


Fig. 6,

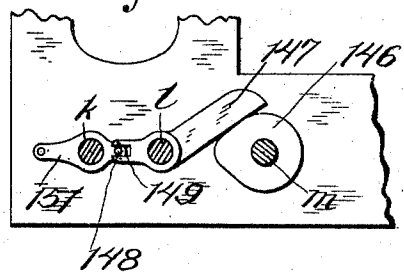
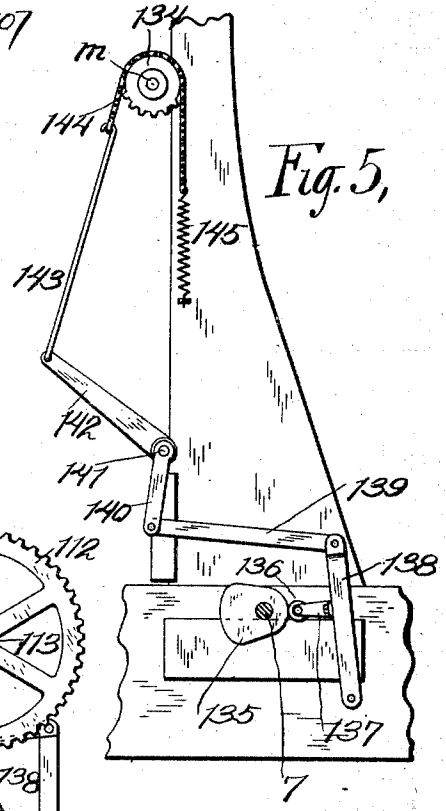


Fig. 5,



WITNESSES:

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NO MODEL. 5 SHEETS—SHEET 3.

Fig. 4.

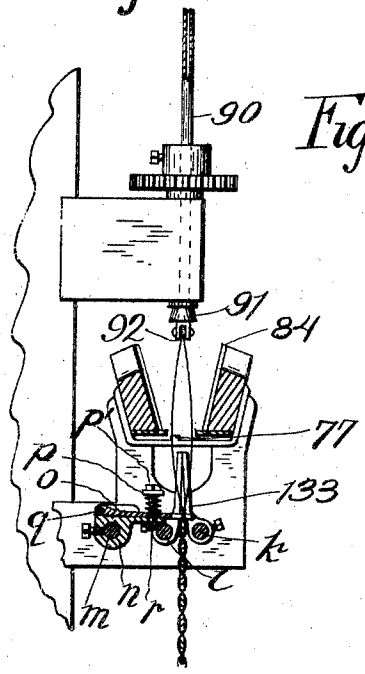


Fig. 3.

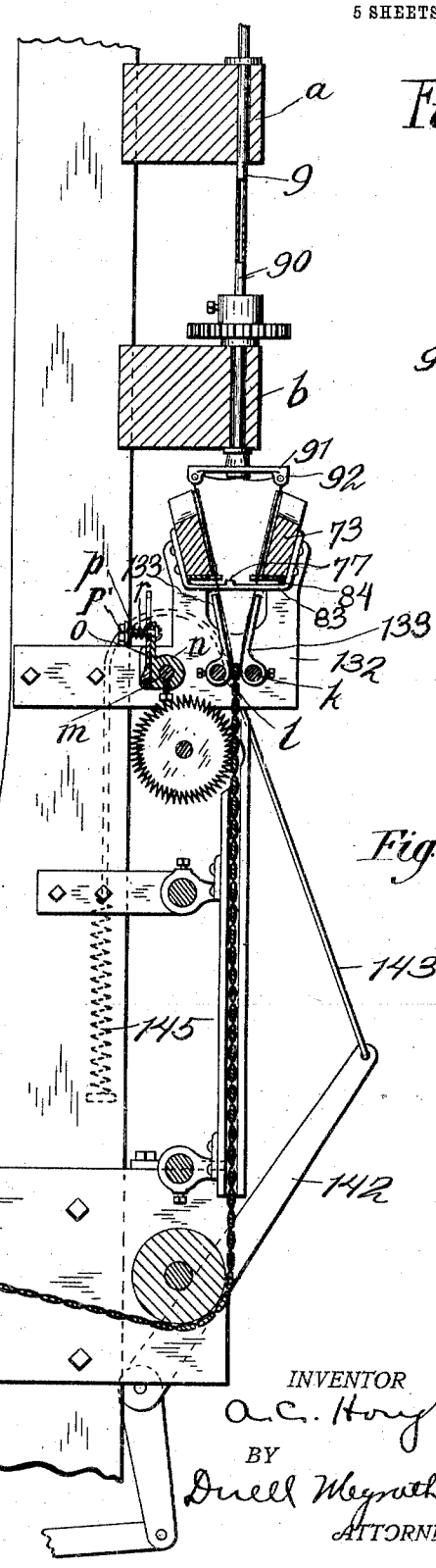


Fig. 12.

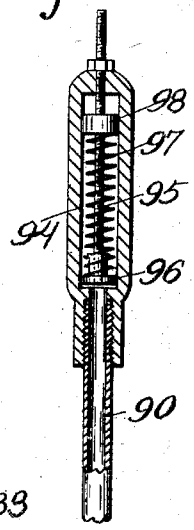
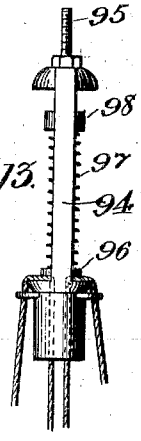


Fig. 13.



WITNESSES:

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LOOM FOR WEAVING SLAT BLINDS.

APPLICATION FILED OCT. 16, 1901.

NO MODEL. 5 SHEETS—SHEET 4.

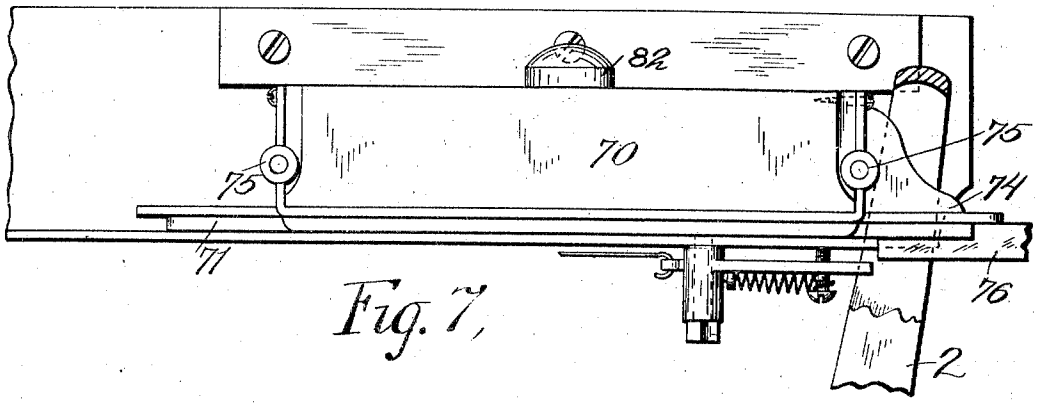

Fig. 7.

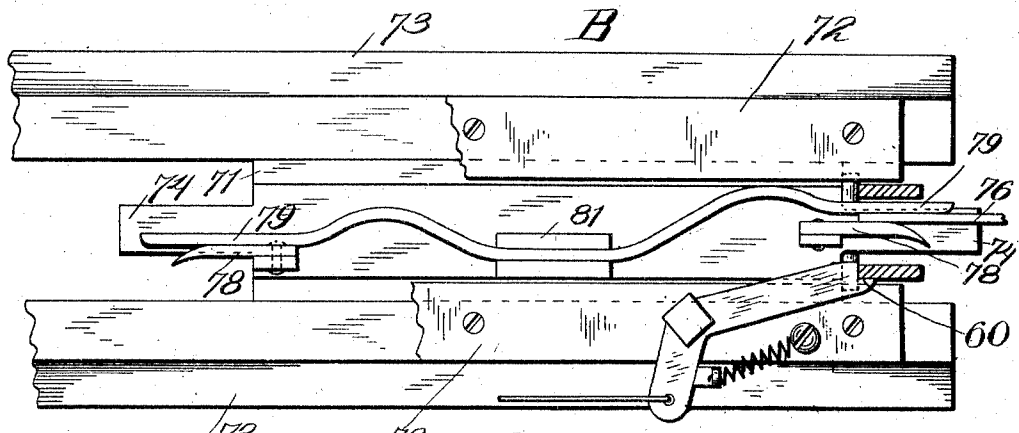

Fig. 8.

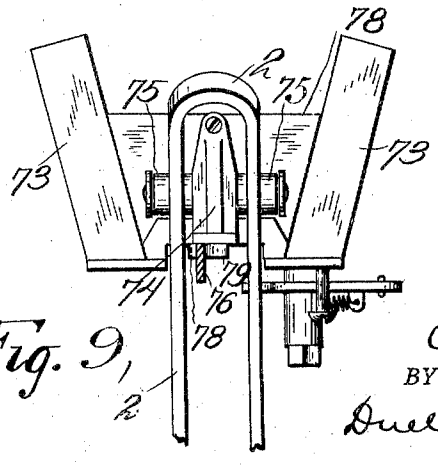

Fig. 9.

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No. 764,290. PATENTED JULY 5, 1904.

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LOOM FOR WEAVING SLAT BLINDS.

APPLICATION FILED OCT. 16, 1901.

NO MODEL. 6 SHEETS—SHEET 5.

Fig. 10,

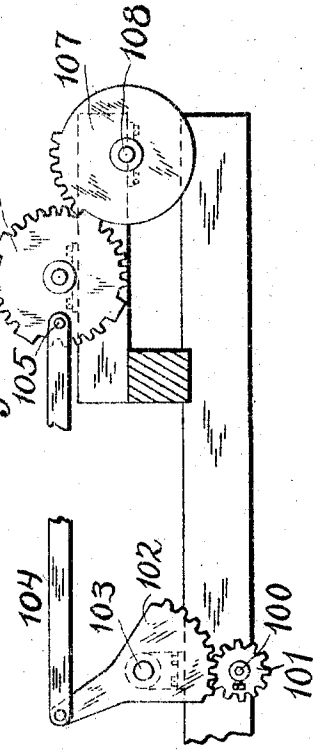
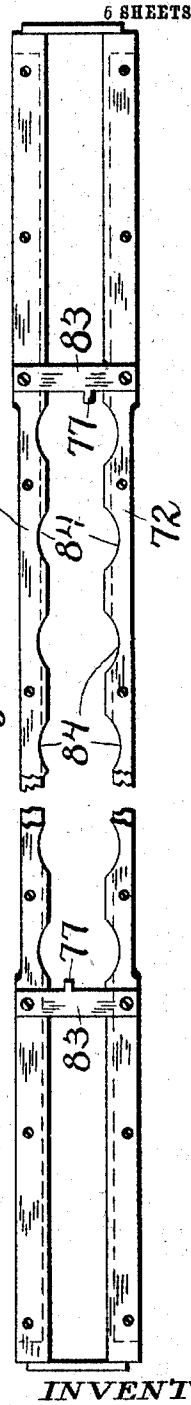


Fig. 11,



WITNESSES:

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No. 764,290. Patented July 5, 1904.

UNITED STATES PATENT OFFICE.

AZEL C. HOUGH, OF SOUTH BUTLER, NEW YORK.

LOOM FOR WEAVING SLAT BLINDS.

SPECIFICATION forming part of Letters Patent No. 764,290, dated July 5, 1904.

Application filed October 16, 1901. Serial No. 78,791. (No model.)

To all whom it may concern:

Be it known that I, AZEL C. HOUGH, residing at South Butler, in the county of Wayne and State of New York, have invented certain new and useful Improvements in a Loom for Weaving Slat Blinds, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a loom for producing woven fabric for curtains, shades, screens, &c., which is formed of splints or slats of wood or other analogous material held together by heavy warp-threads interwoven therewith. Although looms have been designed intended for such purposes, they have not proved practical, nor have they come into commercial use, and fabrics of this class have generally been woven by hand—a slow, tedious, and expensive process.

The object of my invention is to provide an efficient and practical machine which shall be capable of producing such fabric in a substantially automatic manner; and to this end my invention consists of the various features of construction, combinations of elements, and arrangement of parts, as will be clearly understood from the description hereinafter, taken in connection with the accompanying drawings, and the novel features of which will be pointed out in the claims at the end of this specification.

My invention is useful in weaving any fabric the filling or weft of which is composed of substantially stiff material, as slats, cane, or straw, in contradistinction from fabric the filling of which is of textile material proper.

In the accompanying drawings, Figure 1 is a front elevation of my loom, portions being broken away, but enough being shown to give a clear general idea thereof. Fig. 2 is a side elevation. Fig. 3 is a vertical section, on an enlarged scale, on the line IV IV of Fig. 1, certain parts being omitted. Fig. 4 is a sectional detail of the upper end of parts shown in Fig. 3, showing the guide-fingers and the presser-finger thereof in a different position. Fig. 5 is a detail in end elevation with the driving-shaft shown in section, showing the means by which the presser-finger shaft is actuated from the main driving-shaft. Fig. 6 is an enlarged detail, partly in section, showing a cam on the presser-finger shaft which operates one of the guide-finger shafts through an arm thereof, also showing the connection between the two parallel guide-finger shafts, through which such shafts act in unison. Fig. 7 is an enlarged side elevation of the shuttle shown in position on the raceway, one side of the raceway being broken away in order to show said shuttle. Fig. 8 is a bottom plan view of the same. Fig. 9 is an end elevation of the same. Fig. 10 is a detail showing the means for operating the twister-heads. Fig. 11 is a bottom plan view of plates attached to the lower side of the raceway which provide a track on which the shuttle runs. Fig. 12 is a sectional detail showing means for putting tension upon the warp-threads at the point where they enter the upper end of the hollow twister-head arbor. Fig. 13 is a side elevation of the tension-guide.

Throughout the several views similar reference characters refer to similar parts.

My invention comprises generally means for feeding splints or slats into the shed of a loom, means for supplying warp threads or cords to form such shed and for twisting such warp-threads about each successive splint, means for beating up or forcing into proper position each successive splint as it is supplied by the shuttle, means for holding in alinement the splints as they are acted upon by the beating-up means, so as to prevent buckling, and various other subsidiary instrumentalities, as will be fully set forth hereinafter.

Referring to the drawings, the framework of the loom is composed of standards A A, cross-pieces *a b c d*, and various other supporting and stay pieces, as shown. It will be understood that the long pliable splints or strips which form the filling or weft of the fabric are supplied to the loom by a shuttle which is thrown alternately from one end to the other of the raceway, preferably by spring-actuated pivoted levers or picker-sticks, a fresh splint being supplied to the shuttle at each end of the loom before it begins its move-

ment along the raceway. Accordingly the shuttle and its operation will first be described in detail. It may be said in passing, however, that picker-sticks comprising levers 1 1, having at their upper ends yokes 2, adapted to encircle a projecting end of the shuttle, may be used to throw said shuttle from one end of the raceway to the other, such levers being pivoted at their lower ends at 3 3 to the lower cross-piece *d*. Spiral springs 4 4, connected at one end to clips 5 5 on the picker-sticks and at the other end to suitable abutments 6 6, tend to throw these picker-sticks forward normally in the position shown at the left-hand side of Fig. 1. When thrown back against the force of its spring, the picker-stick is adapted to be caught and held by a suitable latch, being thus detained until released through the agency of any suitable mechanism. Mechanism adapted to force back the picker-sticks against the resiliency of their springs must also be provided. A driving-shaft 7, supplied with power by a pulley and belt 8 or in any other desired way, is provided for the purpose of operating the picker-stick mechanism and various parts hereinafter described. This driving-shaft has bearings in the lower ends of standards A.

The shuttle comprises a main frame-piece 70, which is preferably of wood for the sake of lightness and which has on its lower sides shoes 71, preferably of hardened steel, which are adapted to run upon tracks formed by the side pieces 72 of the lower plate of the raceway, (designated in a general way by B,) which projects beneath the bars 73, which form the side walls of the raceway. The ends of the shuttle, as shown, comprise projections 74, which extend through the picker-stick loop, and the shuttle carries friction-rollers 75, against which the picker-sticks act. Such a construction, however, is optional. The lower face of the shuttle carries spring jaws, retainers, or clips, into which a splint is adapted to be forced, as shown at 76, wherein it is held by the spring-pressure in the passage of the shuttle through the raceway and until it is released therefrom, because of the projecting lower corner of the splint striking one of the lugs 77, which stands in its path, said lugs being located near the ends of the raceway. Each jaw of the shuttle is formed by a rigid abutment 78 and a member 79, which is spring-pressed toward the abutment. As shown, these spring-pressed members are formed by the ends of a flexible steel strip fastened at 81 in the center of the shuttle and having such a curvature that their own elasticity will hold them normally against the fixed abutments 78. The ends of each of the jaw members 78 and 79 are shaped so as to provide a funnel-shaped mouth for convenience of the operator in inserting a splint. When the shuttle arrives at one end of the raceway, a splint is inserted between the jaw at that end of the shuttle by an operator just before the shuttle is thrown back by the operation of the picker-stick. A knob 82 may be formed on the top of the shuttle, so that the operator may grasp the knob in one hand to hold the shuttle firmly against the picker-stick and prevent rebounding while inserting the splint with the other hand. It will be seen that the holding-jaws on the shuttle are located in different vertical planes out of alinement with each other, and the lugs by which the splints are to be discharged are likewise out of alinement, as shown in Fig. 8. The precise position of these jaws and lugs is not essential. The cross-pieces 83, which carry the lugs 77, are positioned at any desired points along the raceway according to the length of the splints to be used and the width of the fabric to be woven, so that the splints will be discharged at each end at the proper point; but the lugs are placed out of alinement, so that each splint held by the shuttle-jaws will clear the lug which it first reaches and the splint will only be discharged by the second lug.

As shown in Figs. 3, 4, and 11, the side pieces of the raceway and of the plate which constitute the bottom of said raceway are recessed or grooved, as at 84, so that in one position—that is, the position at right angles to the raceway—the twister-head and the warp-threads will be located within such recesses and out of the way of the shuttle in its passage through the raceway. The precise form of these grooves is not essential; but they should be struck on a circle of large enough diameter to provide free movement of the warp-threads as they are carried around by the twister-heads. The means for supplying the warp-threads and for interweaving them about the splints will now be described.

Spools 85 are supported in series on cross-pieces 86, supported by brackets 87, carried by the cross-pieces *a*, a sufficient number of spools being provided to supply each twister-head with the required number of warp-threads. Stays 88 and the standards A may carry rods 89, over which the warp passes. The twister-heads themselves are best shown in Figs. 3 and 4 and comprise each a hollow arbor or tube 90, on the lower end of which is carried a cross-head 91, having suitable eyes formed, as shown in the drawings, by pins loosely mounted in ears 92, struck up from the cross-head. A central twister-head, the left-hand one of those appearing in Fig. 1, is rotated by means to be hereinafter described, and the connecting-gears 93 on the twister-heads carry them all in unison. The upper end of the hollow arbor 90 is screw-threaded, as shown in Fig. 12, and an elongated guide 94 is adapted to screw down thereupon, which guide carries the screw-threaded pin 95. A disk-shaped head 96, adjacent the upper end of the arbor 90, is provided with a suitable sleeve which loosely encircles the

lower terminal of the pin 95, and said head is adapted to be forced down by a spiral spring 97 encircling the pin between the head and a nut 98 threaded to the pin. The force of this spring can be adjusted by the nut 98. Two warp-threads pass into the upper end of this arbor, one from a spool on each side of the guide to prevent tangling, and tension is here put upon them, as indicated, in order that the feed thereof may be even and regular. They then pass down through the hollow arbor through the eyes in the ends of the cross-head and down to the point where in the rotation of the twister-head they are woven around the splints, as clearly indicated in Figs. 3 and 4.

One of the hollow twister-head arbors carries a sleeve 99, fastened thereto by a set-screw or otherwise, as shown in Fig. 1. At the lower end of this sleeve is the gear 93, which forms one of the line of meshing gears across the loom by which the twister-heads are rotated in unison. Above gear 93 upon and attached to the same shaft 100 as is 93 is gear 101. Gear 101 is driven by segmental gear 102, which is formed upon one end of an arm pivoted at 103 on a stud supported by a bracket, (indicated by dotted lines in Fig. 10.) At the other end of this arm is pivoted a connecting-rod 104, the other end of which is pivoted to crank-pin 105 upon a gear 106, which has four dwells or stops thereon. This gear is supported upon a stud projecting from the framework and is driven by a mutilated gear 107, having teeth for a part only of its periphery. The construction and arrangement is such as will be apparent from an inspection of Fig. 10, that upon each revolution of the gear 107 the gear 106 will be revolved through a quarter of its circumference and then stopped. The gear 107 is on the upper end of vertical shaft 108, journaled at *h h*, Fig. 2, and carrying at its lower end a bevel-gear 109, which is driven by a bevel-gear 110 on the end of the driving-shaft 7. For the sake of clearness of illustration the lower bearing *h* and lower terminal of the shaft 108 are omitted from Fig. 1. This vertical shaft carries also a spiral gear 111, which meshes with and drives a gear 112, supported upon shaft 113, which gear may be used to carry a striker or strikers located at any desired points about its periphery, whereby a bell will be rung at indicated times to show that the driving-shaft has made a certain number of revolutions and that therefore the shuttle has fed a certain number of splints to the machine.

It is not deemed necessary to show the bell in connection herewith; but it will be understood that such construction will be advantageous when it is desired to feed a certain number of splints to the machine and then change to splints of another color, as in weaving patterns wherein the color of the splints is to be changed at predetermined intervals.

At what I term the "operating point"—that is, the point where a fresh splint has just been supplied and the warp-threads are being twisted therearound—I provide means for insuring an efficient action of the loom whereby a firmly-woven smooth fabric will be produced as follows: Three shafts *k l m* extend across the machine, being supported at their ends in suitable bearings in brackets 132, projecting from the standards A, which brackets also serve as supports for the ends of the raceway B. The two shafts *k l* are in a position such that the fabric is fed down between them, and they carry at such intervals as may be desired parts 133, which I term "guide-fingers," the shape of which is clearly shown in Fig. 1 as bored to encircle their shafts and having projecting fingers in the shape of a two-pronged fork. The third shaft *m* carries what I term "presser-fingers," which alternate with the guide-fingers before mentioned and consist, as shown in Figs. 3 and 4, of a part *n*, adapted to be rigidly connected to the shaft *m*, and a second part *o*, pivoted at *q* to said first-mentioned part and held to move therewith by a spring *p*, which presses on the upper face of said pivoted part and is adjustably held thereto by nut *p'* upon the end of a bolt *r*, which passes through both parts. The end of part *o* is forked, so that it may pass upon each side of the warp-thread in operation, as is shown in Fig. 4, which is a section taken through the center of the presser-fingers. The end of shaft *m* carries a sprocket 134, which is partially rotated to rock said shaft from a cam 135 on the main shaft, which at every revolution of the shaft strikes a friction-roller 136 on the arm 137, projecting from the lever 138, pivoted to the framework, and which is connected by link 139 to arm 140 on shaft 141, arm 142 projecting from which has pivoted thereto a hooked rod 143, to which is connected a sprocket-chain 144, which passes over sprocket 134, and at the other end of which is a spiral spring 145, fastened to a fixed abutment on the standard A. Thus by the force of the spring 145 the shaft *m* is held normally in the position shown in Fig. 3, which is the inoperative position; but at each revolution of the driving-shaft through the connections described the cam 135 rocks said shaft and throws it forward, so that the presser-fingers rest upon and force down the splint which has been last fed to the loom, thus beating up the splint and forcing it into the proper position relative to the part of the fabric already woven. As shown in Fig. 6, a cam 146 upon shaft *m* engages an arm 147, rigid with shaft *l*. The two shafts *k l* are connected together by a pin 148 upon an arm projecting from one shaft, which is located within a recess or fork 149 of an arm projecting from the other. A spring 150, Fig. 2, connected to an arm 151 on the other side of the shaft *k*, holds this shaft and the connected shaft *l* normally in position, such that the guide-fingers car-

ried thereby are in the position shown in Fig. 3. In this position said guide-fingers are open and a splint dropped from the shuttle will fall between the guide-fingers approximately adjacent the splint below it. Then during the revolution of shaft *m*, which is actuated from the driving-shaft at the proper time, the cam 146 on said shaft will first throw up the arm 147, (shown in Fig. 6,) and the guide-fingers will be thrown together to press or grip the splint loosely between them. It will of course be understood that when it is said that the guide-fingers grip the splint to hold it under pressure it is only meant sufficient pressure to preserve its alinement and prevent it from buckling under the action of the presser-fingers. Such buckling will occur owing to the pliable nature of the splints unless they are supported in this way. However, the pressure of the guide-fingers must not be such as to interfere with the beating-up action now to be described. Then upon a continued movement of the shaft *m* the presser-fingers *o* will be thrown down to force the splints into position, as already described, while the guide-fingers will prevent the long pliable splints from buckling beneath the force of the presser-fingers, supplying temporarily a stiffening to the splints, which is necessary in order that they may be beaten up into proper position.

From this description of parts and of the operation of various of these parts the general operation of the loom will be readily understood; but such operation will be briefly retraced.

Assuming that the parts stand as shown in Fig. 1 and that the revolution of the driving-shaft causes the right-hand latch to release the corresponding picker-stick, such picker-stick being free will be thrown by its spring, and the shuttle carrying a splint with which it has been supplied by an attendant will be shot or driven through the raceway B until it stops at the opposite end thereof. During the time when the shuttle is at rest and being supplied with fresh splints at either end of the machine the connections described will actuate the twister-heads so that the warp-threads which during the passage of the shuttle have been resting out of the way in the recesses of the raceway and of its bottom plan will now be carried around by the twister-heads to weave the warp-threads about the splint last fed. In the construction as described and shown in detail in Fig. 10 the operation of the mechanism will be to carry each twister-head half-way around, then a rest, then half-way around farther, another rest, then half-way back and a rest, half-way back and another rest. The effect of this motion will be to wind the warp-threads about the splints with an interlocking twist, as will be seen upon inspection of Fig. 4, although it will be obvious that the twister-heads might be simply rotated half-way around and then half-way back, whereby the warp-threads will be simply woven in and out between the splints, but straight up and down without any interlocking or twisting of the threads themselves. Immediately after the splint is fed into position and while this twisting is going on the guide and presser fingers are actuated through the described mechanism to force the splint into the desired position and to hold it there without buckling or getting out of alinement. As soon as the cam 135 has passed the roller 136 the guide-fingers open out and the presser-fingers are thrown back. At the same time the twister-heads have come to rest, so that the warp-threads are located out of the way of the shuttle. The raceway is then clear. The picker-stick on the right is then thrown back and the picker-stick on the left then released to throw the shuttle forward for supplying another splint, and the cycle is repeated. Suitable means may be provided for automatically taking up the fabric as it is completed.

The various advantages which result from the use of constructions such as I have described in weaving fabrics of this class will be apparent. It should be especially noted, however, that owing to the light pliable nature of the splints, because of which they tend to float in the air, it is advantageous to provide some means for carrying them in the shuttle and for taking them from the shuttle which shall be positive and shall not depend purely upon the force of gravity acting upon the splint when it is released from the jaws of a shuttle or carrier. My construction, wherein the splints are carried on the lower face of the shuttle and are released therefrom through the splint striking a fixed lug projecting into its path, provides a positive means for knocking out the splint at any desired point, and the splints from this point will fall directly in the shed of the warp in the desired position. Immediately after the splint is fed into position and while this twisting is going on the guide and presser fingers are actuated through the described mechanism to force the splint into the desired position and to hold it there without buckling or getting out of alinement. As soon as the cam 135 has passed the roller 136 the guide-fingers open out and the presser-fingers are thrown back. At the same time the twister-heads have come to rest, so that the warp-threads are located out of the way of the shuttle, the raceway is then clear, the picker-finger on the left is then thrown back and the picker-finger on the right then released to throw the shuttle forward for supplying another splint, and the cycle is repeated. The operation by which the fabric as it is completed is automatically taken up by means of feed-rolls and the means by which a supple-

mental manual feed may be used as desired are sufficiently clear from the description already given.

The various advantages which result from the use of constructions such as I have described in weaving fabrics of this class will be apparent. It should be especially noted, however, that owing to the light pliable nature of the splints, because of which they tend to float in the air, it is advantageous to provide some means for carrying them in the shuttle and for taking them from the shuttle which shall be positive and shall not depend purely upon the force of gravity acting upon the splint when it is released from the jaws of a shuttle or carrier. My construction, wherein the splints are carried on the lower face of the shuttle and are released therefrom through the splint striking a fixed lug projecting into its path, provides a positive means for knocking out the splint at any desired point, and the splints from this point will fall directly in the shed of the warp in the desired position. It should also be noted that my construction of clutch is such that if the loom is reversed the rod 40 will simply back away from pin 41 without reversing the clutch. It will be seen that the construction is such that it is impossible for an operator to do anything to the loom which will interrupt the cycle of operations through which the various parts pass, but that whenever the loom is stopped it will always be in position to be started up with all the parts continuing the operation from the point at which they stopped. This prevents injury and breaking down which might otherwise occur in a loom a complete cycle of which depends upon the harmonious interworking of different parts.

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

1. In a loom, warp-supplying means, means for supplying filling strips or splints comprising a shuttle, and means whereby said splints are positively disengaged from said shuttle.

2. In a loom, warp-supplying means, means for supplying filling strips or splints comprising a shuttle, and means whereby said splints are automatically and positively disengaged from said shuttle.

3. In a loom, warp-supplying means, means for supplying filling strips or splints comprising a shuttle adapted to alternately carry strips from opposite ends of the loom, and means whereby said splints are positively disengaged from said shuttle at suitable points.

4. In a loom, warp-supplying means, means for supplying filling strips or splints comprising a shuttle adapted to alternately carry strips from opposite ends of the loom, and means whereby said splints are automatically and positively disengaged from said shuttle at suitable points.

5. A shuttle adapted to carry strips or splints, and means to knock out the strips or splints at the instant they should drop.

6. A shuttle adapted to carry strips or splints, and means positioned to forcibly remove the strips or splints at the desired point.

7. A shuttle adapted to carry strips or splints having means for holding such splints on its lower face.

8. A shuttle adapted to carry strips or splints having on its lower face spring-jaws for holding the splints beneath the body of said shuttle.

9. A shuttle adapted to carry strips or splints having holding devices thereon for said splints in different vertical planes, and means for discharging said splints from said shuttle which means are in planes corresponding to the planes of the holding means.

10. In combination, a shuttle adapted to carry strips or splints having on its lower face holding devices in different vertical planes, a raceway for the shuttle, and a stop in the path of each of said holding devices, the construction and arrangement being such that the splint carried by the shuttle in either direction will clear the first stop but be released from the shuttle by the other.

11. In a loom, a raceway, a shuttle adapted to be reciprocated in said raceway, said shuttle having holding devices thereon in different vertical planes, and a stop in the vertical plane of each of said holding devices.

12. In a loom, a shuttle adapted to carry splints, holding devices on the lower face of said shuttle adapted to hold the splints so that a portion of the lower corner of the splint is free therefrom, said holding devices being in different vertical planes, a stop in the vertical plane of each of the holding devices located to strike the free corner of the splint.

13. A shuttle adapted to carry splints, &c., embodying holding devices for such splints, which holding devices are on different sides of the medial longitudinal line of the shuttle.

14. In combination, a raceway, a shuttle adapted to carry splints embodying holding devices for such splints, which holding devices are on different sides of the medial longitudinal line of the shuttle, and stops adapted to discharge the splints from such shuttle, which stops are on different sides of the medial longitudinal line of the raceway.

15. In a loom, a shuttle having two holding devices thereon out of line with each other, a raceway, and two stops adjacent said raceway for discharging the splints from the shuttle, one stop being paired with each holding device.

16. A shuttle comprising a body-piece adapted to run on suitable ways, and holding-jaws on the lower face of said body-piece whereby said shuttle is adapted to carry a strip of filling on its under side in position to be readily dropped therefrom.

17. A shuttle comprising a body-piece

adapted to run on suitable ways, and spring-pressed holding-jaws on the lower face of said body-piece whereby said shuttle is adapted to carry a strip of filling on its under side in position to be readily dropped therefrom.

18. In a loom, a shuttle comprising a body-piece adapted to run on suitable ways, holding-jaws on the lower face of said body-piece whereby said shuttle is adapted to carry a strip of filling on its under side in position to be readily dropped therefrom, and means for releasing said splints from said shuttle.

19. In a loom, a shuttle comprising a body-piece adapted to run on suitable ways, holding-jaws on the lower face of said body-piece whereby said shuttle is adapted to carry a strip of filling on its under side in position to be readily dropped therefrom, and means for positively disengaging said splints from said shuttle.

20. A shuttle having holding devices on each end of its lower face, said holding devices being in different vertical planes.

21. In a loom, a shuttle, and a raceway for said shuttle providing guides for the sides and the lower edge of said shuttle, said raceway having grooves therein adapted to receive the warp-threads, whereby said warp-threads will be out of the path of the shuttle in its passage through the raceway.

22. In a loom, a twister-head by which the warp-threads are fed into the loom, and means in connection with said twister-head for frictionally engaging by pressure and putting a tension upon said warp-threads whereby an even feed of the same will be assured.

23. In a loom, a twister-head comprising a hollow arbor, a cross-arm at the end of said arbor, and suitable guiding-points at the ends of said arm, comprising ears and pins loosely mounted therein.

24. In a loom, a twister-head comprising a hollow arbor, a cross-arm at the end of said arbor, suitable guiding-points at the end of said arm, and means at the point of the hollow arbor where the warp-threads enter the same whereby a tension may be put upon the warp-threads.

25. In a loom, a twister-head comprising a hollow arbor, and a spring-pressed disk adapted to limit the space at one end of said arbor.

26. In a loom, a twister-head comprising a hollow arbor, a spring-pressed disk adapted to limit the space at one end of said arbor, and means for adjusting the force of said spring.

27. In a loom, a twister-head comprising a hollow arbor 90, cross-arm 91, cap-piece 94, and spring-pressed disk within such cap-piece adjacent the end of said arbor, substantially as and for the purpose described.

28. In a loom, filling-supplying means, warp-supplying means, and means for weaving the warp about the filling comprising twister-heads and means for rotating said twister-heads through a half-circle as each filling-piece is supplied and causing the twister-heads to describe two half-circles in one direction and two half-circles in the opposite direction in sequence.

29. In a loom, filling-supplying means, warp-supplying means, means for weaving the warp about the filling comprising twister-heads, means for rotating said twister-heads through a half-circle as each filling-piece is supplied, said means comprising meshing gears connecting all the twister-heads, a segmental gear for rotating one of the twister-heads, a gear having dwells thereon, a crank-pin on said gear, a connecting-rod between said segmental gear and said crank-pin, a mutilated gear meshing with said intermitted gear, and means for driving said mutilated gear.

30. In a loom for weaving splint fabrics, guiding-fingers arranged on each side of the operating point of the loom, and means to oscillate said fingers toward and away from the fabric.

31. In a loom of the class described, warp-supplying means, splint-supplying means, and means for holding said splints under pressure during the weaving operation, whereby proper alinement of the splints is obtained.

32. In a loom of the class described, warp-supplying means, splint-supplying means, and means for beating up each splint as it is fed into the shed, into close proximity to the splint last acted upon.

33. In a loom of the class described, means for supplying warp and twisting such warp about the splints, and means for holding said splints in alinement during the twisting operation.

34. In a loom for weaving fabrics in which the filling is of comparatively stiff material, presser-fingers arranged adjacent to the operating point of the loom, and means for rocking said presser-fingers forward on the top of the filling-piece last supplied for beating up pressing said filling-piece into position.

35. In a loom of the class described, warp-supplying means, splint-supplying means, means for beating up the splints as they are fed between the warp, and means for holding the splints under pressure during such beating-up process, whereby the beating up is facilitated and buckling of the splints is prevented.

36. In a loom of the class described, parallel rock-shafts between which the fabric is fed, guide-fingers carried by said shafts which in normal position are opened to allow the splints to be fed between them, and means for rocking said shafts whereby said fingers will be closed upon the uppermost splint or splints, thereby preventing displacement of said splint or splints during the weaving operation.

37. In a loom of the class described, parallel shafts carrying guide-fingers between which the fabric is fed, a third shaft for carrying

presser-fingers for beating up the splints, and means for actuating said shafts such that after a splint is fed between said guide-fingers, said guide-fingers are closed upon the splint and the presser-fingers are then actuated to beat up the splint.

38. In a loom, in combination, shafts *k* and *l* carrying guide-fingers 133, shaft *m* carrying presser-fingers *o*, cam 146, and sprocket 134, an arm 147 upon shaft *l*, connections whereby said shafts *k* and *l* are moved in unison, a spring for controlling the normal position of said shafts *k* and *l*, a means for controlling the normal position of said shaft *m* comprising spring 145 connected to chain 144 passing over said sprocket, and connections between said chain and a pivoted lever which is oscillated by a cam on the driving-shaft of the loom, substantially as and for the purposes described.

39. In combination, a shaft carrying cam 135, a pivoted lever 138 carrying a projection in the path of said cam, a shaft *m* carrying presser-fingers and a sprocket-wheel, chain 144, spring 145, and connections between said chain and said lever 138.

40. In combination, shafts *k* and *l* carrying guide-fingers, means whereby said shafts rock in unison, means for controlling the normal position of said shafts, an arm 147 upon one of said shafts, a shaft *m* carrying presser-fingers, a cam upon said shaft for actuating said arm, and means for rocking said shaft *m* at intervals from the main driving-shaft of the loom.

41. The combination with operating means, of a presser-finger comprising a part adapted to be attached to such operating means and to be caused thereby to describe approximately a quarter of a circle, and a part pivoted to the first-mentioned part and held elastically to move therewith through the same quarter.

42. The combination with the operating-shaft, of a presser-finger comprising a part *n* adapted to be fixed to said shaft, and a forked finger *o* pivoted to the part *n*, a stud *r* attached to the part *n*, and a spring *p* adjustably mounted on said stud to hold said finger in engagement with the part *n*.

In testimony whereof I affix my signature in the presence of two witnesses.

AZEL C. HOUGH.

Witnesses:

CHARLES A. ROSE,

CHARLES H. DAVIS.