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Patented July 10, 1900.

W. FISCHER, SR. & W. FISCHER, JR.

LOOM.

(Application filed Apr. 26, 1899.)

(No Model.)

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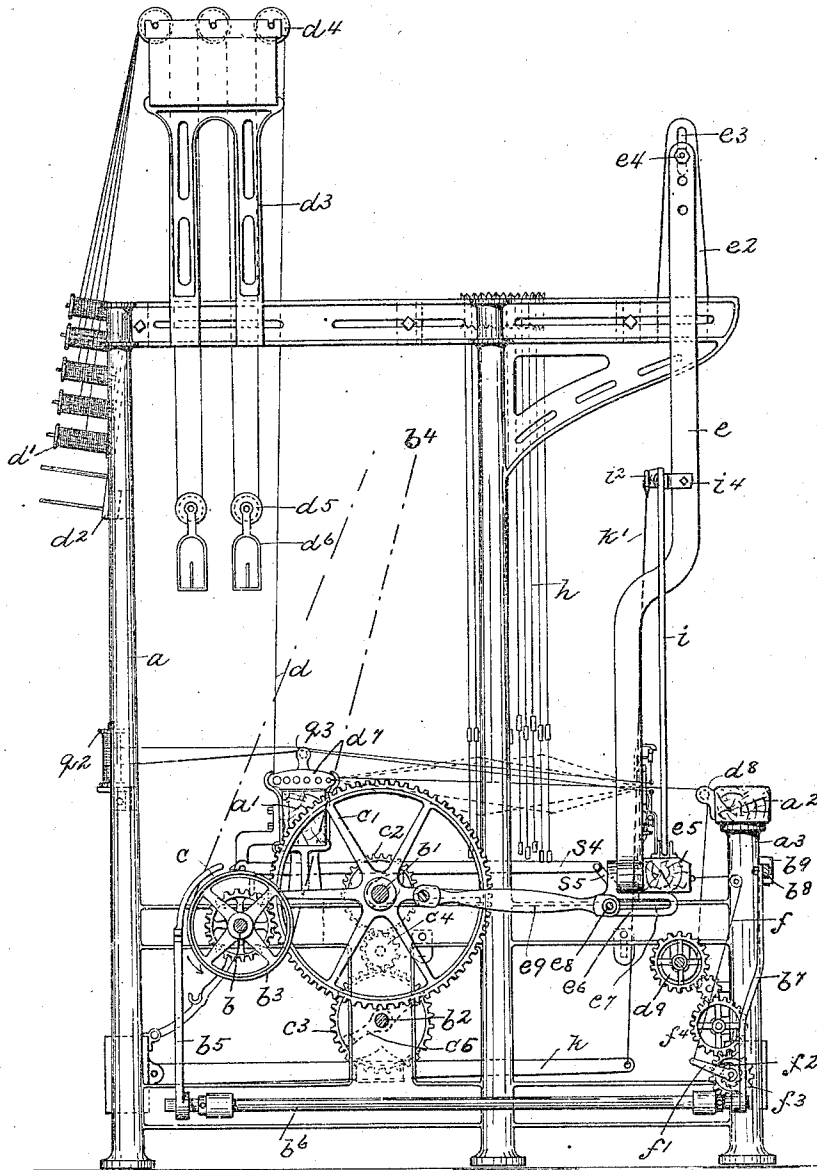


Fig. 1.

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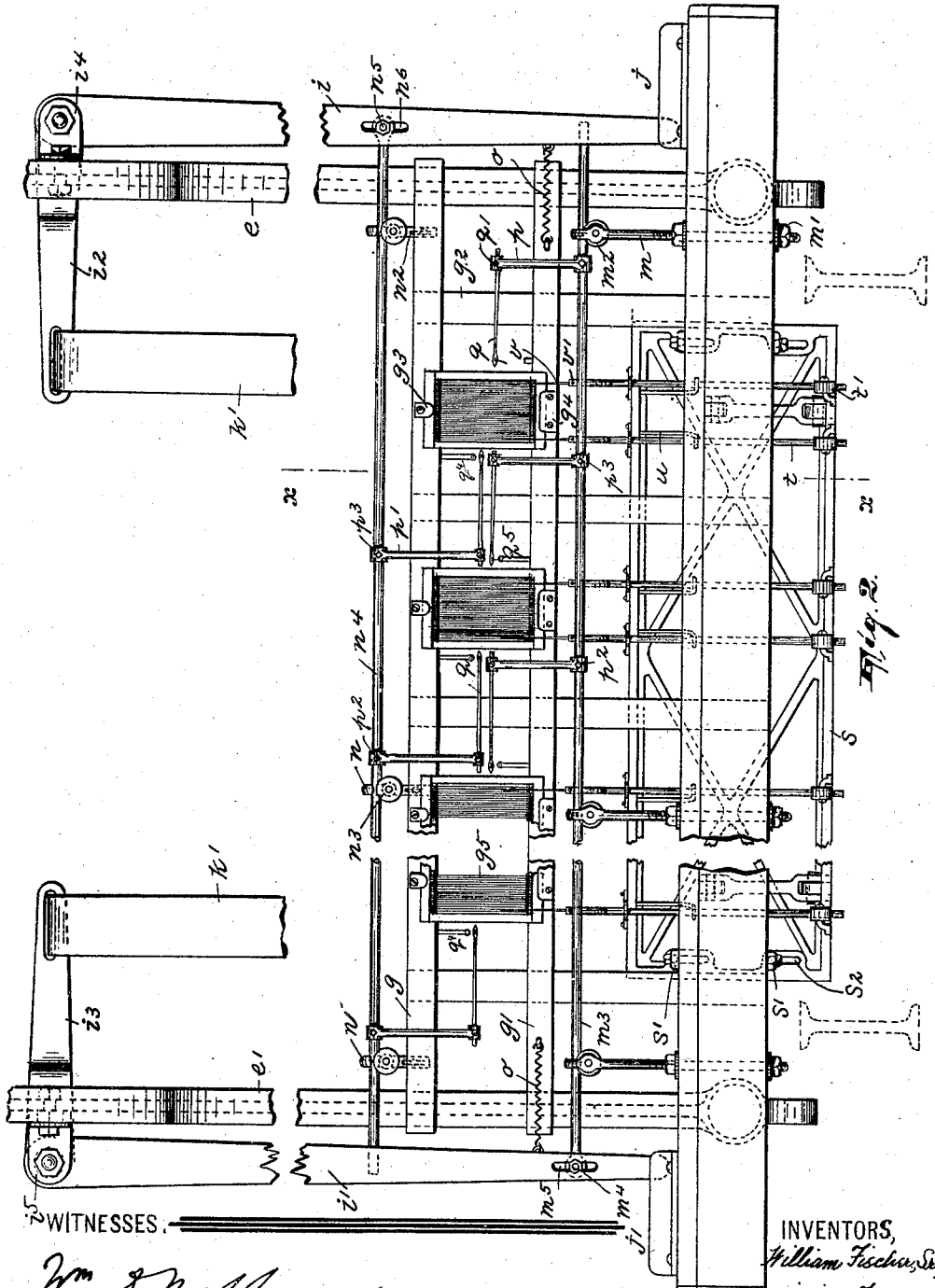
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3 Sheets—Sheet 2.



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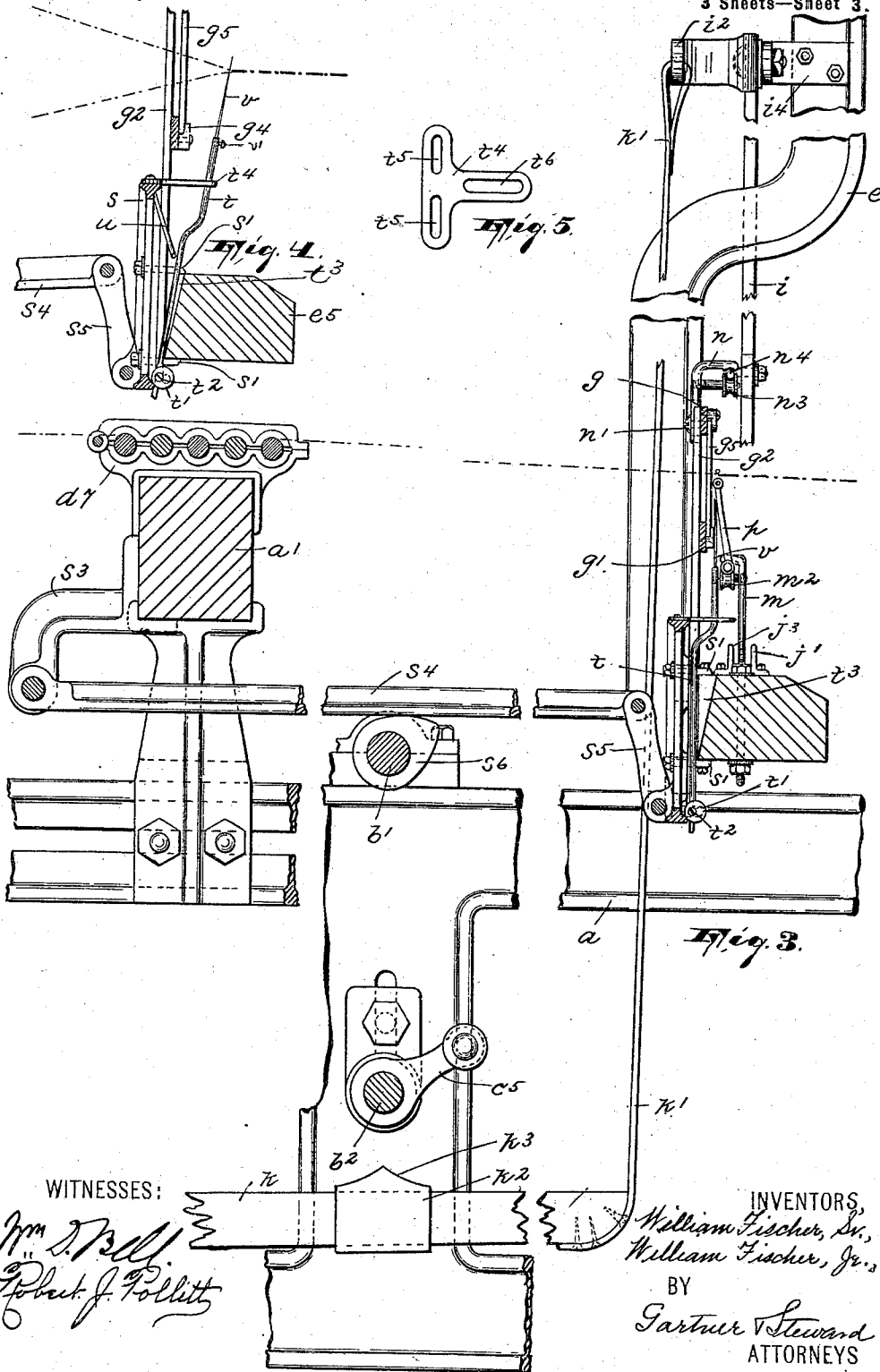
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3 Sheets—Sheet 3.



UNITED STATES PATENT OFFICE.

WILLIAM FISCHER, SR., AND WILLIAM FISCHER, JR., OF PATERSON, NEW JERSEY, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE AMERICAN AUTOMATIC LOOM COMPANY, OF NEW JERSEY.

LOOM.

SPECIFICATION forming part of Letters Patent No. 653,225, dated July 10, 1900.

Application filed April 26, 1899. Serial No. 714,470. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM FISCHER, Sr., and WILLIAM FISCHER, Jr., citizens of the United States, residing in Paterson, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Looms; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to that class of looms known as "needle-looms"—that is to say, looms in which the weft or filling is laid in the shed in loop form by means of needles which carry the weft or filling in conjunction with other needles which enter the successive loops and maintain them in position until each is beaten up and the threads of the warp crossed to form a new shed.

For convenience' sake we term the former needles "weft-carriers" and the latter needles "loopers."

Our invention has to do more particularly with the instrumentalities last named, and its salient feature is that the "loopers," so called, while reciprocated collectively to enter and quit their respective loops are individually and independently spring-yielding and movable toward and away from their respective reeds, so that each looper may adapt itself in this respect to the necessities of the particular work which it may be called upon to perform and to the particular mechanical devices with which it coöperates during the weaving operation without regard to the follows.

In the accompanying drawings, to which we will now refer for a better understanding of our invention, Figure 1 is a transverse sectional view of a loom embodying our invention. Fig. 2 is a front elevation, slightly enlarged, of that portion of the loom which includes the needles and their operating mechanism, the lay or batten, and the lay-swords.

Fig. 3 is a section, on an enlarged scale, taken on line X X, Fig. 2. Fig. 4 is a like section through the batten, showing the vertical needle or looper in its elevated position instead of in its lowermost position, as in Fig. 3. Fig. 5 is an enlarged plan view of one of the guides for the vertical needles or loopers.

The side frames of the loom, one of which is shown at *a*, are connected by longitudinal beams *a'*, *a''*, the latter being the breast-beam of the loom and being sustained by the front pillars *a'''* of the side frames. The lay-swords *e* *e'* are fulcrumed at their upper ends in standards *e''* on the side frames, the fulcrumbolts *e'''* on the lay-swords passing through and being adjustably secured in slots *e''''* in the standards. To the lower ends of the lay-swords is secured in the usual manner the lay or batten *e''''''*. Carried by and moving with the lay-swords and batten are the several sets of reeds, weft-carriers, and loopers, which coöperate with the warp and shed controlling mechanism to weave the several strips or pieces of goods, there being one set of these instrumentalities for each separate piece of goods to be woven. The reeds (shown at *g''*, Fig. 2) are by means of clips *g''''* secured to bars *g* *g'* attached to and extending between the lay-swords and stiffened by rods *g''''''*, fastened to them and to the batten. The weft-carriers are arranged as horizontal needles *q* in pairs, the needles of each pair pointing in opposite directions and the one needle of each pair being mounted on and carried by a horizontal longitudinally-reciprocating rod *m''*, and the other needle of each pair being mounted on another and similar reciprocating rod *n''*, corresponding needles of all the pairs being on one and the same rod. Rod *m''* is supported on grooved rollers *m''''* in standards *m*, secured to the batten, and rod *n''* is supported on grooved rollers *n''''* in standards *n*, secured to the bar *g*. The standards are adjustably secured to their supports at *m''''''* and *n''''''*, respectively. The needles *q* of rod *m''* are secured to their rod by arms *p*, and those of rod *n''* are secured to their rod by arms *p'*, each arm being adjustably secured

at $p^2 p^3$ to the rod and each needle being adjustably secured at q' to its arm. The filling or weft is taken from bobbins q^2 , Fig. 1, there being one bobbin for each needle. Each filling passes over a suitable sustaining-surface q^3 , and thence through a guide q^4 on bar g , Fig. 2, to its needle q . The warp is delivered from sets of bobbins d' , Fig. 1, suitably supported on a bracket d^2 . The warp extends thence to the usual tension mechanism, consisting of rollers d^4 , journaled in a frame d^3 , over which the warp extends, weights d^6 being suspended from rollers d^5 , placed on the warp between each two rollers d^4 . From the tension the warp passes to the usual glass beam-bracket d^7 , and thence through the harness h and reeds g^6 to the bar d^8 on breast-beam a^2 , and thence to take-up roll d^9 .

The harness h may be controlled by any suitable form of shedding mechanism. The batten and the horizontal needles q may be actuated by any suitable mechanism. In the present instance the batten is actuated by a pitman e^9 at each end of the machine, adjustably pivoted at $e^7 e^8$ to a bracket e^6 on the lay-sword at that end, and having its other end hung on a crank-pin on a gear-wheel c' , fast on and revolving with shaft b' , the latter being driven from the main shaft b of the machine through gearing $c c'$. The needles or weft-carriers q are actuated by having their reciprocating rods $m^3 n^4$ attached, respectively, to the picker-sticks $i i'$ at opposite ends of the machine through adjustable pivot connections $m^4 m^5$ and $n^5 n^6$. These picker-sticks are formed as angle-levers, their shorter arms $i^2 i^3$ being pivoted in brackets $i^4 i^5$ on their respective lay-swords, Figs. 2 and 3. The lower end of each picker-stick moves between guides $j j' j^2 j^3$, which assure its correct movement. The vibratory movement of the picker-sticks and the consequent reciprocation of the needle-carrying rods with which they are connected is brought about by straps k' , connected one to each shorter arm of its appropriate angle-lever picker-stick. Each strap k' is connected to the free end of a lever k , pivoted at its rear end at the back of the loom, having on it a block k^2 , provided with a cam-face k^3 , Fig. 3, which is below and in the path of the tappet c^5 on shaft b^2 . By the tappet and cam the needle-carrying rod connected therewith is moved in a direction to carry the needles on that bar through their respective sheds in a direction to lay the weft-loops therein. The return movement of the rods is effected by extensible springs o , attached at one end to the lay swords or bars g' thereon, Fig. 2, and at the other end to their appropriate picker-sticks. The arrangement is such that first one set of needles is operated and then the other, the warp-shed changing at each reciprocation of either set of needles, so as to hold the successive weft-loops deposited by the weft-carriers and beaten up by the reeds. The shaft b^2 takes its motion

from shaft b' through gearing $c^2 c^4 c^3$, Fig. 1. The take-up roll is actuated in the usual way from the batten through the medium of a cord f , Fig. 1, that controls a lever f' , which, through a pawl-and-ratchet mechanism f^2 , is adapted to rotate a pinion f^3 and through said pinion gearing f^4 , whereby the take-up roll d^9 is actuated. The main shaft b itself of the loom is driven from any prime mover, in this instance through driving-belt b^4 , which is used in connection with fast and loose pulleys b^3 on shaft b .

For the purpose of conveniently stopping and starting the machine we employ the usual expedient of a belt-shifter b^5 , secured on a rock-shaft b^6 , provided with a crank-arm, which by connecting-rod b^7 is connected with a horizontally-reciprocating bar b^8 , movable in brackets or guides b^9 on standards a^3 .

We come now to that portion of the loom in which our invention is more particularly found.

It is of course manifest that with each of the weft-carrying needles or weft-carriers there must be combined some means of holding the loop carried across the warp by each needle until that loop is beaten up and the shed is shifted so as to hold it in this condition. It is for this purpose that a second set of needles v is provided. These needles v , or "loopers" as we have called them, are arranged in pairs, one on each side of the warp-shed in connection with which they are used. They reciprocate in a plane transverse to that in which the weft-carriers move and are arranged and operated to enter and quit each its own weft-loop at appropriate times. For this purpose these loopers are mounted on and carried by a frame s , situated back of the batten and adapted for vertical reciprocatory movement by guides s' , that project rearwardly from the top and bottom of the batten into and through vertical slots s^2 in said frame. The reciprocatory movement of the frame s is effected by means of levers s^4 , one at each end of the loom, pivoted to brackets s^3 on beam a' , Fig. 3, and at their free ends connected to the frame s by links s^5 . Both levers s^4 are operated simultaneously by cams s^6 on shaft b' , these cams operating to lift the frame, the descent of the latter being due to gravity. The movement is timed so that the loopers v , which are down when the horizontal weft-carriers q carry the weft across the warp-shed, will rise and enter the weft-loops before the weft-carriers begin to move back, and will thus hold the loops until they are beaten up and the warp-shed is changed, at which time they quit the loops and descend to their normal position. In this way all of the loopers are reciprocated to enter and quit their loops collectively and together. It is, however, necessary that the loopers should be capable of motion to and from their respective reeds, the motion toward the reed being necessary in order to properly beat up

the fabric and secure the weft-loop in place, and the motion from the reed being necessary in order to enable the loopers to enter their respective loops, at which time the weft-carriers *g* are between the loopers *v* and the reeds. Not only is this necessary, but it is also necessary, as we have found, that each looper *v* should be capable of thus moving separately from and independently of all of the other loopers in order that it may adapt itself to the exigencies of the particular weave with which it is associated and to the particular mechanical instrumentalities with which it cooperates in doing that particular work. To this end we make each of said loopers individually spring-yielding and movable to and from the reed, so that while all of the loopers reciprocate collectively and as a group to enter and quit their loops the individual members of that group are separately and independently movable in a direction to and from their respective reeds. For this purpose the needles are adjustably secured by set-screws *v'* in needle-bars *t*, adjustably secured by set-screws *t'* in blocks *t'*, which are pivoted or hinged to the lower part of the frames. When thus pivoted, they can swing or move to and from the reed. With each needle-bar *t* is associated a spring *u*, which tends to hold the needle-bar away from the reed, and each bar passes through a guide-slot *t''* in a three-armed guide *t''*, Fig. 5, adjustably secured to the top of the frame *s* by set-screws which pass through slots *t''* in the guides. This guide restrains the needle-bar from lateral movement and limits the extent of its vibratory movement to and from the reed. The needle-bars *t* are between the frame *s* and the batten, and in the latter at points where the needle-bars come are wedge-shaped clearance-slots *t''*, Figs. 3 and 4, which have their wide end uppermost, so as to allow the vertical needles or loopers to move away from the reed as they rise far enough to permit them to enter the weft-loops. These loopers *v* are arranged in pairs, and the two loopers of each pair are located on opposite sides of the warp-shed with which they are associated and in a vertical line that is slightly within the side bars of the frame of each reed, as seen in Fig. 2, so that in rising and descending they will move in paths in proximity to the edges of the warp-shed.

The looper-needles *v* are plain and without eyes. The weft-carrier needles *g* are provided with eyes, through which the weft is threaded.

When the loom is in operation, one of the weft-carriers *g* of each pair enters and passes across the warp-shed, so as to lay a loop of weft therein, and projects enough beyond the opposite or far edge of the warp-shed to bring the open loop in position to be entered by its appropriate looper-needle *v*, the batten at this time being in the rear position. The frame *s* during this time rises, so that when the loops are in position the vertical needles or loopers

v will enter said loops. The loopers as they rise will, under the influence of the springs *u*, swing forward from the reed far enough to be in position to pass up into the loops on the front side of the horizontal needles or weft-carriers *g*, which at this time are between the loopers and the reed. As soon as the loopers engage their loops the weft-carriers recede and draw back out of the warp-shed, the batten moving forward and the loopers still engaging and holding the loops until the weft is beaten up and the shed changes or is on the point of changing, at which time the frame *s* descends far enough to draw the looper-needles out of their loops. During this operation and as the beating-up operation progresses the vertical needles or loopers, while still holding their loops, will gradually fold up close against their respective reeds, so as to allow the weft to be closely beaten up, each looper yielding independently of its fellows and individually adapting itself to the exigencies of the work. When the frame *s* descends, the needle-bars *t* will by the shallow lower ends of their clearance-slots be closed up toward the reed, so that at this time the needles *v* will be substantially vertical; but in rising and before said needles reach their loops they will be permitted to swing forward away from the reed far enough to enter their loops. Thus the operation proceeds, each of the weft-carriers *g* of each pair and its associated devices being alternately in action.

If desired, the two sets of needles *g* may be worked simultaneously instead of alternately. This can be effected by duplicating the tappets that act against the levers *k* and placing them diametrically opposite each other on their shaft *b''*.

Having described our invention, what we claim, and desire to secure by Letters Patent, is as follows:

1. In a loom provided with suitable warp-controlling mechanism, the combination with the reed, batten, weft-carriers mounted on said batten and adapted to reciprocate transversely of the reed and mechanism for operating said batten and weft-carriers, of a looper-carrying frame and mechanism for reciprocating the same in a path transverse to the path of travel of the weft-carriers, and loopers mounted on and individually hinged to said frame and spring-pressed away from the reed, whereby said loopers, while reciprocated collectively and as a group to enter and quit their respective loops, are individually and independently spring-yielding and movable toward and away from the reed, substantially as and for the purposes hereinbefore set forth.

2. In a loom the combination with warp-controlling mechanism, a batten and a reed mounted on said batten, weft-carriers also carried by said batten and adapted to reciprocate transversely of said reed, and mechanism for operating said weft-carriers, of a

reciprocatory looper-carrying frame, means
for reciprocating said frame, and individually
spring-pressed oscillating loopers mounted
on and carried by said frame, substantially
5 as and for the purposes hereinbefore set
forth.

In testimony that we claim the foregoing

we have hereunto set our hands this 10th day
of April, 1899.

WILLIAM FISCHER, SR.
WILLIAM FISCHER, JR.

Witnesses:

ALFRED GARDNER,
FRANK FISCHER.