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C. A. LITTLEFIELD.

SHED FORMING MECHANISM FOR LOOMS.

(Application filed Aug. 15, 1898.)

(No Model.)

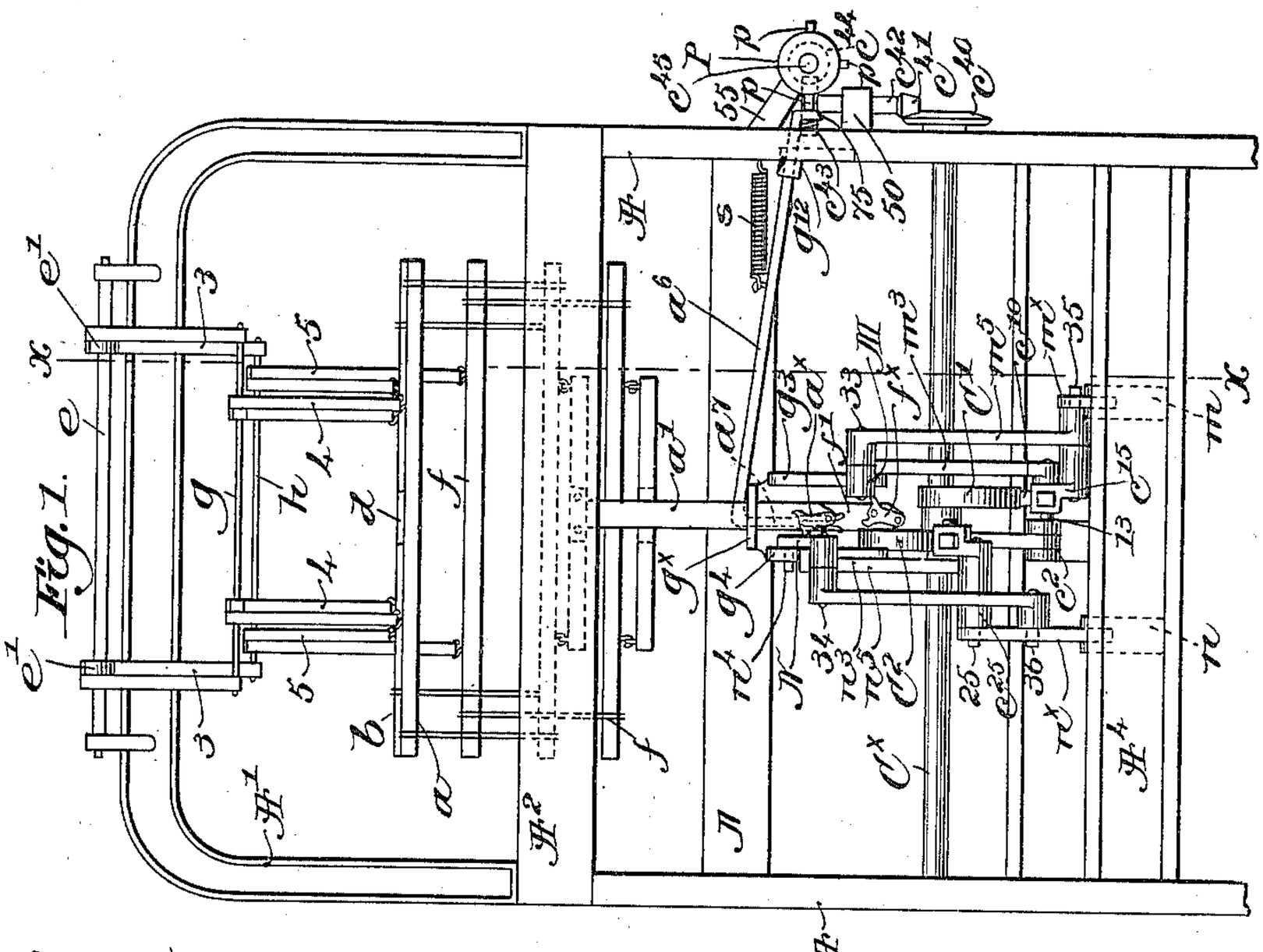

Fig. 1.

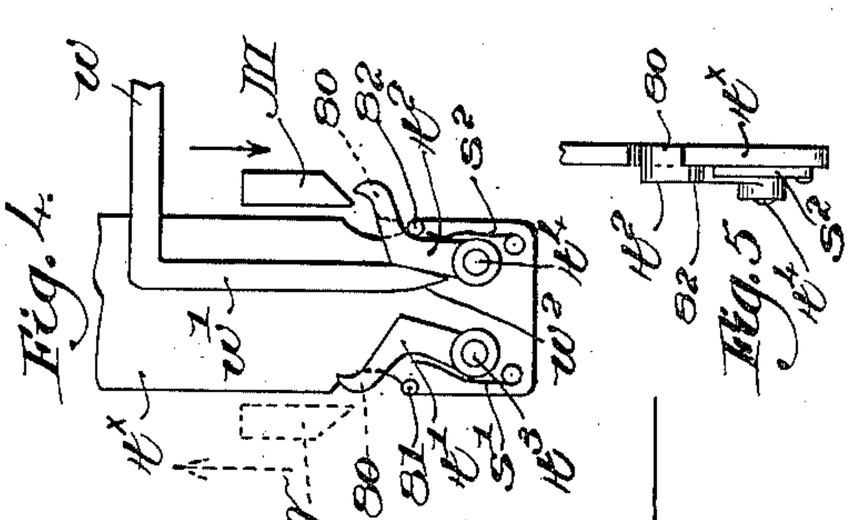

Fig. 4.

Fig. 5

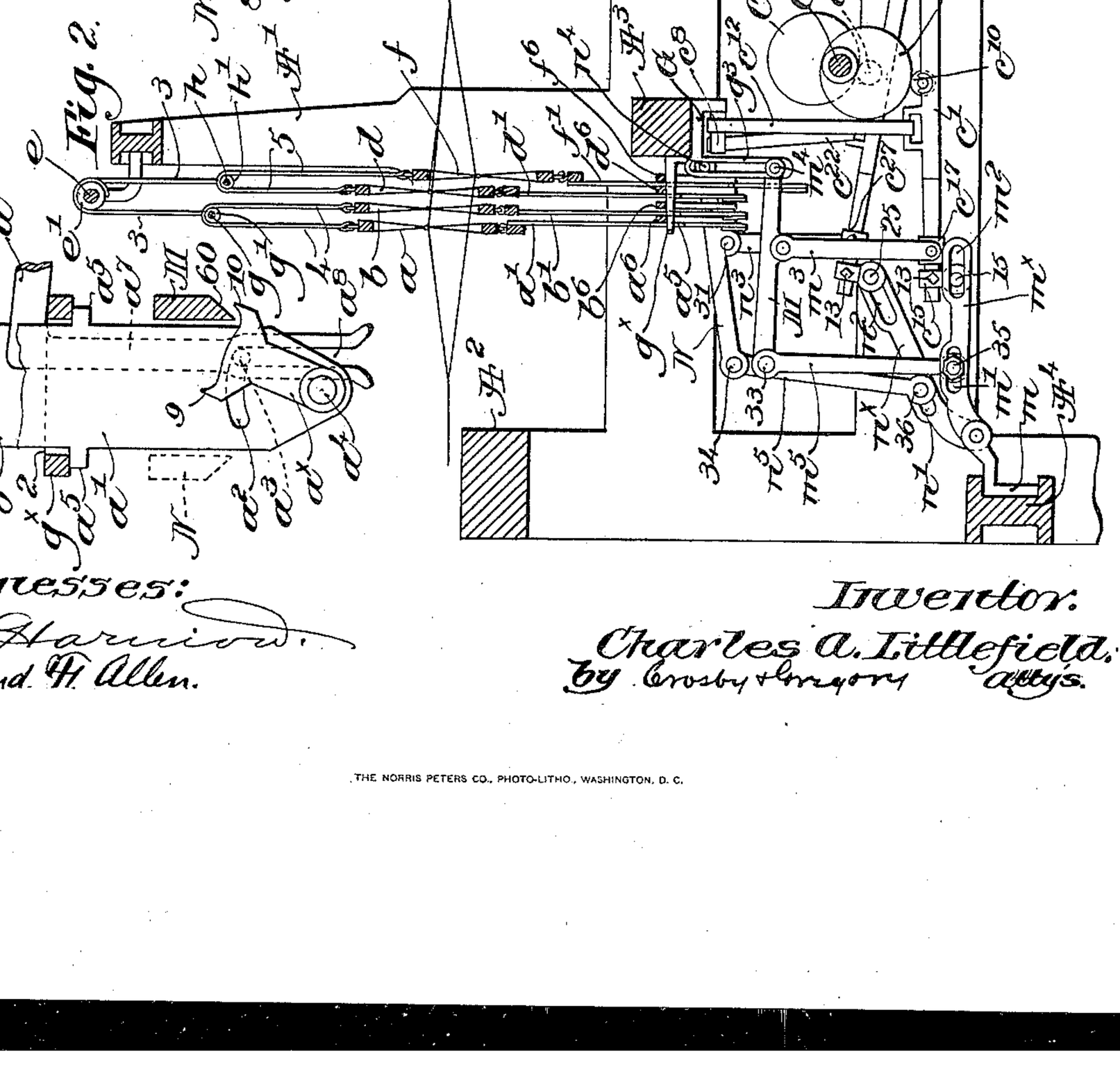

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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SHED-FORMING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 652,434, dated June 26, 1900.

Application filed August 15, 1898. Serial No. 688,612. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. LITTLEFIELD, of Lowell, county of Middlesex, State of Massachusetts, have invented an Improvement in Shed-Forming Mechanism for Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object the production of novel shed-forming mechanism for looms, whereby a very wide range of work may be produced with very simple means readily applicable to the usual loom for plain weaving.

It is well known to practical weavers that the two-harness cam-motion is the best form of shedding mechanism, as it is the easiest on the yarn in the manipulation of the warp, and the contour of the actuating-cams can be varied to suit different kinds of yarn, &c. In this case, however, the loom must be stripped whenever a change of the number of harnesses is desired, for a set of three-harness cams will not do for a four-harness motion, and the old set of cams must be removed and the new set put in place, with appropriate changes in gearing and other parts of the mechanism. A wide range of work is possible with a "dobby;" but the latter is hard on the warps, and the rapid closing of the shed tends to interfere with the free passage of the shuttle therethrough. The matter of expense is a very important item in either case, as the change in cams is costly, even in a two-harness loom, while the dobby must have the other parts of the loom particularly adapted for its coöperation. In my efforts to increase the range of work of a loom, while still retaining the essentials of the two-harness cam-motion, I have devised simple and effective mechanism, including a single pattern-surface, which may be readily applied to a two-harness loom of usual construction, whereby three or more harnesses may be used with equal facility with a range of work equal to that of the dobby mechanism, my invention including the valuable features of both forms of mechanism and eliminating the objectionable features of both.

Figure 1, in front elevation, illustrates a sufficient portion of a loom to be understood with one embodiment of my invention applied thereto. Fig. 2 is a vertical sectional view thereof on the line $x\,x$, Fig. 1, looking toward the left. Fig. 3 is an enlarged detail, in front elevation, of a part of the selecting means carried by and movable with the harness-leaves. Fig. 4 is a similar detail of a modified form of the selecting means to be described, and Fig. 5 is a side elevation of the device shown in Fig. 4.

I have herein shown my invention applied to a well-known form of two-harness loom, and the frame A, arch A′, breast-beam A^2, cam-shaft $C^\times$, harness-cams C′ C^2, their coöperating treadles c' and c^2, provided, respectively, with rolls c^{10} c^{20}, the connecting-straps c^{12} c^{22}, attached to the treadles and to the roll c^8, and the cross-girths A^3, A^4, and A^5 of the loom-frame may be and are substantially all of usual or well-known construction and form no novel part of my invention. All parts of the loom unnecessary to the proper understanding of my invention or not coöperating therewith have been omitted in the drawings to avoid confusion.

I have herein shown the loom as provided with four harness-leaves a, b, d, and f for the purposes of illustration, though it is to be understood that three or a greater number of leaves may be used and come within the scope of my invention.

The arch A′ supports a rock-shaft e, having rolls e', to which are attached the straps 3 3, which latter are connected with auxiliary rods g h, having rolls g' h', respectively, the leaves a and b having an overhead connection by straps 4, attached to the rolls g', while similar straps 5 form the overhead connection between the leaves d f and the rolls h', substantially as in a usual four-harness motion. As herein shown, each harness-leaf is provided with a depending foot a' b' d' f', preferably made as a thin but sufficiently rigid metal bar, the feet lying one behind the other and passing freely through a transversely-slotted guide $g^\times$, herein shown as forming part of a stand G, attached in suitable manner to the cross-girth A^3 of the loom-frame. Inasmuch as each foot is like the others, only that one, a', attached to the harness-leaf a will be hereinafter described in detail, except as may be necessary in some particulars. The feet

extend considerably below the guide $g^{\times}$, and, referring to Fig. 3, the foot a' is shown as provided with a segmental slot a^2 near its lower end to receive a stud or projection a^3 on the back of a switch member or dog $a^{\times}$, pivoted on the foot at a^4. At its upper end said dog is laterally extended to form ears 9 10, preferably slightly concaved at their upper edges, the distance between said ears being such that when the switch-dog is in central position neither one will extend laterally beyond the upright edges of the foot a'. When, however, the dog is thrown to either side, one or other of the ears will project beyond the edge of the foot to be engaged by the actuator, to be described, to thereby effect the downward movement of that particular foot, the ear 10 being shown in operative position in Fig. 3. Lugs a^5 on the foot serve as stops to limit the upward movement by engagement with the under side of the guide $g^{\times}$, the guide having a sufficient number of transverse slots 2 to accommodate the greatest desired or convenient number of harness-leaves to be used.

Like brackets $m\ n$, attached to the front cross-girth A^4, have pivotally mounted thereon levers $m^{\times}\ n^{\times}$, respectively, and longitudinally slotted at $m'\ m^2$ and $n'\ n^2$, as best shown in Fig. 2, the latter slots being located near the free ends of said levers and receiving roller or other studs 15 and 25, extended laterally from collars c^{15} and c^{25}, adjustably held by suitable set-screws 13 on the treadles c' and c^2, respectively, the ends of the latter being preferably squared to better retain the collars in proper position. By the slot-and-pin connection described the two levers are rocked by the movement of the treadles, the adjustment of the collars on the latter serving to properly regulate the throw of the levers, and by reference to Fig. 1 it will be seen that the collars are offset laterally to form bosses for the studs or rolls 15 and 25 in order to properly position them relatively to the treadles and levers. The treadles are also provided, respectively, with adjustable collars $c^{17}\ c^{27}$, to which are pivotally connected links $m^3\ n^3$, the upper ends thereof being jointed at 30 and 31 with the harness-actuators M N, the inner ends of the actuators being provided with roller or other studs $m^4\ n^4$, which travel in vertically-slotted ears $g^3\ g^4$, depending from each side of the stand G below the guide $g^{\times}$. At their outer ends said actuators are pivotally connected at 33 34 with links $m^5\ n^5$, which at their lower ends are adjustably pivoted by suitable set-bolts 35 36 in the slots $m'\ n'$ of the levers $m^{\times}\ n^{\times}$, respectively, so that the rocking of the levers and treadles will act to reciprocate the actuators bodily and at the same time rock them about their fulcra 33 34. The slotted ears $g^3\ g^4$ serve to guide said actuators M and N in their reciprocations, and by adjustment of the collars $c^{17}\ c^{27}$ on the treadles with the adjustment of the lower ends of the links $m^5\ n^5$ the stroke and angular movement of the actuators are regulated according to the number of harness-leaves, the shed-opening, &c. The actuators move up and down in close proximity to the upright edges of the feet $a'\ b'$, &c., depending from the harness-leaves, and, as shown in Fig. 3, the adjacent portions of the actuators are beveled at their under edges, as at 60, to form knife-like portions for engaging the switch-dogs, it being understood that when a dog is thrown to bring one of its ears in the path of an actuator the latter will in its descent effect the descent of the corresponding harness, so that by proper selection of the switch-dogs and the requisite movement thereof into operative position the desired movement is given to particular leaves of the harness in any given order or sequence, according to the weave. When the switch-dog is in mid-position, neither actuator will coöperate with the corresponding leaf of the harness.

My invention is not limited to the precise connections between the cams and actuators for effecting the movement of the latter, as herein shown; but it is a convenient form and obviates the use of actuators several feet long, as would be necessary were they fulcrumed directly on the loom-frame in order to reduce the acuteness of the angle of their movement.

No matter how many harness-leaves are employed it will be evident that but two actuators are required and that the two-harness cam-motion is made effective by my invention to operate them, so that the desirable cam-motion is attained without recourse to a different set of cams and gearing for every different number of harness-leaves.

The operation of the switch-dogs is effected by a single suitable pattern mechanism which determines whether any particular dog shall be operative or inoperative and if operative with which of the actuators it shall coöperate.

Referring to Fig. 1, I have shown the cam-shaft $C^{\times}$ as provided with a bevel-gear c^{40}, in mesh with a bevel-pinion c^{41} on an upright shaft c^{42}, supported in a suitable bearing 50 on the loom side, said shaft having fast thereon a worm-gear c^{43}, in mesh with a worm c^{44} on a shaft c^{45}, supported in the stand 55 and provided with a pattern-surface, herein shown as a cylinder P. This pattern cylinder or wheel is shown as provided with sets of pins or studs, each set comprising a long pin p and two short pins p', arranged quadrantally, the long pin when operative acting to effect engagement of the switch-dog with the actuator N, while the short pins hold the dog inoperative, the surface of the cylinder effecting engagement of the dog with the actuator M by suitable intervening means, to be described, it being understood that there will be as many sets of pins on the cylinder as there are leaves in the harness. Inasmuch as the pattern-cylinder and the pattern-chain are well-known forms of pattern-surfaces, it will be obvious that either may be

3. In shed-forming mechanism for looms, a plurality of reciprocable harness members each having a depending foot connected therewith, two vibrating actuators between which the several feet may reciprocate, means carried by each foot to effect or prevent coöperative engagement therewith by an actuator, a single pattern-surface, and connections between it and the said means carried by the feet, governed and operated by the single pattern-surface to determine which of the harness members shall be moved by an actuator and the sequence of such movement.

4. In a loom, two harness-cams, treadles operated thereby, two levers connected with and to be rocked by the treadles, two actuators, a pair of links pivotally connecting each with a treadle and rocking lever respectively, to bodily vibrate and also effect angular movement of said actuators, and vertical guides for the latter, combined with a plurality of harness members, and means, including a pattern-surface, to effect the positive movement in one direction of said harness members by the actuators in a predetermined order or sequence.

5. In shed-forming mechanism for looms, two harness-cams, treadles operated thereby, two levers connected with and to be rocked by the treadles, two actuators, adjustable connections between each and one of the treadles and a rocking lever, to bodily vibrate and also effect angular movement of the actuators, and guides for the acting ends of the latter combined with a plurality of harness members, and connecting mechanism between said members and the actuators.

6. In shed-forming mechanism for looms, two harness-cams, treadles operated thereby, two levers connected with and to be rocked by the treadles, two actuators, movable fulcra therefor carried by the rocking levers, and a link pivotally connecting each actuator with a treadle, whereby the actuators are reciprocated bodily and also rocked on their fulcra combined with a plurality of harness members, and connecting mechanism between said members and the actuators.

7. In shed-forming mechanism for looms, a plurality of reciprocable harness members each having a rigid depending foot provided with a segmental slot, a switch-dog fulcrumed on the foot and having a stud extended through said slot, to limit the throw of the dog, a slotted, longitudinally-movable rod in engagement with the stud to control the position of the dog, and a pattern-surface to govern the movement of the several rods and thereby determine the position of the dogs, combined with two actuators vibratable at each side of the depending feet and adapted to engage a switch-dog when in extreme position, to effect movement of the corresponding harness member, and means to vibrate the actuators.

8. In shed-forming mechanism for looms, a plurality of reciprocable harness members each having a rigid depending foot, a guide for said feet, two vibrating actuators, either of which can move any harness member in one direction, selecting means, including switch-dogs on the depending feet, to effect the coöperation of an actuator with a harness member, and a single pattern-surface to govern the operation of the selecting means.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES A. LITTLEFIELD.

Witnesses:

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