

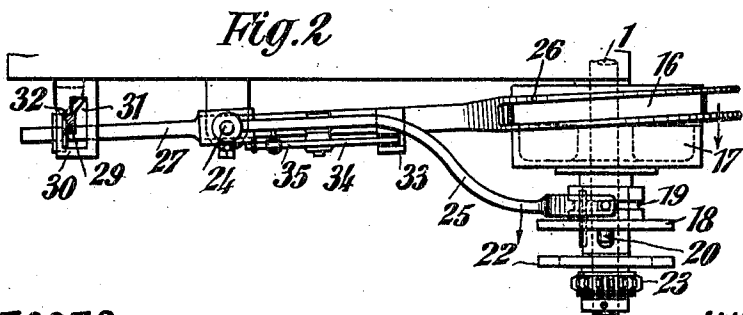
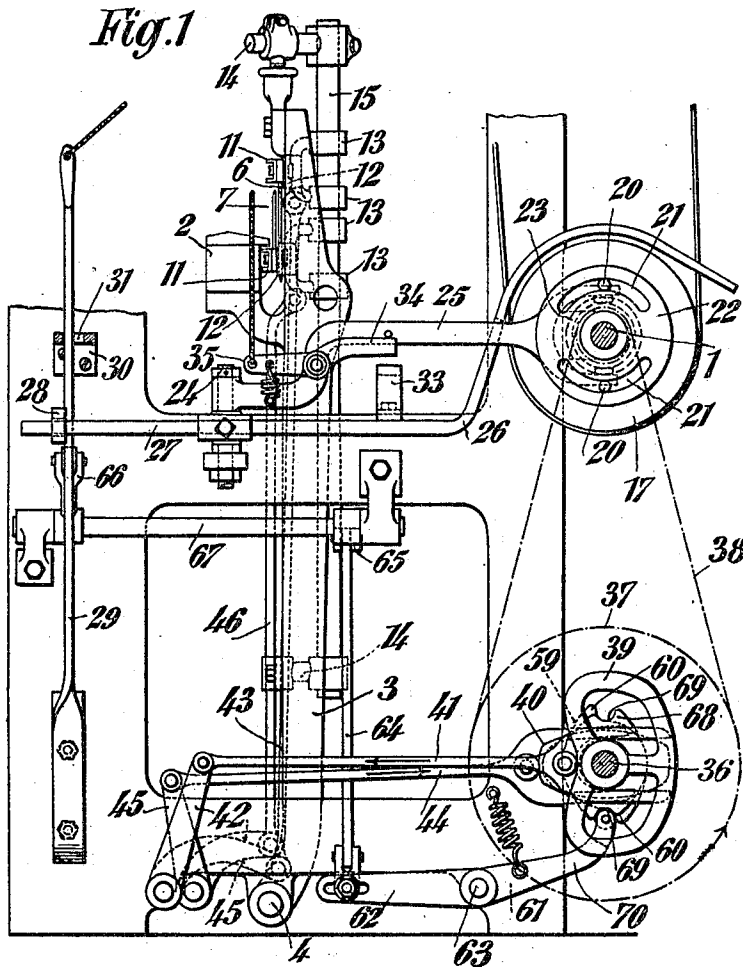
No. 839,435.

PATENTED DEC. 25, 1906.

H. STÄUBLI.
LOOM FOR WEAVING CROSS WOVEN FABRICS.

APPLICATION FILED SEPT. 19, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

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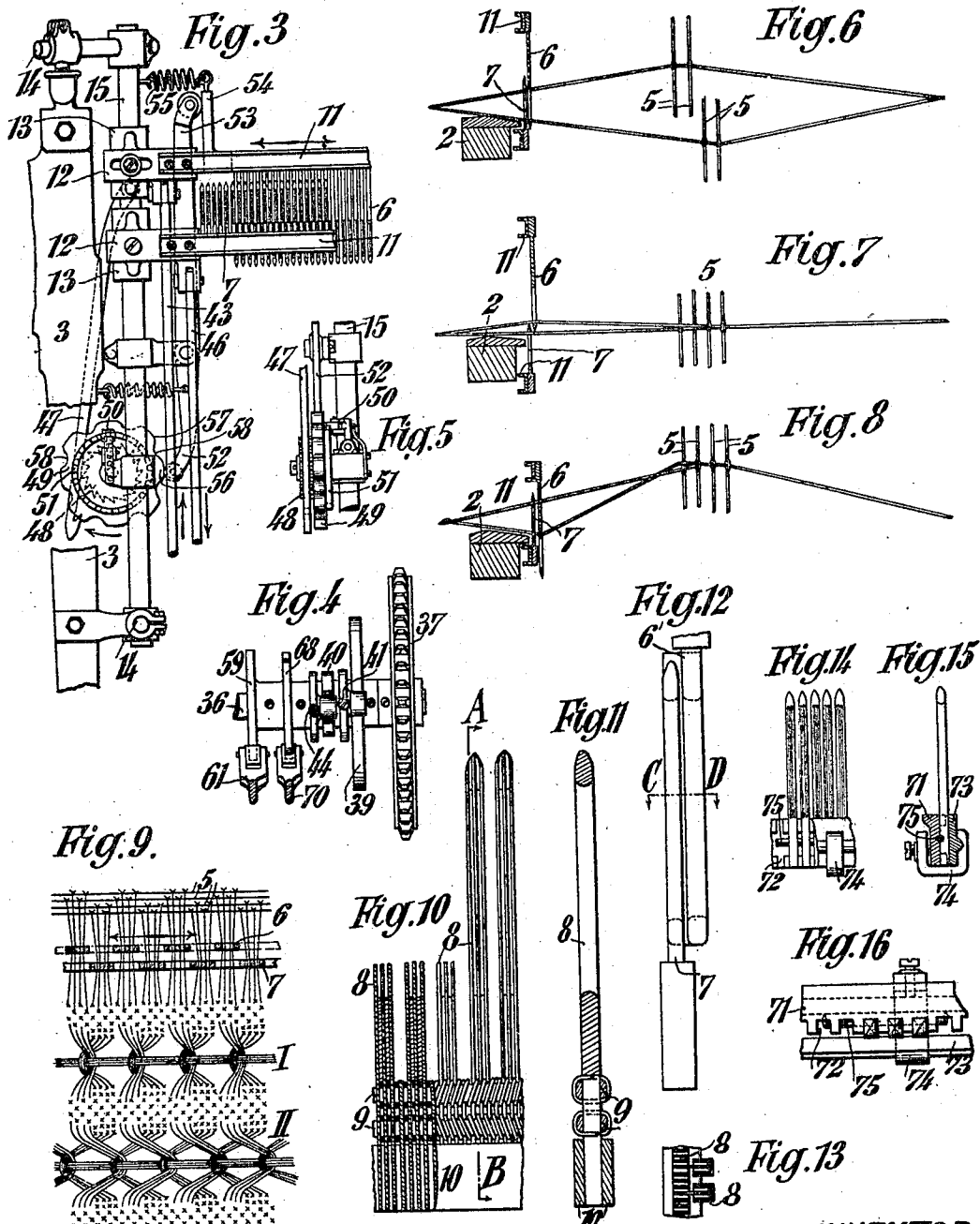
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UNITED STATES PATENT OFFICE.

HERMANN STÄUBLI, OF HORGEN, SWITZERLAND.

LOOM FOR WEAVING CROSS-WOVEN FABRICS.

No. 839,435.

Specification of Letters Patent.

Patented Dec. 25, 1906.

Application filed September 19, 1904. Serial No. 225,101.

To all whom it may concern:

Be it known that I, HERMANN STÄUBLI, a citizen of the Republic of Switzerland, residing at Horgen, Switzerland, have invented new and useful Improvements in Looms for Weaving Cross-Woven Fabrics, of which the following is a specification.

For the production of cross-woven fabrics there has heretofore been employed apparatus provided with a vertically-reciprocating open reed, a stationary reed in front of the harness, a vertically-reciprocating needle-comb, and a leaf arranged between the stationary reed and the needle-comb and provided with doup-heads that are drawn through the needles of the comb and divide the warp-threads into selected groups. For the purpose of forming the twist shed the needle-comb, with its doup-head, is drawn upward out of the dobby, so as to bring into the upper shed the groups of cross or whip threads drawn against the needles and held in the doup-heads.

Now according to the present invention a divided or two-part reed is employed having an upper reed portion for the cross-threads and a lower reed portion for the standing threads, both reed portions being moved up and down in opposite directions. The cross-threads in the forming of the shed are lifted out and brought into the bottom of the shed by the upper reed portion (which has a to-and-fro motion in addition to its up-and-down motion) through the medium of fillings provided in both reed portions between the ends of the reed-dents that receive the groupse of threads.

In the accompanying drawings, Figures 1 to 11 illustrate, by way of example, a construction of apparatus of this kind for the production of cross-woven fabrics. Fig. 1 is a side elevation, partly in section; Fig. 2, a part plan of Fig. 1, and Fig. 3 a front elevation of a device for actuating the divided or two-part reed. Fig. 4 illustrates a detail of Fig. 1, and Fig. 5 illustrates a detail of Fig. 3 in another view. Fig. 6 shows the position of the two-part reed during the formation of the shed for ordinary weaving, and Figs. 7 and 8 show the position of the reed during the formation of the shed for cross-weaving. Fig. 9 is a diagrammatic representation, by way of example, of a piece of cross-woven fabric, illustrating, by way of example, the arrangement of the threads in the weaving. Fig. 10 illustrates a detail on a larger scale. Fig. 11

is a section on the line A B of Fig. 10. Fig. 12 illustrates a modified construction of the reed. Fig. 13 is a section on the line C D of Fig. 12, and Figs. 14 to 16 relate to a further modified construction of the reed.

1, Fig. 1, is the main shaft of a loom from which motion is imparted to the lay or batten 2, that is adapted to be oscillated on the axle 4 by means of the arms or swords 3. Along the rear side of the lay there is arranged a divided or two-part reed which is composed of the upper reed portion 6 and the lower reed portion 7, the latter portion being arranged a small distance in front of the upper reed portion 6. The dents 8, Figs. 10 and 11, of each reed portion are arranged in groups of three dents each, the said groups being arranged side by side at regular intervals apart, and the spaces between the ends of the dents of each group are filled up in such a manner as to connect together the dents of each group and to leave between these dents the requisite free space for the formation of the shed. All the groups of dents of each reed portion are fastened at one end between flat bars 10 and double collars 9, wound with wire, and are connected with one another by fillings of, for instance, tin solder, and they thus constitute the reed portion, the other free ends of the groups of dents being made pointed. The reed portions 6 and 7 are carried by longitudinal bars 11, which are in their turn fixed, by means of plates 12, to guide-pieces 13, that are capable of moving up and down in opposite directions along the bars 15, which are connected, by means of arms 14, to the lay swords or arms 3. The upper reed portion 6 is also capable of movement in a horizontal direction, and its plates 12 are formed with longitudinal slots.

On the shaft 1 is mounted the driving-pulley 16, by the side of which is the loose pulley 17, having on its boss a disk 18, capable of being shifted along a feather. The boss of this disk is formed with an outer annular groove 19, and on that side of the disk which is farthest from the boss there are fixed two pins 20, which are arranged diametrically opposite to each other and which by the shifting of the disk 18 are caused to engage in corresponding concentrically-arranged slots 21 in a counter-disk 22, that is mounted loose on the shaft 1, whereby these two disks can be coupled with each other. A pinion 23 is mounted on the boss of the disk 22. The

fork of a lever 25, which is capable of rotating horizontally on the vertical axle 24, engages by means of pins in the annular groove of the disk 18. In a transverse slot in the same axle 24 there is mounted the belt-fork rod 26, which is provided with an arm 27 (that is extended beyond the pivot-axle 24) and is capable of rotation in a horizontal sense similar to the lever 25. The arm 27 passes through a guide-eye 28 of a spring-bar 29, which is attached in a vertical manner to the framing of the machine, and the upper part of which extends through the slot 31 of an angle-piece 30 and bears therein under pressure against a nose 32, which projects into the slot, Fig. 2.

On the belt-fork rod 26 there is fixed a carrier or dog 33, having a recess, and on the lever 25 there is pivoted a two-armed lever 34 35, the arm 34 of which is situated over the recess of the piece 33 and is held in this position by a spring engaging with the arm 35. The upper end of the bar 29 is formed as a handle, and the arm 35 of the double lever 34 35 is connected by tensile devices to a dobby apparatus and can be actuated from that apparatus.

Below the shaft 1 is mounted a horizontal shaft 36, which can be caused by the shaft 1 to rotate at intervals. For the purpose of transmitting this motion there is fixed on the shaft 36 a toothed wheel 37, which is connected, by means of a chain 38, with the pinion 23 on the shaft 1. On the ends of this shaft 36 are mounted eccentrics 39 and 40 for the upward and downward movements of the reed portions 6 and 7. For the purpose of producing contrary motion of the reed portions the eccentric 39 is keyed in position ninety degrees apart from the eccentric 40. The reed portion 6 receives its motion from the approximately heart-shaped eccentric 39 through the medium of the connecting-rod 41, provided with fork and antifriction-roller, through levers 42, fixed on a transverse axle, and through the rods 43, which are pivoted to them and to the plates 12 of the reed portion 6. The motion of the reed portion 7 is derived from the eccentric 40 through the medium of a connecting-rod 44, provided with fork and antifriction-roller, through levers 45, also fixed on a transverse axle, and through rods 46 pivoted to the plates 12 of the reed portion 7, Figs. 1 and 3. The longitudinal motion of the upper reed portion 6 takes place after the upward movement of this reed portion and is effected through the medium of a downwardly-hanging pawl 47, which is pivoted to one of the guide-pieces 13 of the reed portion and is adapted to engage with a ratchet-wheel 48. The wheel 48, together with a tappet-disk 49, is pivoted on one guide-bar 15. The disk 49 is held after each partial rotation by means of a pawl 50, which is provided with an anti-

friction-roller and which is caused by spring-pressure to bear against a recessed rim 51 of the tappet-disk. A double lever 52 53, pivoted on the aforesaid bar 15, is caused by a spring to bear with its arm 52 (that is provided with an antifriction-roller) against the periphery of the tappet-disk 49. The other lever-arm 53, which is likewise provided with an antifriction-roller, bears against a fixed stop 54 on the reed portion 6, which is caused by a spring 55 to be held in contact with lever-arm 53. The tappet-disk 49 is provided on its periphery with small and large tappets 56 57, arranged alternately behind one another at regular intervals of distance apart. They are divided by recesses 58 from one another and serve to cause the double lever 52 53 to make alternately a long stroke, which is transmitted similarly to the reed portion 6. On the shaft 36 there is also mounted a disk 59, which is provided on its periphery with two tappets 60, arranged diametrically opposite to each other, and against the under side of which the arm 61 (provided with an antifriction-roller) of a double lever 61 62, pivoted at 63, is caused by spring-pressure to bear. The other lever-arm 62 is connected by a rod 64 with a lever 65, which is connected with a second lever 66, that is fixed on an axle 67, arranged in bearings on the framing of the machine and that bears with an antifriction-roller against the rear side of the bar 29. By the side of the disk 59 on the shaft 36 is mounted another disk 68, which is formed on its periphery with two recesses 69, situated diametrically opposite to each other, and in which the antifriction-roller of a lever 70, pivoted at 63 and acted on by a spring, is adapted to engage at times for the purpose of locking the shaft 36 in position after every completed half-revolution, Figs. 1 and 4.

The warp-threads which are drawn through the healds 5 and the two-part reed are divided by the two reed portions 6 and 7 into two groups of threads—namely, the standing threads and the cross or whip threads. The standing threads are again passed in groups between the dents 8 of each group of dents of the reed portion 7, and the cross-threads are passed in a similar manner between the dents of the groups of dents of the reed portion 6 and are held between these dents that are closed at top and bottom. In weaving an ordinary plain fabric the position of the reed portions 6 and 7 in a lateral direction relatively to each other is such that each group of dents of the rear reed portion 6 is situated in line with the space between two groups of dents of the forward reed portion 7, the arrangement being such that the two outermost dents of one group of dents of the reed portion 6 coincide with the juxtaposed outermost dents of two adjacent groups of dents of the reed portion 7. In this arrangement, as shown in Figs. 12 and 13, the middle dent

of each group of dents of the rear reed portion 6 may be made deeper, so that it extends through the space between two groups of dents of the forward reed portion 7 and is flush with the forward side of this said reed portion for the purpose of completing the forward reed portion when beating up the weft.

The operation of the herein-described apparatus is as follows: The position of the two-part reed in Figs. 1 and 3 corresponds with that shown in Fig. 8. In this figure the reed portion 6 is shown entirely depressed, and the reed portion 7 is shown in its uppermost position vertically, while laterally the reed portion 6 is shifted to the extent of one spacing or width of one group of dents relatively to the reed portion 7. The standing threads and the cross-threads, are lifted by the healds 5 to the top of the shed, while the cross-threads, by reason of the position of the reed portion 6, are brought down and over the standing threads, so that the shuttle can carry the weft-threads through the open shed of the cross-threads which is thus formed, thereby producing the crossing indicated by I in Fig. 9. The shaft 36 is locked by the lever 70, and the driving-belt is held by the belt-fork 26 in its position on the fast pulley, while the bar 29 presses on the nose 32 of the angle-piece 30, and so remains until the desired weft-threads are inserted. Now the dobby acts upon these parts by pulling the cords or other tensile devices connected to the bar 29 and the lever 34 35. The bar 29 is thereby moved laterally and shoots past the nose 32 in the slot 31 to the rear, and at the same time the arm 34 of the double lever 34 35 is rotated, and thereby enters the notch in the carrier 33, and thus couples the lever 25 to the bar 26. By means of the bar 29, which shoots back by reason of elasticity, the belt-fork rod 26 is rotated, so as to shift the belt from the fast pulley 16 onto the loose pulley 17. In this manner after the standing threads and the cross-threads have been drawn by the heald 5 into the middle-shed position, Fig. 7, the shaft 1, and therefore the loom, is stopped. By means of the lever 25 the disk 18 is shifted and is brought, by means of the pins 20, into engagement with the disk 22, and by this means the latter is caused by the pulley 17 to rotate. By means of the pinion 23, the chain 38, and the wheel 37 the shaft 36 is caused to rotate in the same direction indicated by the arrow in Fig. 1. The eccentrics 39 and 40 act now, respectively, upon their respective rods 41 42 43 and 44 45 46, whereby the reed portion 6 is raised and the reed portion 7 is depressed. When the two reed portions have reached their highest and lowest positions, respectively, the upper reed portion 6 is moved back into its initial position by means of the ratchet-wheel 48, which is rotated by

the pawl 47, and therefore also rotates the tappet-disk 49, the arm 52 of the lever 52 53 leaving the tappet 56 and engaging, by means of its roller, in the adjacent recess 58, so that the upper arm 53 of the lever is able to act upon the stop 54 of the reed portion 6. Then on further rotation of the eccentrics 39 and 40 the reed portion 6 will move down again and again raise the reed portion 7—*i. e.*, move into the position shown in Fig. 6. Now one tappet 60 of the disk 59 comes in operation and rotates the lever 61 62 and by means of the rods 64 65 66 moves the bar 29 in the slot 31 again forward in opposition to its spring action, so that the said bar snaps again behind the nose 32 and is held by it in its position. By the forward movement of the lever the belt-fork rod 26 and the lever 25 are moved back again into the position shown in Fig. 2, whereby the belt is brought again onto the fast pulley 16 and the disks 18 22 are again uncoupled. At the same moment the lever-arm 70 has snapped with its roller by the action of its spring into a recess 69 in the disk 68, and it thereby locks the shaft 36 in position after it has completed its half-revolution. The dobby now releases the lever 34 35 again, so that its arm 34 moves out of the recess of the carrier 33. By the locking of the shaft 36 the reed portions 6 and 7 after having moved into the position shown in Fig. 6 will also remain therein, while the loom starts again and produces a plain fabric. If it be now desired to produce a further crossing, the dobby is caused to act again upon the bar 29 and lever 34 35. The former will be released and will snap back, and the bar 26 and the lever 25 will be coupled together by the lever 34 35, and the belt will be shifted, by means of the fork, onto the loose pulley, and the disks 18 22 will be caused to engage with each other, so that the shaft 1—*i. e.*, the loom—will therefore be stopped, while the shaft 36 will be caused to rotate. The reed portions 6 and 7 are again respectively raised into the highest position and depressed into the lowest position by means of the eccentrics 39 40, and the reed portion 6 is moved laterally by a higher tappet 57 of the disk 49, which is rotated by the pawl 47 during the upward movement of the reed portion 6, said tappet acting upon the double lever 52 53. The groups of cross-threads passing through the reed portion 6 are in that operation brought past and over the groups of straight threads situated in the middle shed, and the shifting of the reed portion 6 is also greater to correspond with the tappet 57. Then the groups of standing threads and cross-threads are raised into the upper shed by the healds 5 on the complete depression and rising of the respective reed portions 6 and 7; but the cross-threads are, however, drawn down by the reed portion 6 for the purpose of forming

the open crossing-shed, as shown in Fig. 8, so that the shuttle can insert the weft-threads, whereupon the two groups of threads are brought into the middle shed by the healds 5, whereby a longer cross-weave is produced, as shown at II in Fig. 9, owing to the greater lateral displacement of the cross-threads. Then the dobby locks the shaft 36 again, and the loom is started again to produce a plain fabric. It is obvious that these crossings can be formed by means of the card of the dobby apparatus one after another with any desired intervals of distance apart and of any desired kind by the alternating arrangement of different sized tappets on the tappet-disk 15 49, so as to produce the most varied designs.

It is in many instances necessary to arrange the crossings in single groups only over the breadth of the fabric or at any desired distances apart in accordance with the desired design. An arrangement of reed portion suitable for this purpose is shown in Figs. 14 to 16. In this arrangement there is provided a bar 71, which is formed over its entire length with notches 72, situated side by side, into which at the places determined by the design the several groups of dents are inserted and are held fast therein by a bar 73 by means of clips 74. In order to prevent vertical movement of the groups of dents in the bar 71, a wire 75, that extends throughout the length of the said bar, is inserted therein, entering corresponding recesses in the groups of dents.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a loom the combination with a two-part reed, of means to move one of the parts vertically, and mechanism controlled by the vertical movement of said part to laterally shift said part, substantially as described.

2. In a loom the combination with the swords and a two-part reed and means to vertically move both reed parts; of mechanism carried by the swords to laterally move the upper reed portion and means operated by the vertical movement of said upper reed portion, to laterally move the upper reed portion, substantially as described.

3. In a loom the combination with means to weave a plain fabric, of devices to stop the operation of the plain fabric-weaving means, cross-weaving devices set in operation during such stoppage to cross sets of warp-threads, means to reset the loom in operation to insert the desired weft-picks while the warps are held crossed, and mechanism to again stop the loom during the uncrossing of the warp-threads and preparatory to continuing the plain weaving, substantially as described.

4. In a loom, the combination with means to weave a plain fabric, of devices to auto-

matically stop the operation of the plain-weaving means, cross-weaving devices set in and out of operation to form a cross-weave with the same warp-threads, and means to vary the length of the cross-weave, substantially as described.

5. In a loom, the combination with means to weave a plain fabric, including shedding mechanism and a two-part reed, of means to laterally move one of the parts of the reed to cross one set of warp-threads over the other, and means to move both parts of the reed to and from each other to form a shed independently of the shedding mechanism for the plain fabric, substantially as described.

6. In a loom, the combination with means to weave a plain fabric, including shedding mechanism, of means to stop the operation of the plain-fabric-weaving means, a two-part reed, one of the parts moving behind the other and both parts having long interdental spaces to permit the shed by the plain-fabric mechanism, means to laterally move one of the parts of the reed to move one set of warp-threads across another set, and means to move the reed parts to form a shed of the crossed warps, substantially as described.

7. In a loom such as described, the combination with the swords; of a two-part reed carried thereby, mechanism to move the parts of the reed to and from each other, means to move one of the reed parts laterally including a device to control the extent of lateral movement and set in operation by the vertical movement of the laterally-movable reed portion.

8. In a loom such as described, the combination with the swords and guide-rods thereon; of a two-part reed mounted on the guide-rods, means to separately move the parts of the reed on the guide-rods, one of the parts of said reed also laterally movable, a lever mounted on a guide-rod to laterally move one of the reeds, a ratchet-wheel and a controller-cam carried thereby both mounted on a rod 15, said cam acting on the lever and thereby controlling the extent of lateral movement of the laterally-movable reed, and a pawl to actuate the ratchet-wheel and cam actuated by the vertical movement of the laterally-movable reed, substantially as described.

9. In a loom such as described, the combination with the swords and guide-rods thereon; of a two-part reed mounted on said rods, means to move the parts of the reed separately up and down, one of said reed parts also laterally movable, a spring to normally hold this part against lateral movement, a lever mounted on a rod 15 engaging the laterally-movable reed portion, a ratchet-wheel, a controller-cam having a notched boss connected to the ratchet-wheel, both

mounted on said rod 15, a spring-actuated latch to engage the notches, a pivoted pawl moving up and down with the laterally-movable reed part and engaging the ratchet-wheel, whereby the cam will be rotated to actuate the lever and laterally move the reed portion the required number of dents, substantially as described.

10. In a loom, the combination with mechanism to weave a plain fabric; of a two-part reed the dents thereof arranged in groups, the dents in one of the parts opposite the spaces between the groups of dents in the other, thereby forming a continuous reed, and mechanism timed to give relative movement to the separate parts of the reed to cross the warp-threads in one part over warp-threads in the other part, substantially as described.

11. In a loom, the combination with mechanism to weave a plain fabric; of a two-part reed having long interdental spaces, the dents of which are arranged in groups and the groups of dents connected at their free ends, means to laterally move one of the parts of the reed, some of the dents of each group in said laterally-movable part projecting through the spaces between the groups of dents in the other part to present a uniformly-divided striking-face on the reed, whereby one or more warp-threads carried by the laterally-movable reed portion can be moved across one or more warp-threads in the other portion of the reed, substantially as described.

12. The combination with a dobby-loom and its driving-shaft, of a fast and a loose belt-pulley thereon, a cross-weaving driving mechanism, an auxiliary shaft and means to operate said mechanism, means to drive the auxiliary shaft from the loose pulley, a belt-shifter and means to actuate the belt-shifter controlled by the dobby to automatically bring the cross-weaving mechanism into operation, substantially as described.

13. The combination with a dobby-loom, its driving-shaft and a fast and loose pulley thereon; of a cross-weaving mechanism, an auxiliary shaft to drive the same, a pinion loose on the driving-shaft to drive the auxiliary shaft, a clutch between the pinion and loose pulley, a belt-shifting lever and a clutch-operating arm, a latch to connect said arm and lever, a spring to move the belt-

shifting lever, said spring released and the latch operated by the dobby, whereby the clutch-operating arm will be connected to the belt-shifting lever to automatically place the plain-fabric-weaving mechanism out of operation and simultaneously start the cross-weaving mechanism, substantially as described.

14. The combination with a dobby-loom, its driving-shaft, and a fast and a loose pulley thereon; of a cross-weaving mechanism, an auxiliary shaft to drive the same, a pinion loose on the driving-shaft to drive the auxiliary shaft, a clutch between the pinion and loose pulley, a belt-shifting lever, a clutch-operating arm, a latch to connect said arm and lever, a spring, normally held out of operation, to move the belt-shifting lever, said spring released and the latch operated by the dobby, a locking-cam having notches therein on the auxiliary shaft, a lever to engage the notches and hold the auxiliary shaft in inoperative position, cams on the auxiliary shaft, to disengage said lever and locking-cam, and mechanism operated by said lever to return to normal position and operate the belt-shifter, substantially as described.

15. The combination with a loom, of a two-part reed and swords, of a rod 15 on each sword, means to slidably connect the parts of the reed to said rods, means to laterally move one of the reed parts, an auxiliary shaft, cams thereon, rods operated by the cams, levers 42 and 45 operated by the rods and rods 42, 46 to move the reed parts up and down, substantially as described.

16. In a loom the combination with a main driving-shaft, plain-weaving mechanism operated therefrom, and a fast and a loose pulley mounted on said shaft; of cross-weaving mechanism driven from the loose pulley and means to automatically and intermittently bring the cross-weaving mechanism into operation, substantially as described.

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

HERMANN STÄUBLI.

Witnesses:

MAX FÖHR,
A. LIEBERKNECHT.