

No. 647,957.

Patented Apr. 24, 1900.

O. FROWEIN.
RIBBON LOOM.

(Application filed Oct. 30, 1899.)

(No Model.)

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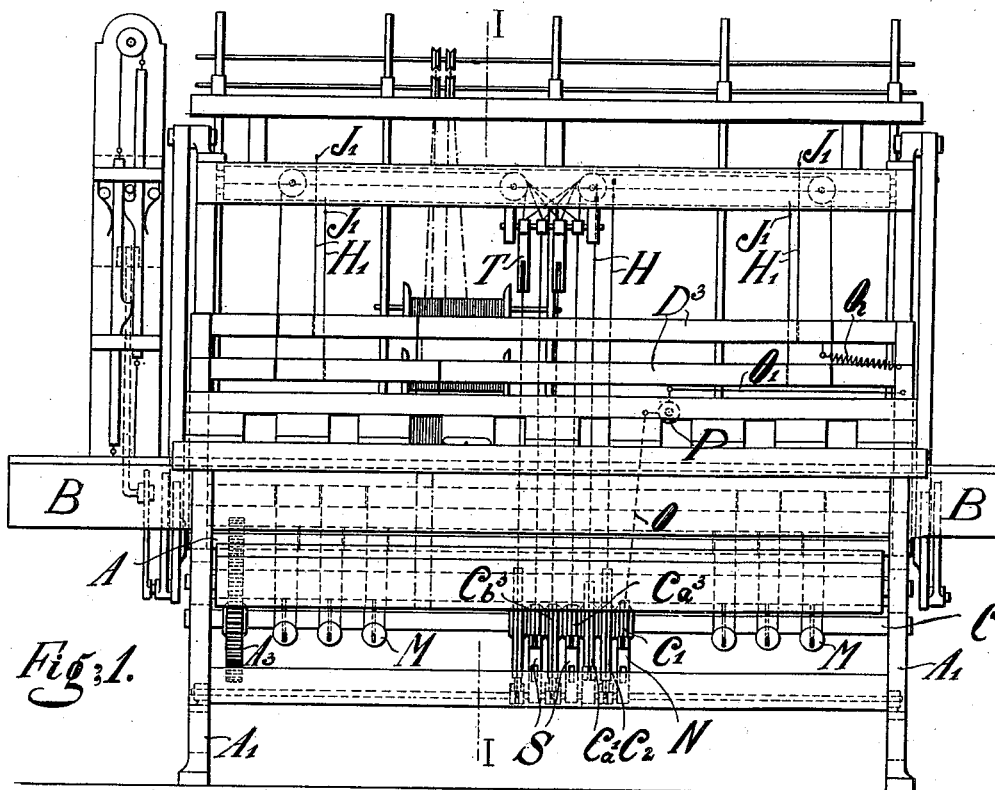


Fig. 1.

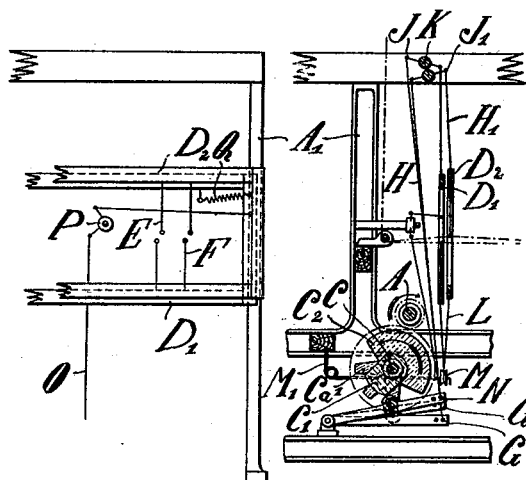


Fig. 13.

Fig. 14.

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Inventor:

O. H. Frowein

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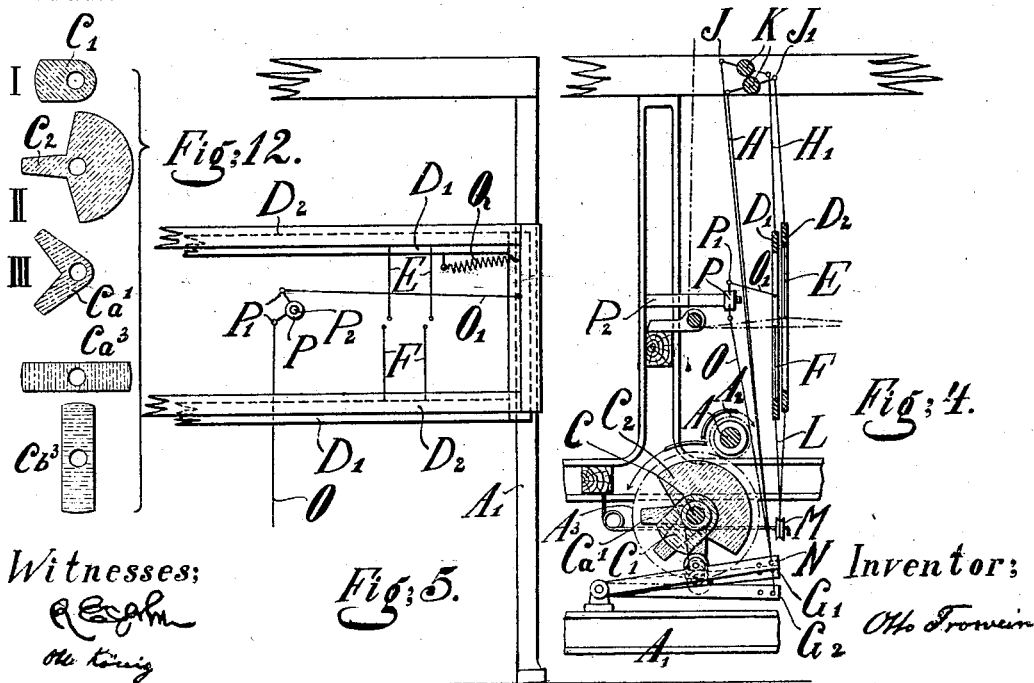
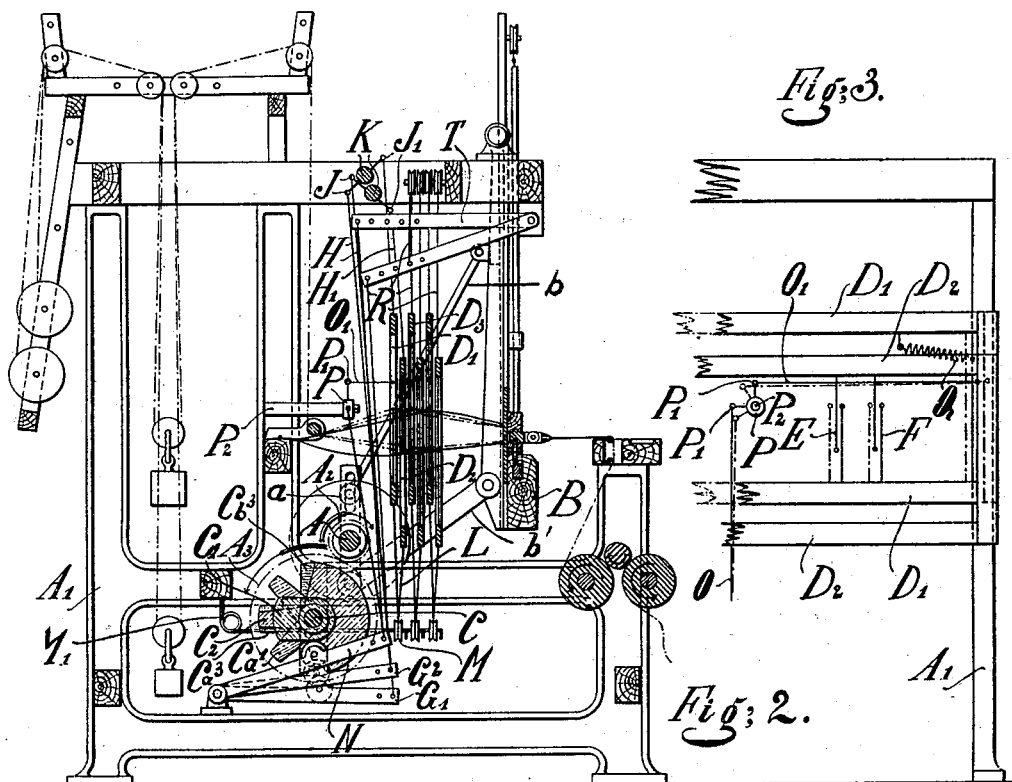
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3 Sheets—Sheet 2.



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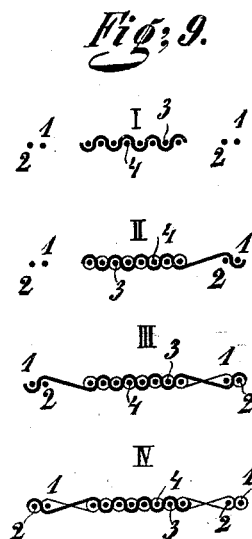
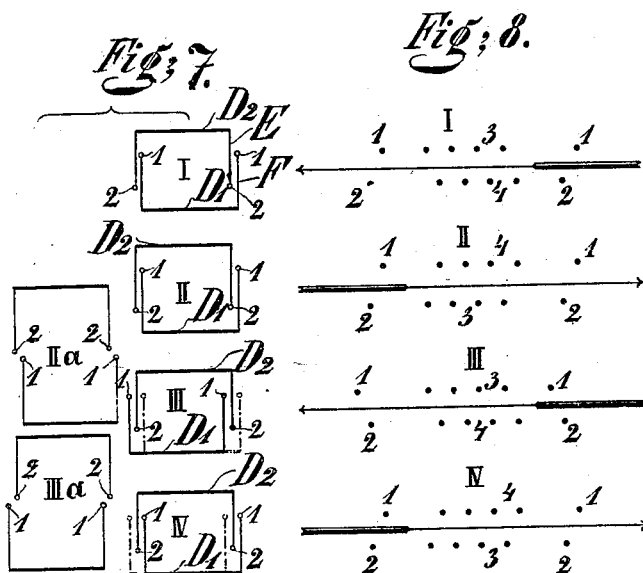
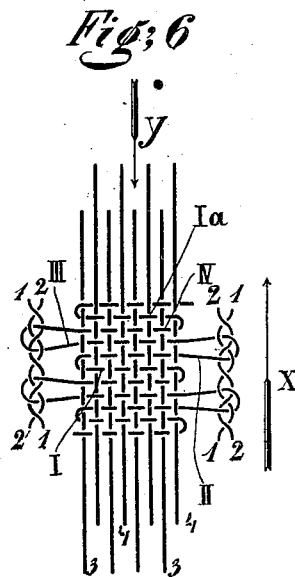
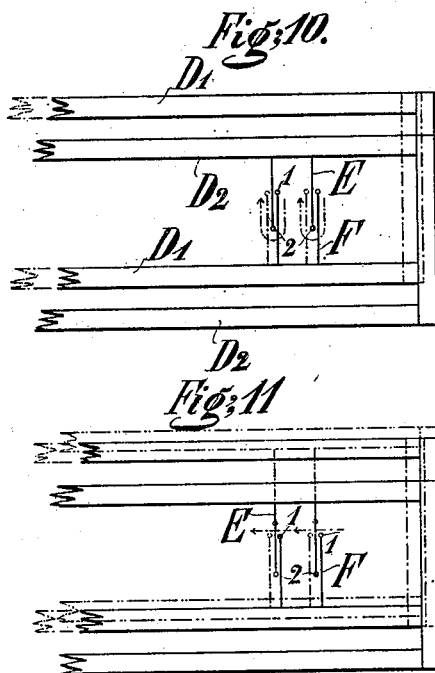
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(Application filed Oct. 30, 1899.)

(No Model.)

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UNITED STATES PATENT OFFICE.

OTTO FROWEIN, OF BARMEN, GERMANY, ASSIGNOR TO ALB. & E. HENKELS,
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RIBBON-LOOM.

SPECIFICATION forming part of Letters Patent No. 647,957, dated April 24, 1900.

Application filed October 30, 1899. Serial No. 735,267. (No model.)

To all whom it may concern:

Be it known that I, OTTO FROWEIN, a subject of the Emperor of Germany, residing at Barmen, in the Province of Rhenish Prussia, Germany, have invented certain new and useful Improvements in Ribbon-Looms; and I 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.

This invention relates to improvements in ribbon-loom; and it has for its object to make in a new manner and by new means ribbons with lace-like selvages formed by cross-weaving or with crossed warp at the edges. Such ribbons have been made before this, but the means used hitherto to produce them required for making the cross-bound edges various passages of the weft or of the shuttle, respectively, through the shed without allowing a binding being made in the middle part of the weaving, and thus a great loss of time was caused. By means of my new arrangement I can make the cross-bound selvage at every time of the passage of the shuttle, so that no "dead shoots" are required to be made and no time is lost, but a proper binding is made also in the middle part of the weaving at every passage of the shuttle through the shed. I attain this by means of the device shown on the accompanying drawings, in which—

Figure 1 shows a ribbon-loom in front view with the new device arranged therein. Fig. 2 is a vertical cross-section of the same along line I I of Fig. 1. Fig. 3 is a front view of a part of the loom, showing the needle-leaf, only in the position of Fig. 2, making shed. Fig. 4 shows in a view similar to Fig. 2 the essential parts of the new device in an altered position. Fig. 5 is the corresponding front view, the needle-leaves in normal position. Fig. 6 shows, in an enlarged scale, the woven product and its manner of binding. Fig. 7 shows in diagram form in succession the six positions of the needle-leaf for completing the crossed-warp selvage-binding. Fig. 8 shows the corresponding positions of the warp-threads in cross-section and the direction of the weft in each case. Fig. 9 shows in a cross-section of the ribbon the relative positions of the warp and weft threads corresponding to the dia-

grams of Figs. 7 and 8. Figs. 10 and 11 indicate the movements of the needle-leaves with their starting position shown in full lines and the end position in dotted lines. Fig. 12 shows in detail the cams C' , C^2 , $C^{a'}$, C^{a^3} , and C^{b^3} . Figs. 13 and 14 are two views similar to those shown in Figs. 4 and 5 in a small scale.

The general arrangement of the ribbon-loom is the one known, and in the following description I therefore enumerate and describe only those parts which are necessary for the understanding of the present invention.

A is the main shaft of the loom, journaled in the side frames A' and which drives the batten B. The batten B is actuated by the following means: On the shaft A are rigidly mounted at both its ends crank-disks a , having crank-pins projecting outward and to which are linked with one end connecting-rods b , the other ends of which are linked to pins projecting from the lower ends of the hangers c of the batten. By means of suitable spur-wheels A^2 A^3 the cam-shaft C is set in motion. This is also carried in the side frames A' . The cams C' $C^{a'}$, C^2 , C^3 , and C^{b^3} on said shaft set in motion the leaves D' D^2 D^3 , respectively, as will be hereinafter more fully explained. The four leaves D^3 work as in ordinary weaving, and they make the ordinary binding of the middle part of the weaving. They present nothing new, neither in their construction nor in their working. The leaves D' and D^2 serve for making the cross-bound selvage of the ribbon, and they are constructed and worked in the following manner: They consist each of a rectangular wooden frame extending across the whole width of the loom and on the right and left of each set of warp-threads for a ribbon. The leaf D^2 is provided with needles E, having an eye at their lower free end reaching down to the middle of the leaf. The leaf D' is provided with similar needles F, reaching from the lower lath of the frame half-way up to the middle of the leaf. Now by means of suitably-shaped cams $C^{a'}$ and C^2 on shaft C, which actuate the treadle-levers G' G^2 , and by means of the cords H, fixed at the end of these levers at bottom and to the ends of fingers J of oscillating bars K, and cords H', fixed with

their upper ends to fingers J', projecting opposite to the fingers J out of the bars K and with their lower ends to the upper horizontal laths of the frames D' and D², while to the lower laths of these frames is fixed a cord L, passing around a roller M on a wire spring M', the leaves D' D² can be raised and lowered alternately and simultaneously—that is to say, when the one goes up the other goes down. By a similar arrangement of cam C', a treadle-lever N, cords O and O', and a little oscillating roller P, with fingers P', on a pin P² the leaves D' D² can be pulled sideways, as indicated in Figs. 3, 5, 10, and 11, a spring Q pulling them back again into their original position as soon as the form of the cam C' gives the treadle N free. Now the cams C', C², and C³ are so shaped and so arranged on their shaft C that while the batten makes one complete stroke forward and backward and during the time the shuttle makes one complete run to and fro, laying in a weft-thread, a cross-binding is formed, and at the same time the cams C³ C³ cause the leaves D³ to make their ordinary movement up and down by means of treadles S, levers T, and cords R in the well-known manner. This does not form part of my patent.

The working of this mechanism for making the crossed-warp selvage is now as follows: The needle-leaf D', which makes the upper shed, goes down half the shed, and the other one D² rises an equal distance, so that warp-threads carried by their needles meet halfway—that is, in the middle of the shed. The leaf D' moves then so much toward the right, so that the thread passing through its needle, which before was on the left side of the thread passing through the needle of the leaf D², now stands right of this now the leaves are so moved up and down that they make a complete shed. This is the best mode of working; but instead of distributing the necessary movements equally upon both leaves I can attain the same result by causing one of the leaves to make the whole up-and-down stroke and the other one making only the side movements. This is indicated in Fig. 11, or I might cause one of the leaves to make both movements, as indicated in Fig. 10.

From Fig. 6 it will be seen that out of every four weft-threads one (marked I) is bound by the ordinary warp-threads in the usual manner, while the three following weft-threads (marked II, III, and IV, respectively) extend out laterally beyond the warp-threads, by which they are bound, as is weft-thread I, and bind in the loops formed by such extension the crossed-warp threads 1 2, forming the selvage at both sides. In order to be able to do this, the main shaft A must make four revolutions while the cam-shaft C is going around once. Of the warp-threads making the crossed warp those marked 1 are passed through those needles of the leaves standing upward, and those marked 2 are passed through the eyes of the needles hang-

ing down from the upper bar of the respective leaf. From Figs. 6 to 9 it will now be seen that in the position I the warp-threads 1 are in the upper shed and at the right side of the warps 2. The ordinary warp-threads 3 4, forming the middle part, are making shed in the usual manner. The weft is passed through from right to left, making the binding indicated in Fig. 9. While the threads 3 4 make new shed the cross-warps 1 2 remain in their former position and the weft is going back from the left side to the right, a new binding of the ordinary warp has been completed, Figs. 8, 9, and II, and Figs. 6 and II. On the right side the weft has passed over the cross-warp thread 2 and below the thread 1. During the next oscillation of the batten the leaf D² is raised and the leaf D' is sunk so much that it can bring its warp-thread 1, when moving toward the left, to the left side of the warp 2, thereby passing underneath of the latter. Then one of the leaves rises again and the other one goes down, each taking the level it originally occupied, Fig. 7, III, but having their places changed in lateral direction. By this a cross-binding of the cross-warps has been completed.

The arrow *x* in Fig. 6 indicates the succession of the weft. The woven fabric and the warp-threads in reality move in the other direction, as indicated by the arrow *y*.

The diagrams, Figs. 7, 8, and 9, show, in the three respective positions I, II, II^a, and III and III^a, how a complete cross-binding is accomplished, while at the same time the ordinary warp-bindings in the middle part are made. In position IV the leaves D' D² take again the position they had in position I, ready to begin with the next stroke I^a, Fig. 6, the same play and succession of movements.

It is evident that the described cross-binding may be made only on one side if the fabric produced would make such a simplified binding desirable.

I am aware that cross-bindings have been accomplished with looms before my invention, and mechanisms for making the same have been used also, and I do not claim a patent for the idea in general; but

What I do claim is—

In a ribbon-loom the combination of the needle-leaves D³ and means for raising and lowering the same to open and close the shed for the middle part of the fabric, with supplementary needle leaves or frames D', D², and mechanism including the oscillating bars K for raising and lowering the said supplemental leaves to open and close the auxiliary shed or sheds for selvage-binding, needles carried by said leaves or frames, and arranged on each side of the main body of the fabric, the needles of the said supplemental frames being respectively above and below the latter, a cam-shaft operating the raising and lowering mechanism of all the said leaves, a cam for moving laterally said supplemental needle-leaves D', a lever in contact with said cam and actu-

ated thereby for the said purpose, an oscillating pulley provided with two pins P' arranged on opposite sides of the center of the said pulley, a cord extending from one of said pins to said treadle, another cord extending from the other pin P' to the said leaf D' and a retracting-spring acting on the said frame in opposition to the pull of the cord,

all substantially as and for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

OTTO FROWEIN.

Witnesses:

R. E. JAHN,
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