

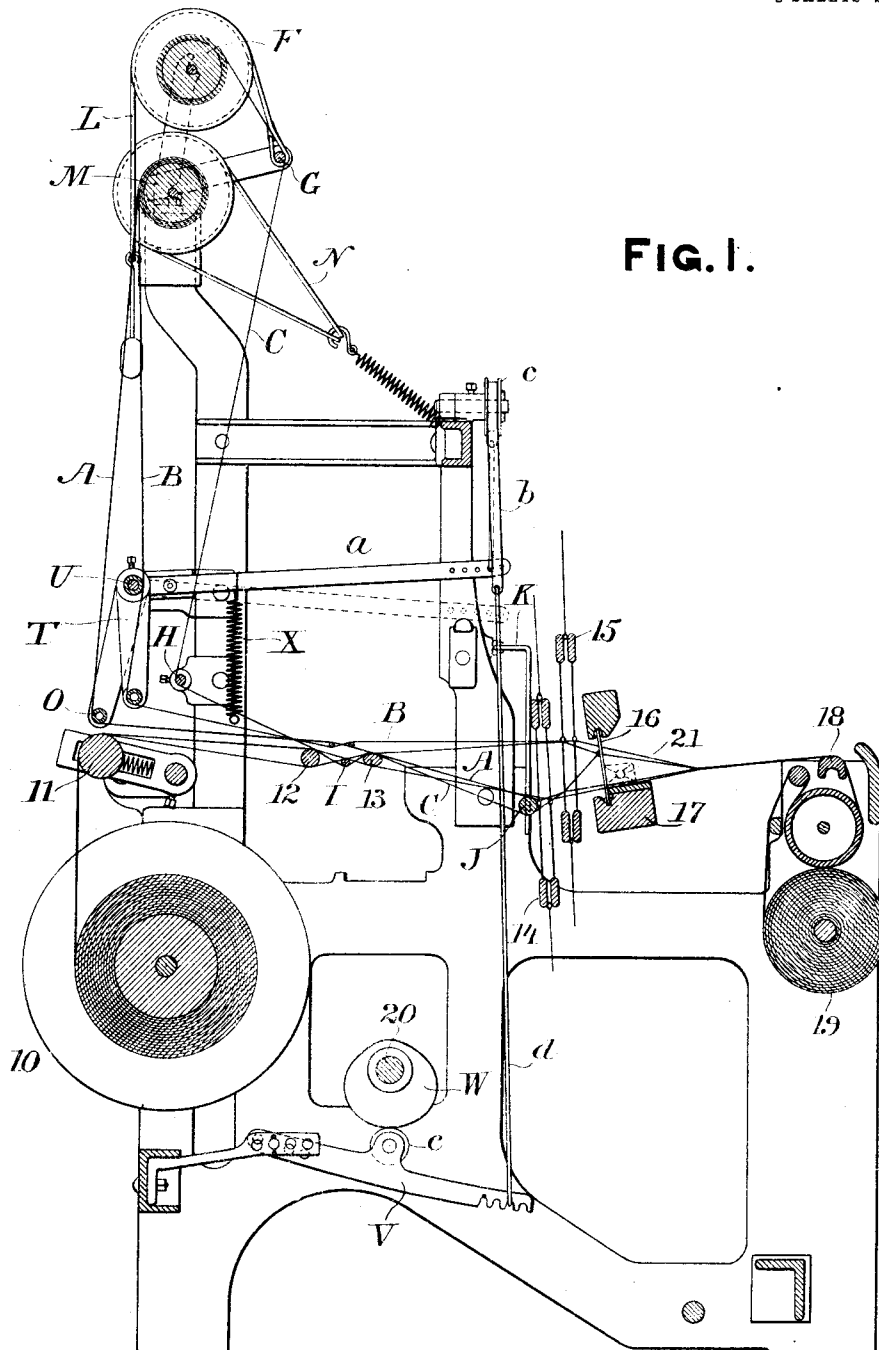
F. B. RICKETSON & J. HAMPSON.  
LENO OR CROSS WEAVING LOOM.  
APPLICATION FILED MAR. 29, 1911.

1,031,733.

Patented July 9, 1912.

2 SHEETS-SHEET 1.

FIG. 1.



Witnesses:  
Engene D. Bond.  
Theodore Simmons

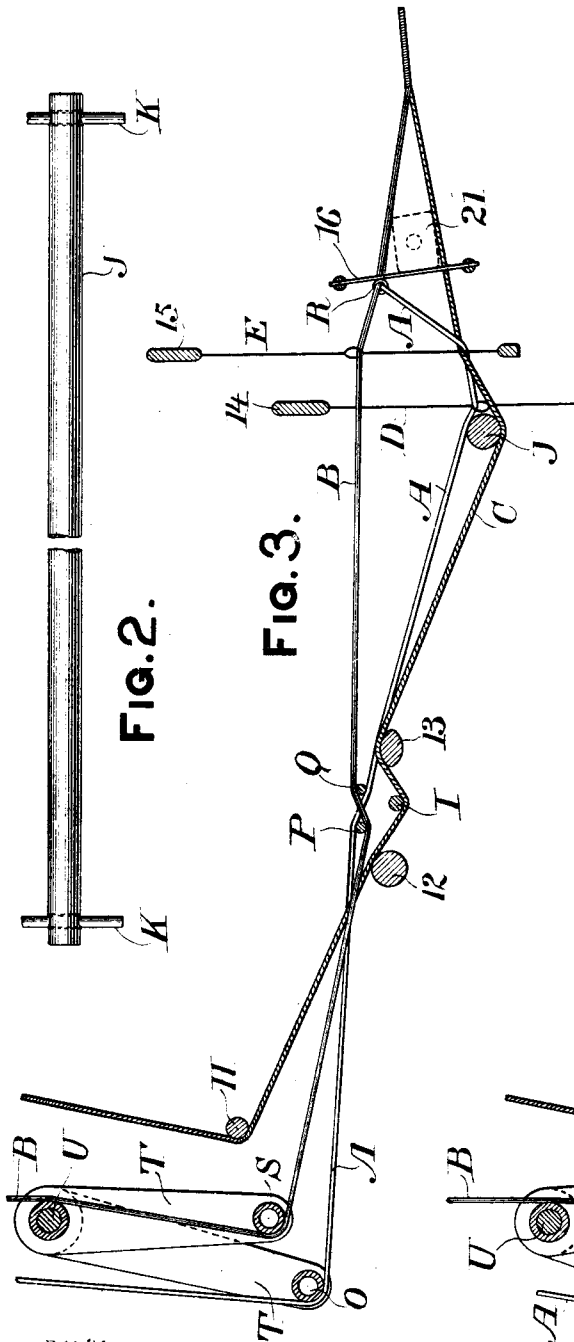
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Inventors:  
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# UNITED STATES PATENT OFFICE.

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## LENO OR CROSS-WEAVING LOOM.

1,031,733.

Specification of Letters Patent.

Patented July 9, 1912.

Application filed March 29, 1911. Serial No. 617,644.

*To all whom it may concern:*

Be it known that we, FRANK B. RICKETSON, of Pawtucket, in the county of Providence and State of Rhode Island, and JOSEPH HAMPSON, of New Bedford, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Leno or Cross-Weaving Looms, of which the following is a specification.

The present invention consists in certain improvements upon the cross-weaving or leno loom which is described in United States Letters Patent of William Hannah, No. 841,087, January 8, 1907, and No. 870,823, November 12, 1907. In accordance with the said Hannah patents, the ground ends or "warp-threads" are controlled by a harness which does not rise above the central plane of the shed; and the doup eyes are permanently attached to the loom by means of leashes.

In accordance with the present invention, the ground ends are given their half-and-return movement without the employment of any harness mechanism, but simply through a ground controlling-rod or bar, the half-stroke of which is governed by the warp threads themselves, thus simplifying the mechanical construction; and the leashes for the doup eyes are wholly dispensed with so that the doup eyes are loose and unattached to the loom except for the doup ends or "binding threads" passing through them, thereby minimizing the chafing of the threads.

In the accompanying drawings the present improvements in leno or cross-weaving mechanism are shown in connection with an ordinary two-harness plain loom adapted for weaving plain cloth having ornamental effects produced by the added cross-weaving mechanism. The improvements can, however, be otherwise used.

In the drawings Figure 1 is a vertical longitudinal section of the loom. Fig. 2 is a detailed view of a crosswise extending rod or bar, the purpose of which will hereafter appear. Figs. 3 and 4 are diagrammatic views illustrating the cross weaving instrumentalities and showing them in two different positions.

Reference numerals are used to designate the parts of the loom which are usually em-

ployed in plain or regular weaving and which take part in such weaving.

Reference letters designate the additional parts which are peculiar to the cross weaving.

As shown, the warp threads which take part in the regular weaving pass from the warp beam 10 over the whip roll 11; over and under the lease rods 12 and 13 through heddle eyes in the two harnesses 14 and 15; through the reed 16 carried by the lay 17; and thence over the breast beam 18, to the cloth roll 19. The cam shaft is shown at 20 and the shuttle at 21. All of these instrumentalities operate in the usual way to do ordinary plain weaving. Two harnesses only are shown so that the simplest character of plain weaving is done.

Coöperating with these usual instrumentalities are the special devices which perform the cross weaving. In cross or leno weaving the warp threads are commonly called the "ground" and "doup" ends respectively, and this phraseology will be followed in preference to that used in said Hannah patents. To simplify the description, a single group of the ground and doup ends will be considered. As shown in Figs. 3 and 4 there are two doup ends A and B for each ground end C. These three ends are differentiated in the drawings by shade lines on two of them.

The ground ends C do not pass through any heddle eyes, so that they are not immediately governed by the harnesses. The doup ends A and B, however, pass through the eyes of heddles D and E, (Figs. 3 and 4) which are carried by the harnesses 14 and 15 respectively, these being the same harnesses which form the shed with the regular warp threads which do the plain weaving.

The ground ends C are carried by the beam F, shown in Fig. 1 as mounted at the top of vertical standards at the upper portion of the framework of the loom. The ground ends pass from this beam F over fixed guide bars G and H; thence under a special lease rod I (located between the two lease rods 12 and 13) thence over the lease rod 13; thence under the special ground controlling rod or bar J; thence through one of the reed spaces of the lay; and thence to the cloth. The shuttle always passes over

the ground ends C, as shown in Figs. 3 and 4 which illustrate the flights of the shuttle in opposite directions.

The ground controlling rod or bar J beneath which the ground ends pass is located just back of the harnesses and forward of the lease rods and it has a rising and falling motion, being suitably guided in a vertical direction, as by the fixed guides K at the opposite sides of the loom which are shown in Figs. 1 and 2. With the exception of the ground ends, all of the other warp threads pass over this controlling rod, including the doup ends as well as the regular warp threads. When the harnesses shift and the regular warp threads and the doup ends controlled thereby come to their central level or crossing plane, the ground controlling rod J rises, being moved upwardly by the tension of the ground ends beneath it which ends are raised to the central plane of the shed both by the action thereon, of the doup ends and by the beating up of the lay. Should this lifting action be insufficient (as might be the case if only a few ground ends were employed across the width of the fabric) lifting springs could be applied to the ground controlling rod J for the purpose of raising it. The ground controlling rod can never pass above the central plane of the warp threads. As soon as the two sections of the plain warp threads pass each other, the ground controlling rod J is forced down by the descending section of the warp threads. Accordingly, the ground ends have a rising and falling movement to an extent of only about half that which the other warp threads have. It will be noted that this "half rise and fall" of the ground ends is similar to the half movement which is imparted by the usual "jumper" of former leno looms; and that with the present invention the desired rise is secured by the simple rising and falling guided half-stroke ground controlling rod which is itself moved up and down by the threads themselves, aided in rising, it may be, by springs.

The ground ends are under light tension only. Accordingly, they are carried by the independent beam F to which only a light let-off brake L is applied.

Both sets of the doup ends A and B are carried by the same beam M, which is mounted just beneath the ground end beam F. Let off tension is applied to the beam M by the spring governed brake N. Each doup end A passes from the beam M around the slackener O; thence over and under lease rods P and Q (Figs. 3 and 4); thence through the eye of a heddle D of the rear harness 14; thence through a doup eye R, located between the front harness 15 and the reed 16 of the lay; thence through one of the reed spaces to the cloth. Each of the doup ends

B passes from the beam M around a slackener S; thence under and over the lease rods P and Q; thence through the eye of a heddle E on the front harness; thence through the same doup eye R; thence through one of the reed spaces to the cloth. The doup eye R in connection with the two slackeners O and S always maintains both doup ends A and B above the shuttle, so the shuttle in its flights in both directions always passes beneath both doup ends. The doup eye R also insures maintenance of the appropriate relation between the doup ends A and B and the ground end C. Before explaining this relation, however, the action of the two slackeners O and S will be explained.

Each of the slackeners is governed by a cam and intermediate instrumentalities, and as this controlling mechanism for each slackener is the same, only that for one slackener is illustrated; it being understood that the two controlling cams for the two slackeners are properly timed both with respect to each other and with the weaving instrumentalities, so that each slackener is moved to slacken and tighten the ends governed by it at the right moments. As shown in Fig. 1, the slackener S is carried at the lower end of arms T (one only being shown) which rock on a bearing U. One of these arms T has a forward extension  $a$ , which is connected by a strap  $b$  passing over a pulley  $c$  to a rod  $d$  connected at its lower end to a lever V, which has a roll  $e$  bearing upon a cam W on the cam shaft 20 of the loom. This roll  $e$  is maintained in contact with the cam W by means of a spring X which pulls down on the extension  $a$ . By reason of this construction the slackener S will be vibrated back and forth at appropriate times for the purpose of slackening and tightening the doup ends B. In just the same way the slackener O is vibrated back and forth to slacken and tighten the doup ends A, the two slackeners working in alternation.

One ground end C and the two coöperating doup ends A and B (which both pass through the same doup eye R) extend through the same reed space. The ground end C passes between the two heddles D and E which control the two coöperating doup ends A and B respectively, as shown in Figs. 3 and 4. As shown in these two figures the ground end C passes in front of the heddle D and behind the heddle E.

Assuming the initial position to be that shown in Fig. 3, wherein the harness 15 is raised and the harness 14 is lowered, then the doup end B is taut and the doup end A is slack. Accordingly, the doup eye R is held elevated by the taut doup end B; and the slack doup end A passes at a steep angle from the eye of its heddle D to and through the elevated doup eye R, so that said slack

doup end A (forward of the doup eye) is maintained in the upper plane of the shed together with the taut doup end B with the result that the shuttle passes under both doup ends.

The ground end C is held down by the ground controlling rod J (which in turn is held down by the overlying warp threads occupying the lower plane of the shed) and it extends forwardly above the slack doup end A; and thence extends along the lower plane of the shed so that the shuttle passes over it.

The shuttle having passed, the two harnesses 14 and 15 cross to the position shown in Fig. 4; and during their crossing the ground controlling rod J and the ground end C rise to the central plane of the shed and thence descend again to the lower position. During this crossing of the two harnesses, the two slackeners O and S move in opposite directions so that doup end A is now taut and doup end B is now slack; but, as these two doup ends have reversed their positions so that taut doup end A is now uppermost, it maintains the doup eye R in the upper plane of the shed, and the slack doup end B now passes abruptly upward from the eye of its heddle E to the loose eye R, so that it passes forwardly with the taut doup end A along the upper plane of the shed and over the shuttle.

The ground end C now passes over the slack doup end B and along the lower plane of the shed beneath the shuttle. Consequently in its succeeding traverse the shuttle passes under and above the ground end just as before and as in ordinary leno weaving.

The interlocking of the ground end with the two doup ends by the shuttle or weft thread is due to the alternate crossing of the two doup ends with respect to the ground end, and this alternate crossing is due to the action of the group eye R in connection with the slackening and tightening of the two doup ends passing therethrough, as in said Hannah patents.

In the specific fabric made by the illustrated loom the doup ends extend lengthwise of the finished fabric and the ground end zig zags back and forth. This effect is produced by the slight tension on the ground ends imposed by the weighted brake L on beam F, and consequently, in the beating up of the weft each ground end is beaten into zig zag form.

If the ground and doup ends are arranged at different places across the loom and hence across the fabric longitudinally raised stripes will be woven along the face of the fabric. If the ground ends are of appropriate texture and quality and contrasting in color with the body of the fabric, they will conceal the doup ends on

the face of the fabric so that they form solid colored stripes extending lengthwise of the fabric and contrasting in color therewith. This, however, is only one instance of the character of fabric which can be woven with a single embodiment of the improvement. Each end may be composed of several strands.

The characteristic differences between the present improvement and former methods and appliances for leno or cross weaving are apparent. Leashes for the doup eyes are entirely dispensed with thereby avoiding the friction incident thereto. The doup eyes are wholly unattached to the loom except for the doup ends passing through them. The loose unattached doup eyes R can be made of any durable material. They may be made of porcelain or glass or of hard metal. They are simple and inexpensive and if made of proper material wear indefinitely. In actual practice they may be much smaller than shown in the drawings which exaggerate their size in order to accommodate the exaggeratedly illustrated threads.

The improvements can be applied to a loom having any ordinary harness movement. It is not necessary to use a dobby or equivalent mechanism for giving peculiar movements to the harnesses. The simple rising and falling half-stroke ground controlling rod J dispenses with the employment of a "jumper," or a harness for the ground ends.

The improvements can be applied to any usual weft-replenishing loom, so that a single weaver can look after a large number of looms, thus greatly decreasing the cost of production of leno fabrics. Indeed, the additional labor developing upon the weaver is so slight that a good weaver can run practically the same number of weft replenishing looms as if the improvements were not applied thereto.

Fig. 1 of the present drawings illustrates the improvements added to the well known Northrop automatic weft replenishing loom, such as is illustrated, for example, in United States Letters Patent No. 529,940, November 27, 1894. Except for the parts to which reference letters are applied the illustrated loom is one of the usual Northrop looms.

In the illustrated construction the shuttle passes over the ground ends C and beneath the doup ends A and B, so that as the cloth passes over the breast beam, the ornamental effects produced by the leno instrumentalities are on the under side of the cloth. This is not essential, however, since the instrumentalities can be arranged and timed so that the leno effects will be produced on the upper face of the fabric. In such case the ground controlling rod J, would be above

all of the warp threads excepting the ground ends C.

It will be noted that the loose unattached doup eye R crosses the ground end when all of the warp threads are substantially at the central shed plane. Consequently the loose unattached doup eye R can freely pass the ground end carrying with it the appropriate doup end without interference or undue friction.

We claim—

1. A cross-weaving loom having, in combination, two full-stroke oppositely moving harnesses controlling two sets of doup ends; a warp-beam for said doup ends; two independently moving slackeners for said two sets of doup ends respectively; a warp-beam for a set of ground ends, each ground end passing between two heddles carrying two of the doup ends; a reed through one space of which pass a pair of the doup ends and one of the ground ends; a loose unattached doup eye between the harnesses and the reed for each pair of doup ends; a half-stroke ground controlling-rod for the ground ends which is moved to the central shed plane by the ground ends and back by the other warp ends; and means for moving said slackeners so that, when the shed is open, the set of slack doup ends before reaching its harness is in the same shed plane as the ground ends, while the other set of doup ends is taut.

2. A loom having, in combination, warp-beams for the plain warp ends and for two sets of doup ends; two full-stroke oppo-

sitely moving harnesses controlling the plain warp ends and the two sets of doup ends; two independently moving slackeners for said two sets of doup ends respectively; a warp-beam for a set of ground ends, each ground end passing between two heddles carrying two of the doup ends; a reed through one space of which pass a pair of the doup ends and one of the ground ends; a doup eye between the harnesses and the reed for each pair of doup ends; and a half-stroke ground controlling rod for the ground ends which is moved to the central shed plane by the ground ends and back by the plain warp ends; means for moving said slackeners so that, when the shed is open, the set of slack doup ends before reaching its harness is in the same shed plane as the ground ends while the other set of doup ends is taut; and a shuttle carrying a single weft thread coöperating with all of said warp threads.

3. A cross-weaving loom having a ground controlling-rod moved in one direction from the central shed plane by the warp threads when forming the shed, and means for returning said rod to the central shed plane when the shed is closed.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

FRANK B. RICKETSON.  
JOSEPH HAMPSON.

Witnesses:

MILTON PAYNE,  
GEORGE T. GREENHALGH.