

No. 708,951.

Patented Sept. 9, 1902.

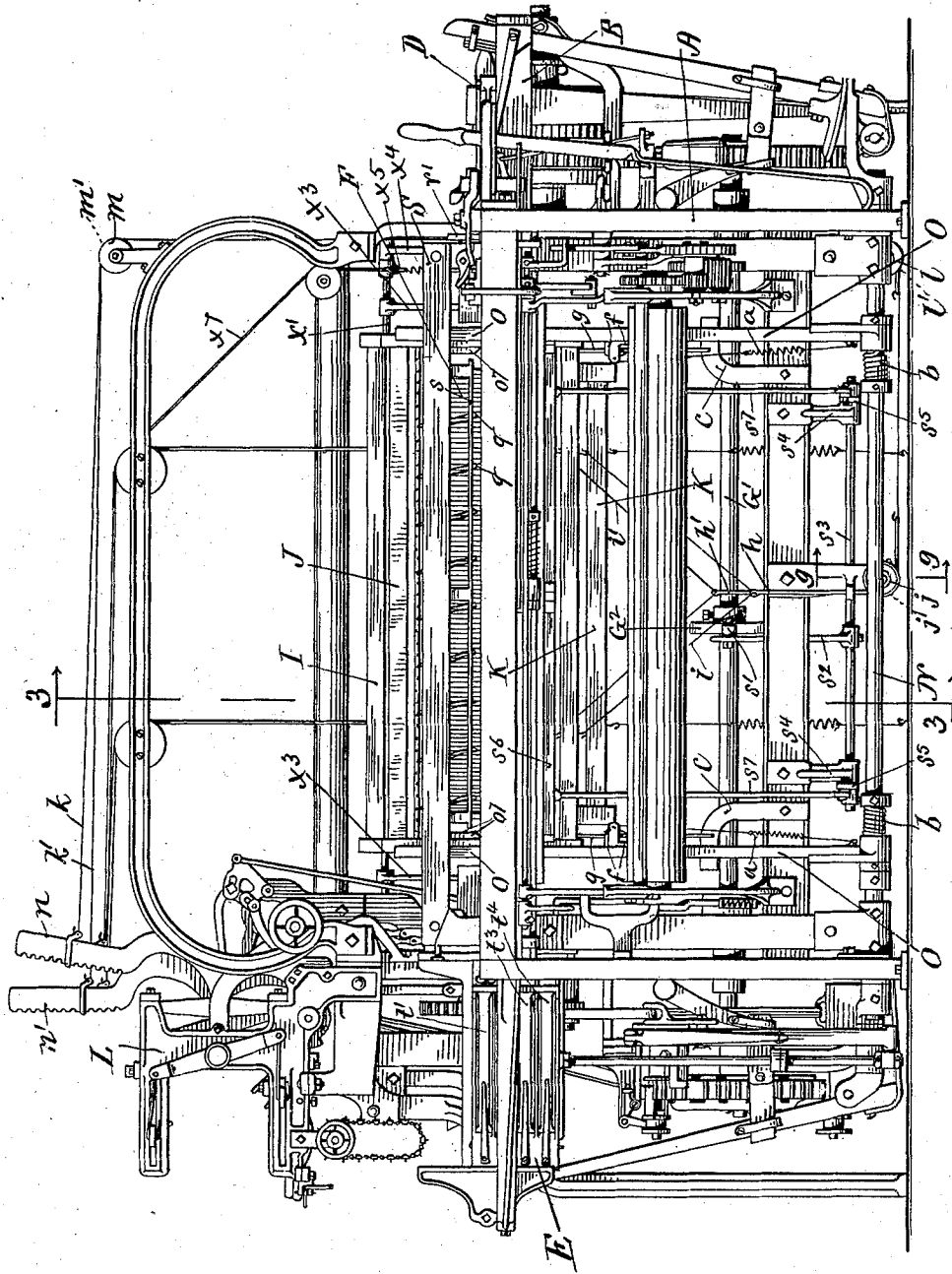
E. H. BALLOU.

LENO LOOM.

(Application filed May 27, 1901.)

(No Model.)

7 Sheets—Sheet 1.



WITNESSES:

Henry J. Garreau
Andrew J. Pitcher

FIG. 1.

INVENTOR:

Eugene H. Ballou
S. Scholfield.

BY ATTY.

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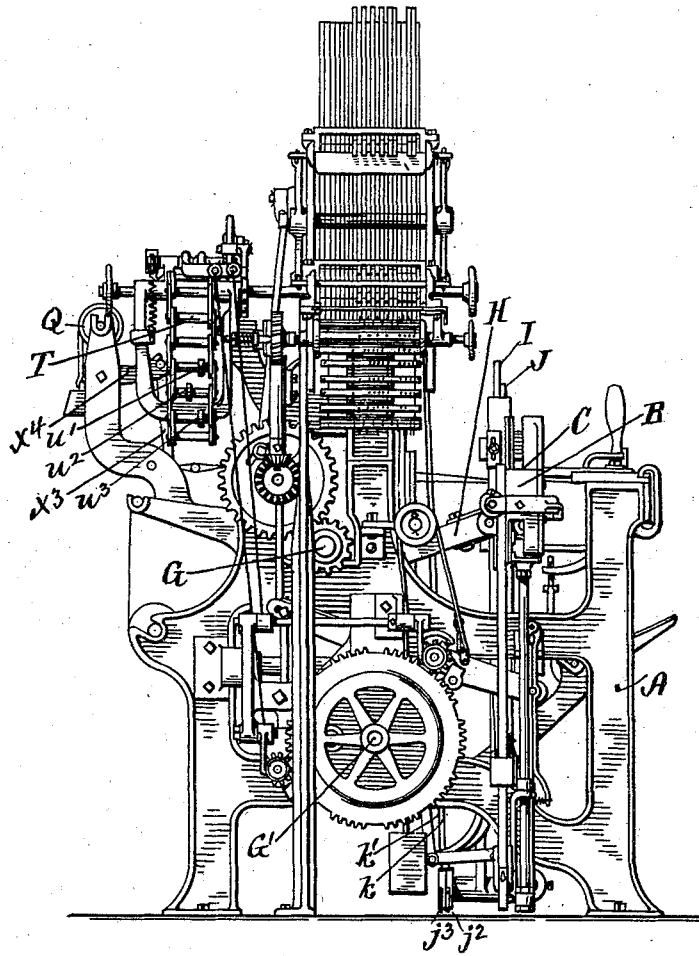


FIG. 2.

WITNESSES:

Harry J. Garceau
Andrew J. Pelletier

INVENTOR:

Eugene H. Ballou

BY *S. Scholfield*
ATTY.

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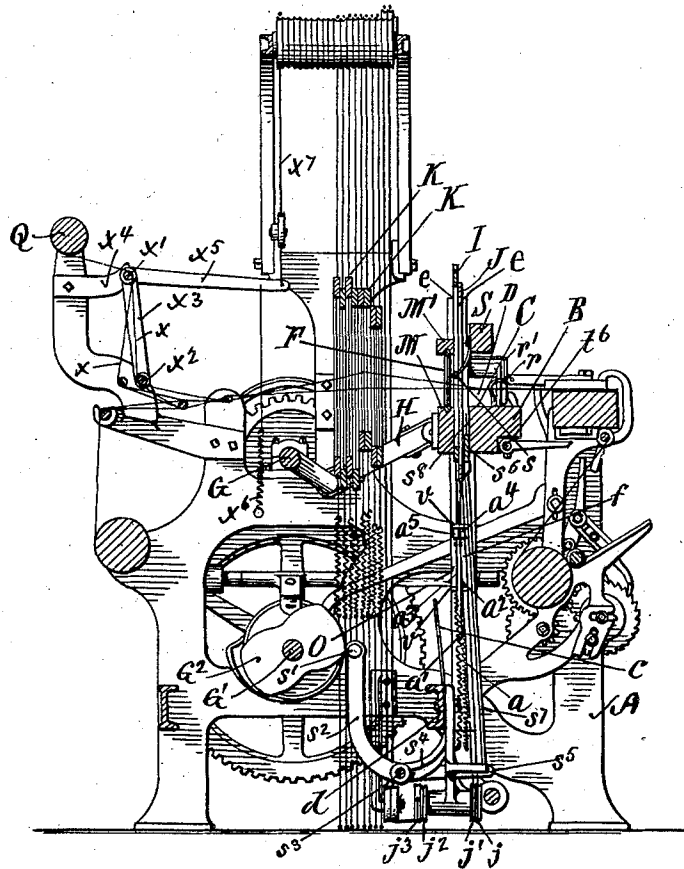


FIG. 3.

WITNESSES:

Harry J. Garceau
Andrew J. Pletcher

INVENTOR:

Eugene H. Ballou
BY *S. Scholfield*
ATTY.

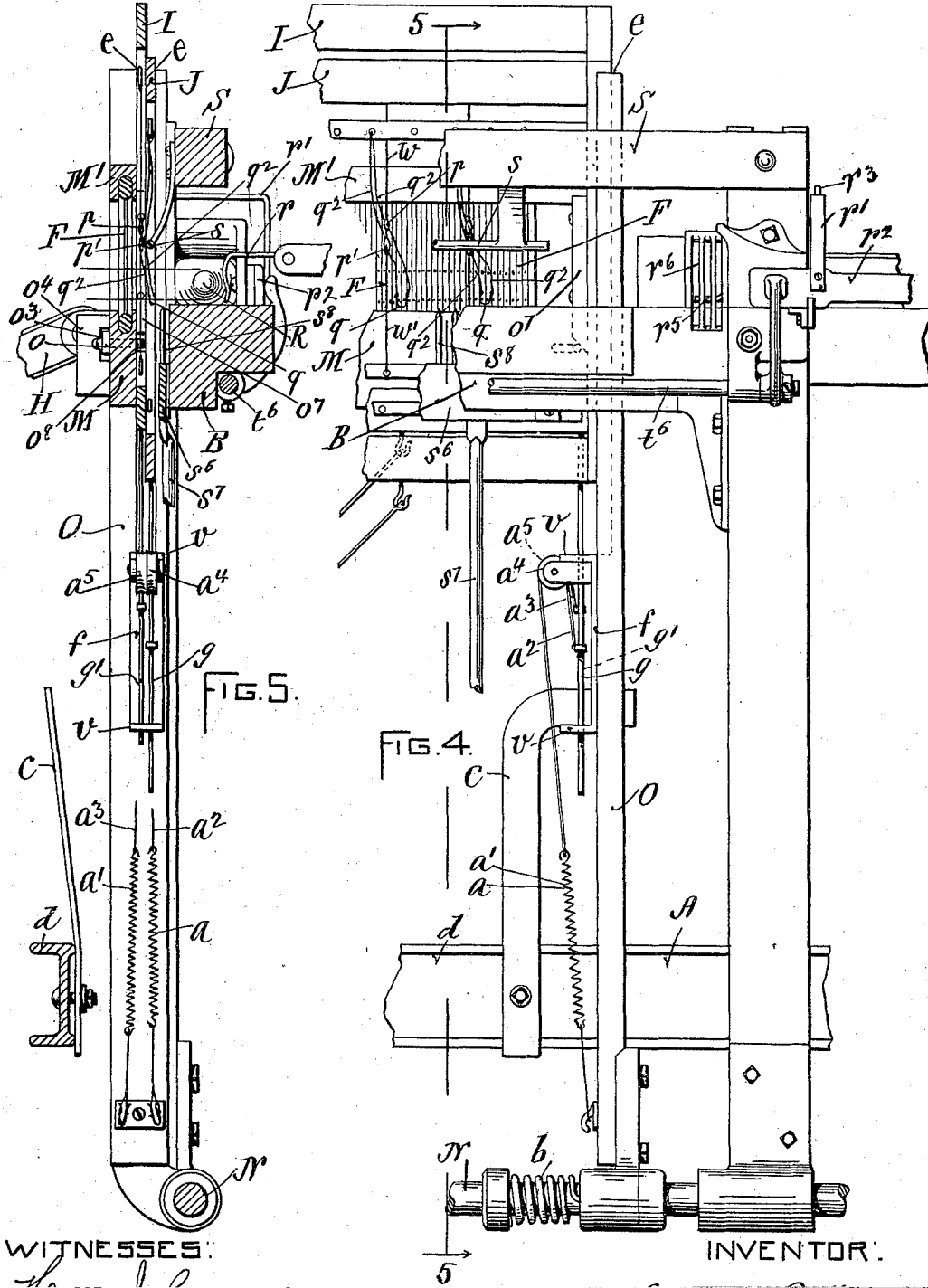
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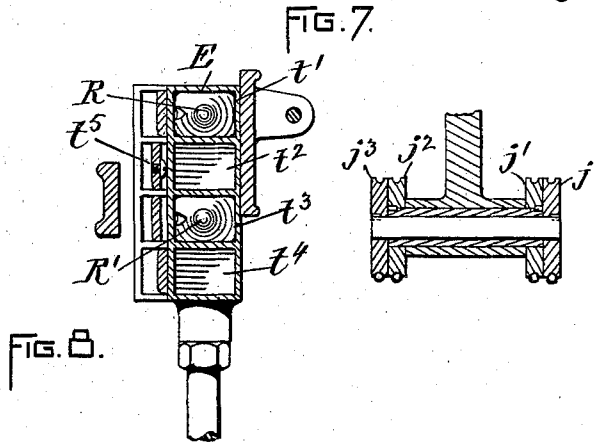
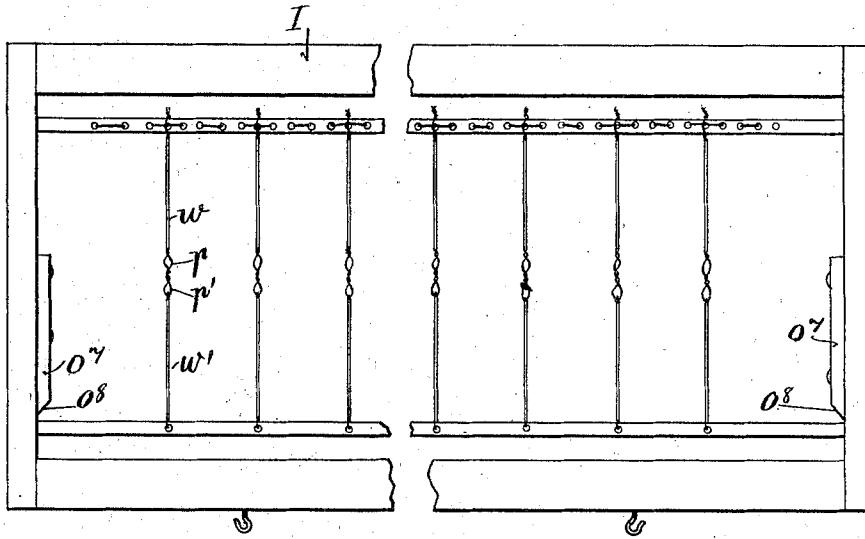
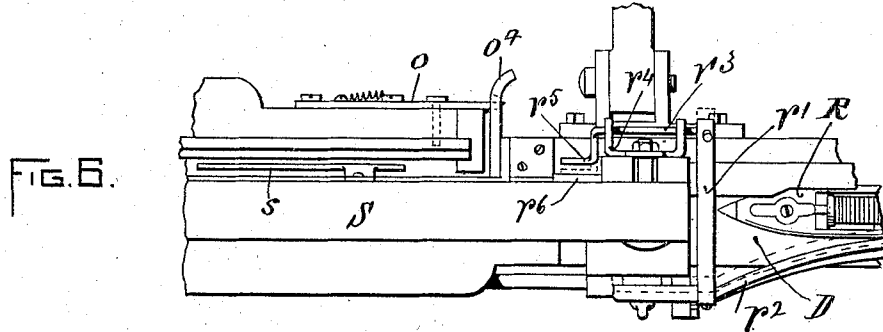
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(Application filed May 27, 1901.)

(No Model.)

7 Sheets—Sheet 5.



WITNESSES:

Harry J. Garceau
Arthur J. Peterson

INVENTOR:

Eugene H. Ballou

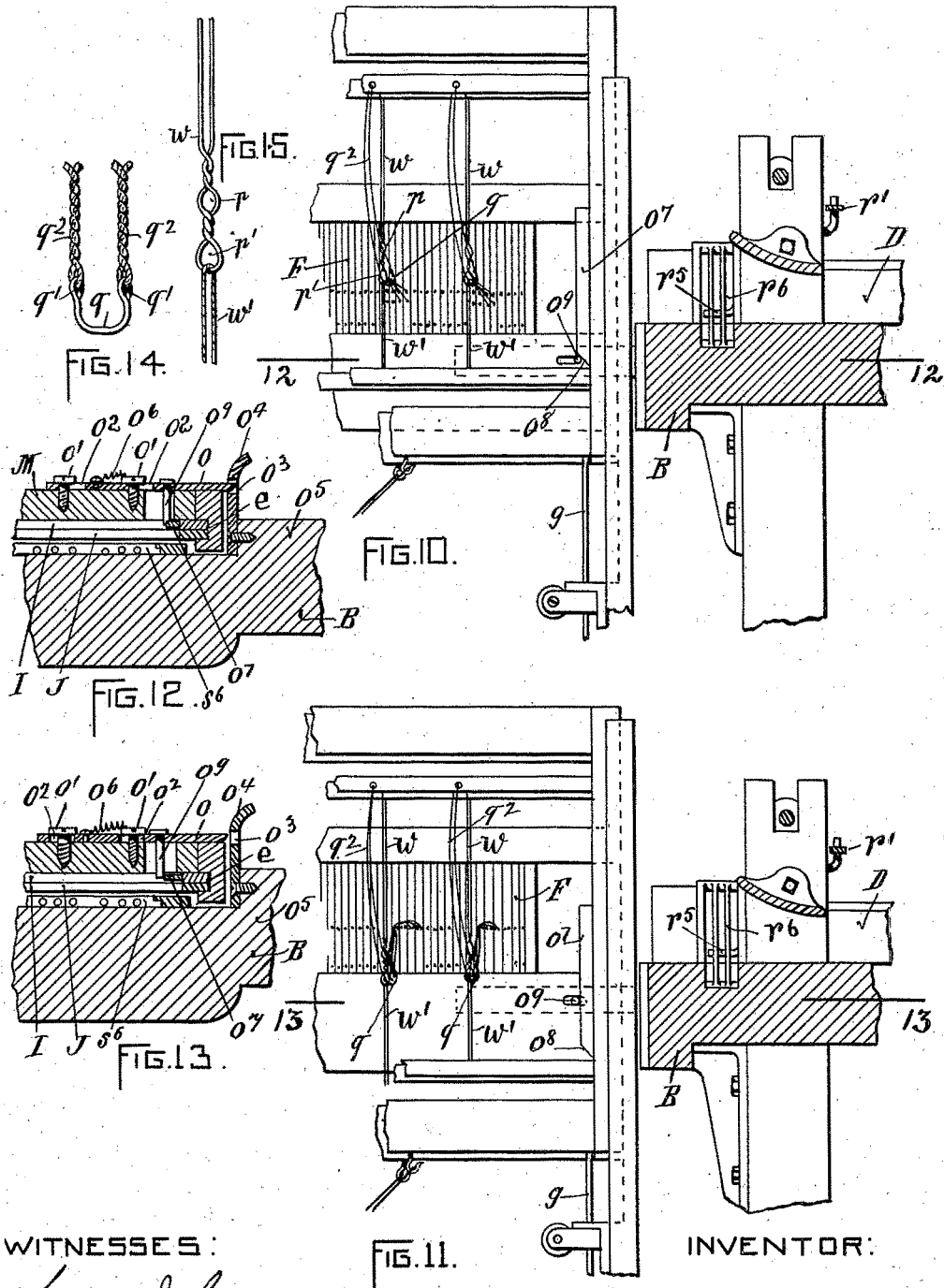
BY *S. Scholfield.*
 ATTY.

E. H. BALLOU.
LENO LOOM.

(Application filed May 27, 1901.)

(No Model.)

7 Sheets—Sheet 6.



WITNESSES:

Harry J. Garceau.
Andrew J. Peterson

INVENTOR:

Eugene H. Ballou
S. Scholfield
ATTY.

BY

UNITED STATES PATENT OFFICE.

EUGENE H. BALLOU, OF PAWTUCKET, RHODE ISLAND.

LENO-LOOM.

SPECIFICATION forming part of Letters Patent No. 708,951, dated September 9, 1902.

Application filed May 27, 1901. Serial No. 62,162. (No model.)

To all whom it may concern:

Be it known that I, EUGENE H. BALLOU, a citizen of the United States, residing at Pawtucket, in the State of Rhode Island, have invented a new and useful Improvement in Leno-Looms, of which the following is a specification.

Heretofore in leno-weaving the warp-threads to be crossed have been made to pass through a single dent in the reed and the crossing effected by means of doup and standard harnesses located back of the reed; but in carrying out my invention the warp-threads to be crossed are passed through several of the dents of the reed, and the crossing of the threads is effected by means of doup and standard harnesses located in front of the reed; and my invention consists in the employment of a doup and standard harness in front of an independent reed which is detachable from the lay, also in means for preventing the stopping of the loom by the action of the weft-fork when the loom is making the blank picks required for the proper weaving of the fabric, and also in improved details of construction, as hereinafter set forth.

In the accompanying drawings, Figure 1 represents the front elevation of a loom provided with my improvement. Fig. 2 represents an end view of the same. Fig. 3 represents a vertical section taken in the line 3 3 of Fig. 1. Fig. 4 represents an enlarged detail view showing a front view of the doups when the loom is making the plain weave. Fig. 5 represents a section taken in the line 5 5 of Fig. 4, showing an edge view of the doups. Fig. 6 represents a detail view showing the protector-arm for preventing the stoppage of the loom when making the required blank picks. Fig. 7 represents a side view of the standard harness. Fig. 8 represents a transverse section of the drop-box of the loom. Fig. 9 represents an axial section taken in the line 9 9 of Fig. 1 to show the construction of the pulleys for operating the doup and standard harnesses. Fig. 10 represents a detail front view showing the doups when they are drawn up for making the required turn of the leno warp-threads. Fig. 11 represents a detail front view showing the doups when the turn of the warp-threads has been made. Fig. 12 represents a section taken in the line

12 12 of Fig. 10 showing the reed-beam in locked engagement with the lay-beam. Fig. 13 represents a section taken in the line 13 13 of Fig. 11, showing the reed-beam unlocked from the lay-beam. Fig. 14 represents an enlarged view of metallic loops which form the bight of the doup. Fig. 15 represents an enlarged view of the eye portion of one of the heddles of the standard harness and the bight of the soft portion. Fig. 16 represents a section showing the reed and the connected standard and doup harnesses when disengaged from the lay-beam. Fig. 17 represents the warp-thread crossing of the leno fabric.

In the drawings, A represents the frame of the loom; B, the lay; C, the shuttle-race; D, a single shuttle-box at one end of the loom; E, a drop shuttle-box of four box members at the opposite end of the loom; F, the reed; G, the crank-shaft; H, the pitman connecting the crank-shaft with the lay; I, the standard harness; J, the doup-harness, and K K the weaving-harnesses, which latter are operated, as usual, from the dobbie L. The reed F is made separable from the lay and supported for operation by means of the swords O O, which are pivoted upon the pivot-rod N of the lay, the said swords being actuated backwardly from contact with the lay-beam by means of the torsion-springs *b b*, held upon the pivot-rod, the backward movement of the said swords being checked by means of the flat buffer-springs *c c*, attached to the tie-beam *d* of the frame A. The reed F is held between the reed-beam M and the top rail M', and in front of the reed-beam and moving in suitable guideways *e e*, formed at the inner sides of the swords O O, is placed the standard harness I, and in front of the standard harness is placed the doup-harness J, also moving in the guideways *e e*, formed in the said swords. The doup and standard harnesses are held at their elevated positions, as shown in Figs. 4 and 16, by means of the spiral springs *a a'*, to which are attached the cords *a² a³*, passing over the sheaves *a⁴ a⁵*, which are held by the brackets *f f*, attached to the inner sides of the said swords O O, the said cords then passing downward to their points of attachment to the rods *g g g' g'*, which rods serve to support the doup and standard

harnesses by contact with the lower edges of the harness-frames, the said rods being held and guided by means of suitable perforations made in the ears *vv* of the bracket *f*, through
 5 which the said rods pass and serve to impart upward movement to the said harnesses. The required downward movement of the doup and standard harnesses is imparted by means of the straps *h h'*, which are connected with
 10 the lower shafts of the said harnesses by means of the wire connections *i* and *i'* and attached to the sheaves *j j'*, respectively. The sheave *j²* is connected with the sheave *j* and the sheave *j³* with the sheave *j'*, as shown in
 15 Fig. 9, and from the said sheaves *j² j³* connection is made to the operating-levers *n n'* of the dobby L by means of flexible connection *k k'*, which pass over the sheaves *l l'* and *m m'* to the said dobby-levers. The reed F is
 20 secured to the lay to beat up the weft by means of the sliding catch-bolt *o*, (shown in Figs. 10 and 13,) secured to the back of the reed-beam M by means of the screws *o' o'* and the slots *o² o²*, the said catch-bolt being actuated in a forward direction for engagement
 25 with the perforations *o³* in the catch-plate *o⁴*, attached to the lay-beam *o⁵*, by means of the spring *o⁶*, the said catch-bolt being actuated for release from engagement with the said
 30 catch-plate by means of the cam projections *o⁷*, attached to the inner edge of the end bars of the standard harness, as shown in Fig. 7, whereby upon the downward movement of the said harness the reed will be released
 35 from the lay, the inclined end *o⁸* of the said cam projection engaging with the stud *o⁹* of the catch-bolt to cause the disengagement, as shown in Fig. 13. The upper portion *w* of the heddles of the standard harness I is made
 40 of wire, with the eyes *p p'* formed by twisting the wire loop, as shown in Fig. 15, and in order to prevent injurious action upon the weft-threads at the beat-up of the lay I make the lower portion *w'* of the heddle of soft cord,
 45 by means of which such injurious action will be prevented, and in order to prevent the injurious wear of the doup, which in its movement back and forth with the lay is in frictional engagement with the inclosed warp-threads, the holding-loop *q* is preferably made
 50 of metal and provided at its ends with eyes *q' q'*, to which the doup-harness cords *q² q²* are attached, one of the said cords being made to pass through the eye *p* and the other through
 55 the eye *p'* of the standard heddle, as shown in Figs. 4 and 5. In operating the loom it is necessary to make blank picks or picks in which the shuttle is not driven across the shuttle-race, and in this case it is necessary to provide
 60 means for preventing the engagement of the weft-fork *r* with the stop mechanism, and for this purpose I attach the arm *r'* rigidly to the shuttle-binder *r²* and connect the bent lever *r³* to the back of the sword of the lay by means
 65 of the bracket *r⁴*, the lower arm *r⁵* of the said bent lever *r³* extending parallel with the grid *r⁶* for the weft-fork, the upwardly-extending

arm of the bent lever *r³* being made to pass loosely through a perforation made in the end
 70 of the arm *r'* of the shuttle-binder, the said arm *r'* and bent lever *r³* being so arranged that when the shuttle is absent from the shuttle-box D at the beat of the lay the guard-arm *r⁵* will lie in close proximity to the back of the grid *r⁶*, as shown in Fig. 16, and engage
 75 with the weft-fork to prevent the action of the stop mechanism; but when the shuttle R is in the shuttle-box D the outward movement of the shuttle-binder will cause the outward movement of the guard-arm *r⁵* away from the
 80 grid, thus allowing the weft-fork to act upon the weft-thread, so as to stop the loom whenever the thread is missing. To the hand-rail S of the lay is attached the protector-rod *s*, which serves to hold the several doups of the
 85 doup-harness out of the path of the flying shuttle. Upon the cam-shaft G' is placed the cam G², which engages with the roller *s'* upon the upper end of the arm *s²*, secured to the rock-shaft *s³*, held in the bearing-brackets *s⁴*
 90 *s⁴*, and to the opposite ends of the shaft *s³* are secured the arms *s⁵ s⁵*, from which connection is made with the shuttle guide-bar *s⁶* by means of the connecting-rods *s⁷ s⁷*, the pins *s⁸*
 95 of the shuttle guide-bar being projected upward with the shed to form a guide for the shuttle when the reed and the connected doup and standard harnesses are disengaged from the lay-beam and to protect the harnesses
 100 from the action of the shuttle when they are connected to the lay. The loom is provided at one end with a single shuttle-box D and at the opposite end with the drop shuttle-box E, which is shown as provided with four members
 105 *t' t² t³ t⁴*, of which the box *t²* is a blank into which the shuttle does not pass, the said box being provided with a projection *t³*, which represents a deflected shuttle-binder, in order that when the blank box *t²* is brought in line
 110 with the shuttle-race to make the required blank picks of the loom in which the shuttle does not pass through the shed the protector or stop-rod *t⁶* of the loom will not be operated. The lower box *t⁴* is adapted for a shuttle carrying colored filling for weaving cross stripes
 115 or checks, and when this shuttle is not employed the proper arrangement of rollers *u' u² u³* upon the pattern-chain T for operating the drop shuttle-box is shown in Fig. 2, the upper box *t* being in this case adapted for a
 120 shuttle R, which carries the ground filling, while the box *t³* is adapted for a shuttle R', carrying the coarse filling-thread required for binding the several warp-threads which are turned by the action of the doups. The mechanism for raising and lowering the drop shuttle-box is the same as that in common use, and therefore does not need particular description.

In the operation of the loom the doups are
 130 always down, as shown in Fig. 4, when making the plain weave, and when making the cross-weave the doup-harness J is raised and carries the doups into the eyes *p p'* of the

standard heddles *w*, as shown in Fig. 10. The doup and standard harnesses then both go down together to make the cross, as shown in Fig. 11, and at the same time the reed-beam M becomes unlocked from the lay-beam by the engagement of the cam projections *o*⁷, attached to the inner edge of the end bars of the standard harness I with the studs *o*⁹ of the catch-bolts *o*, and then the connected reed and the doup and standard harnesses are carried back to their rearward position, as shown in Fig. 16, by the action of the torsion-springs *b b*. Then the drop shuttle-box is to be raised, so as to bring the blank member *b*² of the shuttle-box in line with the shuttle-race, the ground-filling shuttle being then in the upper box *t*, as shown in Fig. 8. Then two blank picks are to be made by the loom, the doup and standard harnesses I and J being lowered by the action of the dobbie L during the time of making the second blank pick to cause the release of the reed and the connected doup and standard harnesses from the lay, and then the drop shuttle-box is to be still further raised, so as to bring the box *t*³ in line with the shuttle-race and two picks of the loom made with the coarse filling-thread shuttle R'. Then the drop-box is to be lowered to again bring the blank shuttle-box member *b*² in line with the shuttle-race and two blank picks made as before, the doup and standard harnesses I and J being then raised by the action of the dobbie L during the time of making of the second blank pick to cause the engagement of the reed and the connected doup and standard harnesses with the lay, the yielding movement of the buffer-springs *c c* upon the impact of the swords O O therewith serving to allow sufficient time for the proper engagement of the catch-bolt *o* with the catch-plate *o*⁴, whereby the reed and the doup and standard harnesses will be locked to the lay for continued action therewith. Then the drop shuttle-box is to be lowered, so as to bring the upper box *t* in line with the shuttle-race, as shown in Fig. 11, and thereafter the plain weaving resumed with the ground-filling shuttle R, and this operation repeated will result in the production of a fabric such as is represented in Fig. 17, the threads after passing through the dents of the reed being grouped together in the doups and crossed in the weaving. The warp-threads *x*, which are crossed by action of the doup and standard harnesses, are spooled upon the beam Q, and the warp-threads which pass through the doups pass from the beam Q over the rod *x*¹ and around the rod *x*², the said rods being held together by opposite arms *x*³ *x*³ to form a pendent frame, which is pivoted in the bearing-brackets *x*⁴ *x*⁴, the said frame being provided with the projecting arm *x*⁵, from which connection is made downwardly to the spring *x*⁶ and upwardly to one of the levers of the dobbie by means of the cord *x*⁷, whereby when the threads in the doups are being crossed over the other threads the doup-

threads may be properly slackened by the action of the dobbie, while their weaving tension will be preserved by the action of the spring.

It is evident that my improvement may be adapted to a pick and pick-loom, and in that case it will not be necessary to make two blank picks, a single blank pick being sufficient for the proper weaving of the fabric, the said blank pick serving to provide room for beating up the cross of the leno warp-threads without causing the distortion of the fabric.

I claim as my invention—

1. In a leno-loom, the combination of the lay, with a reed detachable from the lay, and doup and standard harnesses held for operative movement in front of the reed, and means for imparting such movement.

2. In a leno-loom, the combination of the lay, with a reed detachable from the lay, and doup and standard harnesses, arranged for operation in front of the reed, and means for locking the combined reed and doup and standard harnesses to the lay, and for disengaging the same.

3. In a leno-loom, the combination of the lay, with a reed detachable from the lay, and doup and standard harnesses arranged for operation in front of the reed, means for locking the combined reed and doup and standard harnesses to the lay, and for disengaging the same, and the metallic loops by means of which the doups of the doup-harness are adapted to resist the wear caused by the forward and backward movement of the doup-harness with the lay.

4. In a leno-loom, the combination of the lay, with a reed detachable from the lay, and doup and standard harnesses, arranged for operation in front of the reed, and adapted to swing back and forth with the lay, means for locking the combined reed, and doup and standard harnesses to the lay, and for disengaging the same, and the soft lower portion of the standard-harness heddles, whereby the heddles are made adapted for beating up the weft in front of the reed.

5. In a leno-loom, the combination of the lay, with a reed detachable from the lay, and doup and standard harnesses arranged for operation in front of the reed, means for locking the combined reed, and doup and standard harnesses to the lay, and for disengaging the same, and the spring-buffers limiting the backward movement of the reed and the doup and standard harnesses.

6. In a leno-loom, the combination of the lay, with a reed detachable from the lay, and doup and standard harnesses arranged for operation in front of the reed, means for locking the combined reed, and doup and standard harnesses to the lay, and for disengaging the same, the shuttle guide-bar having guide-pins attached thereto, and means for raising the pins of the shuttle guide-bar into the shed.

7. In a leno-loom, the combination of the

- lay, and a drop shuttle-box provided with a box for holding a ground-filling shuttle, and a box for holding a shuttle which carries the binding-thread for securing the crossed warp-threads, and means attached to the drop shuttle-box to provide for the normal actuation of the lay upon the protector-rod, when the shuttle is not thrown through the shed at the crossing of the grouped warp-threads.
8. In a leno-loom, the combination of the lay, and a drop shuttle-box provided with a box for holding a ground-filling shuttle, a box for holding a shuttle carrying the binding-thread for the crossed warp-threads, and a blank shuttle-box member provided with a projection representing a deflected shuttle-binder.
9. In a leno-loom, the combination of a drop shuttle-box provided with a box for holding the ground-filling shuttle, a box for holding the shuttle carrying the binding-thread for the crossed warp-threads, a blank shuttle-box, and a projection which represents a deflected shuttle-binder, with the shuttle-binder of the shuttle-box at the opposite end of the lay, the weft-fork, the grid and the guard-arm, arranged back of the grid, and connected with the shuttle-binder.
10. In a leno-loom, the combination of the reed, and the standard and doup harnesses held for operation in front of the reed, with

the lay, and the doup-protecting rod attached to the lay to prevent the engagement of the doups with the flying shuttle.

11. In a leno-loom, the combination of the reed, and the standard and doup harnesses held for operation in front of the reed, with the lay, the shuttle guide-bar provided with the guide-pins, and means for raising the pins into the shed at each backward movement of the lay.

12. In a leno-loom, the combination of the reed, and the standard and doup harnesses held for operation in front of the reed, with the lay, the doup-protecting rod, attached to the lay to prevent the engagement of the doups with the flying shuttle, the shuttle guide-bar provided with the guide-pins, and means for raising the pins into the shed at each backward movement of the lay.

13. In a leno-loom, the combination of the reed for beating up the weft, the doup and standard harnesses arranged in front of the reed for crossing action upon groups of threads in front of the reed, and means for imparting movement to the doup and standard harnesses to effect the required crossing of the groups of threads.

EUGENE H. BALLOU.

Witnesses:

SOCRATES SCHOLFIELD,
JOHN WALKER.