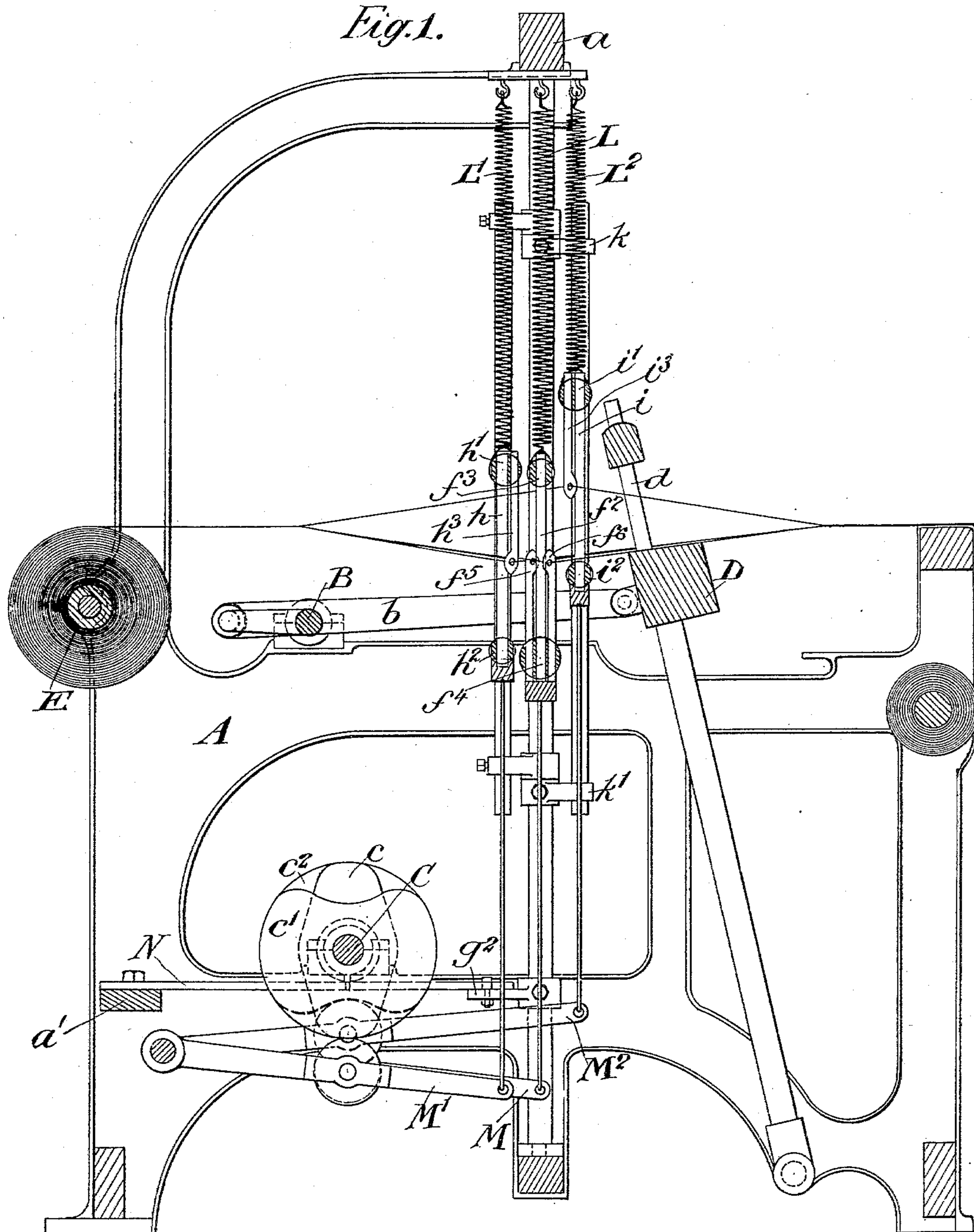


3 Sheets—Sheet 1.

No. 597,856.

Patented Jan. 25, 1898.

Fig.1.



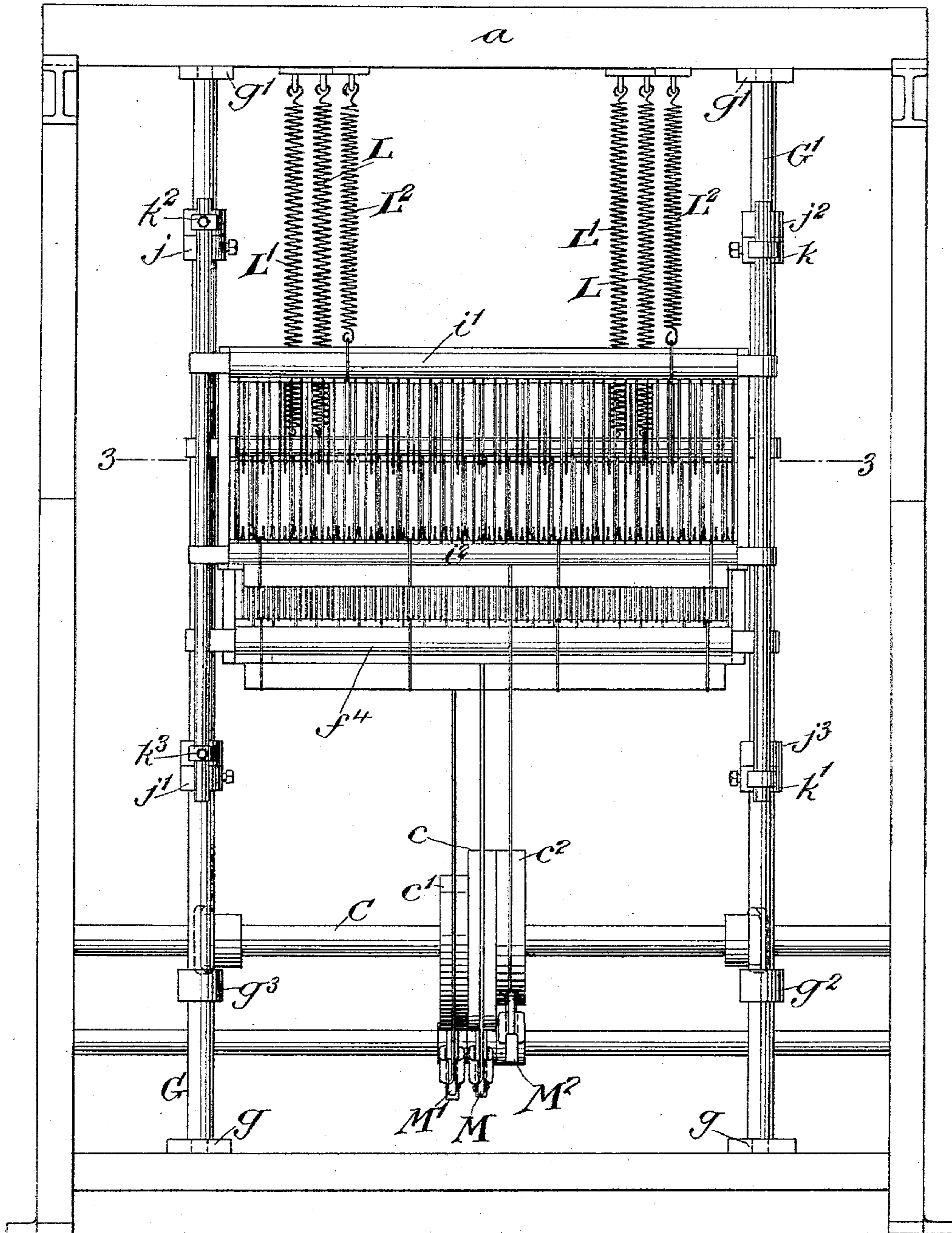
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3 Sheets--Sheet 2.

Patented Jan. 25, 1898.

Fig. 2.



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(No Model.)

3 Sheets—Sheet 3.

I. E. PALMER.
LOOM FOR CROSS WEAVING.

No. 597,856.

Patented Jan. 25, 1898.

Fig.3.

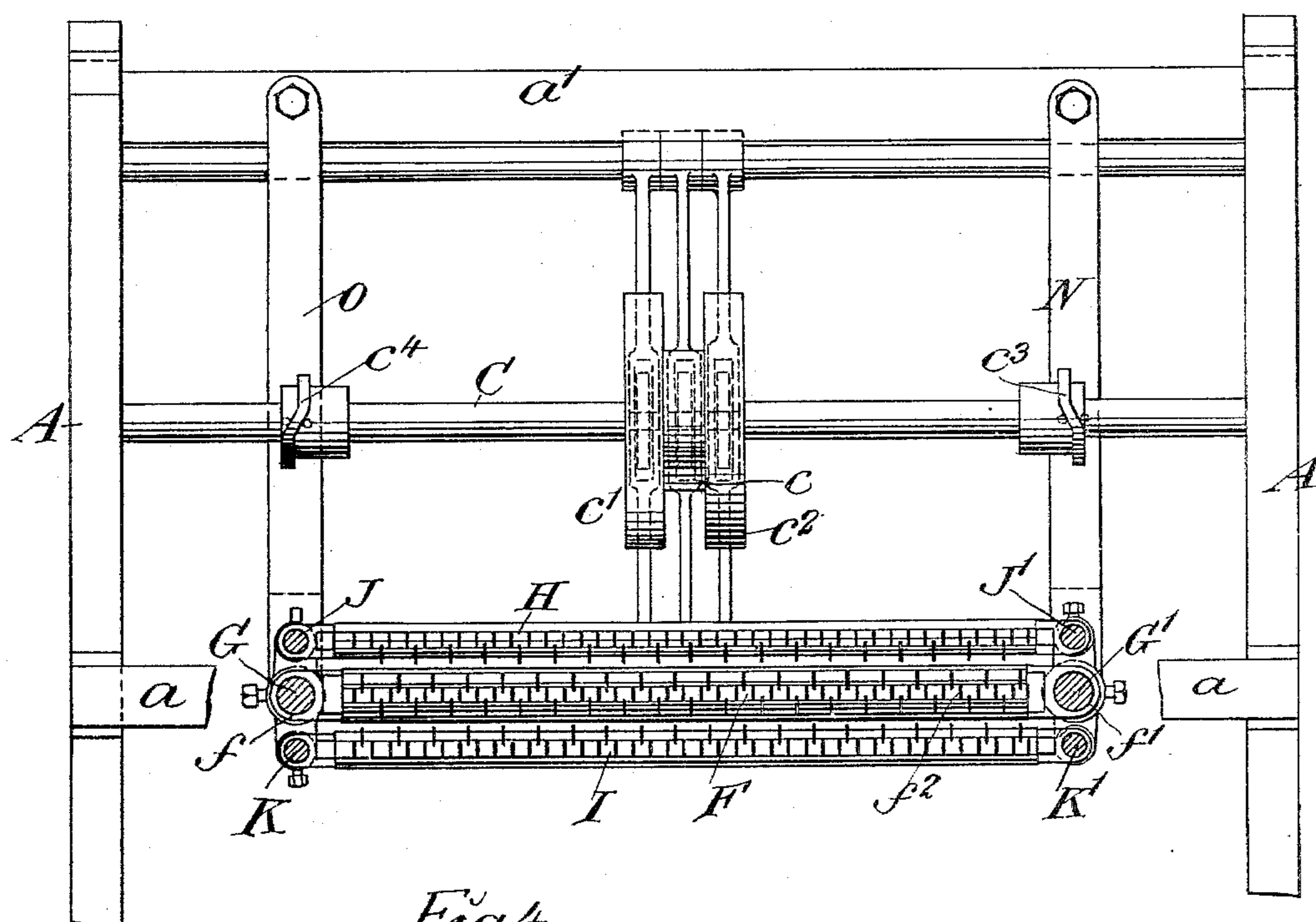
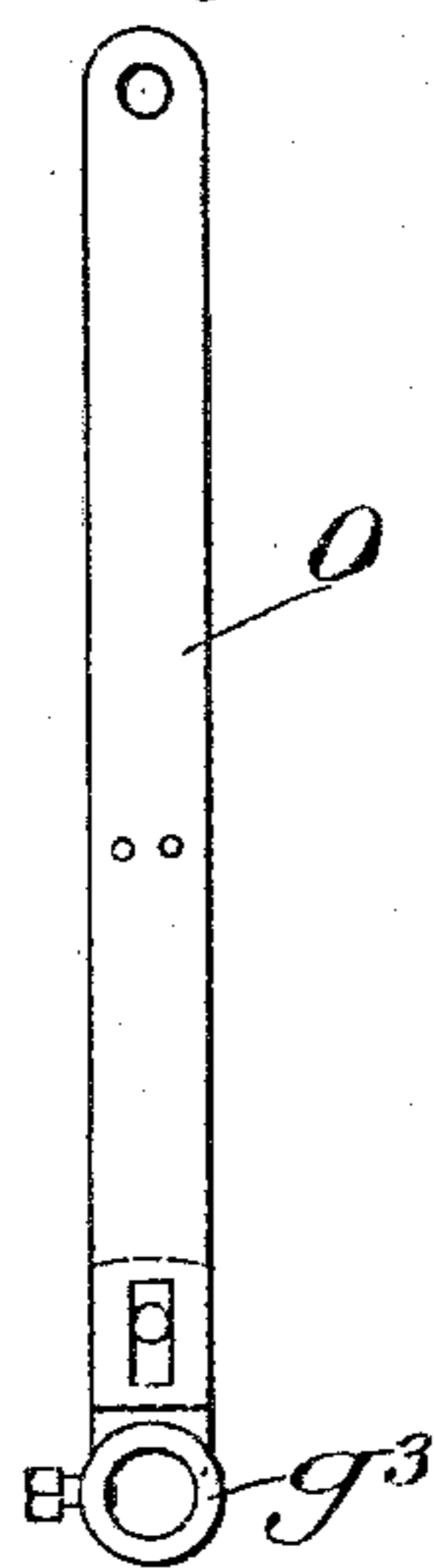


Fig.4.



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UNITED STATES PATENT OFFICE.

ISAAC E. PALMER, OF MIDDLETOWN, CONNECTICUT.

LOOM FOR CROSS-WEAVING.

SPECIFICATION forming part of Letters Patent No. 597,856, dated January 25, 1898.

Application filed November 12, 1896. Serial No. 611,805. (No model.)

To all whom it may concern:

Be it known that I, ISAAC E. PALMER, of Middletown, in the county of Middlesex and State of Connecticut, have invented a new and useful Improvement in Looms for Cross-Weaving, of which the following is a specification.

My invention relates to an improvement in looms in which there are provided three heddles—viz., a main or central heddle and two auxiliary heddles—and means for operating the same, the two auxiliary heddles being adapted to be independently moved laterally without interfering with their upward and downward movements for forming different weaves.

A further object is to provide simple and effective means for carrying out the above.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 is a vertical section from front to rear through the loom, showing only such parts thereof as are necessary for a clear understanding of my present invention. Fig. 2 is a front view of the same. Fig. 3 is a horizontal section through the loom on the line 3 3 of Fig. 2; and Fig. 4 is a detail view of one of the shifting levers and its connection with the heddle-frame, which it is adapted to vibrate laterally.

The side frames of the loom are denoted by A, and mounted therein in suitable bearings is the slay-beam-operating shaft B and the cam-carrying shaft C. The slay-beam is denoted by D, and it is connected with the operating-shaft B by suitable connecting-rods *b*. The slay-beam D is of the usual construction, carrying reeds *d*, through which the threads of the warp pass. The warp-supplying roller is denoted by E and is mounted, as usual, at the rear of the loom, between the side frames A. The shafts B and C are driven by any suitable mechanism, which mechanism is not shown herein.

The main heddle is denoted by F, and it is guided in its upward-and-downward movements by means of suitable sleeves *f f'* at its sides, which sleeves surround a pair of vertical guide-rods G G', which are mounted in suitable lower and upper bearings *g g'*.

These upright or vertical guide-rods are mounted to rock in the said bearings *g g'*.

The auxiliary heddles are denoted by H and I. The heddle H has a free downward-and-upward sliding movement between a pair of supplementary vertical guide-bars J J', which are supported by the main guide-rods G G'. The other auxiliary heddle I is located upon the opposite side of the main heddle F from the auxiliary heddle H, and the said heddle I has a free upward-and-downward sliding movement between a pair of supplementary guide-rods K K', which guide-rods are supported by the pair of main guide-rods G G'.

The three heddles are caused to move up and down to form the sheds of warp by the following mechanism: Pairs of retracting-springs L L' L² extend from the top cross-piece *a* of the loom-frame down into engagement with the tops of the heddles F, H, and I, respectively, tending to slide them upwardly to the limit of their movements in that direction. Tappets M M' M² have connections with the lower portions of the heddles F, H, and I, respectively, so that when they are engaged by cams on the shaft C they will slide the said heddles downwardly against the tension of the said retracting-springs. The cams on the shaft C are denoted by *c, c', and c²* and are adapted to engage their respective tappets M M' M². These cams on the shaft C are of the desired shape and are so adjusted that as the shaft C is rotated they will cause the heddles to be operated at the required intervals for producing the desired number of sheds of warp to be formed. In the present instance the main heddle F is caused to be slid up and down twice to the other heddles' once, and the cams *c c' c²* are so arranged with respect to each other that when the heddle H is at the limit of its downward movement the heddle I is at the limit of its upward movement.

The main heddle F consists of a reed formed of a series of strips *f²*, extending flatwise of the warp-threads between the upper and lower rails *f³ f⁴* of the heddle. The heddle F is provided with a double row of needles *f⁵ f⁶*, having eyes in their heads, through which pass the warp-threads. These needles *f⁵ f⁶* are arranged upon opposite sides of the row of

strips f^2 and alternately projected into the spaces formed by the said strips.

The auxiliary heddle H is of reed form, the reed consisting of a number of strips h , extending between upper and lower rails h' h^2 , and a single bank of needles h^3 , which needles have suitable eyes through their heads, through which pass certain of the warp-threads. This bank of needles h^3 corresponds to the bank of needles f^6 in number.

The auxiliary heddle I is of reed form and is provided with strips i , extending between upper and lower rails i' i^2 and provided with a single bank of needles i^3 , having eyes through their heads, through which pass certain of the warp-threads. This bank of needles i^3 corresponds in number to the bank of needles h^3 in the main heddle F. The reeds which constitute the heddles are so made that the shanks of the needles extend along substantially parallel with the strips which extend between the top and bottom rails of the reed and are located in a plane a short distance to the front or rear of the plane in which the said strips are located. The heads or noses of the needles in which the eyes through which the warp-threads pass are located project a short distance into the spaces between the said strips. This construction allows of the warp-threads having a very free passage up and down within the reeds, their liability to chafe or wear rough being reduced to a minimum. This construction is clearly seen in Fig. 1, in which the banks of needles in the auxiliary heddles are secured to the top rails and the double banks of needles in the main heddle are secured within the bottom rail upon opposite sides of the bank of strips.

The auxiliary heddles H and I are caused to be independently moved laterally for causing the threads which they carry to cross the threads carried by the main heddle and pass first on one side and then on the other side of the said main-heddle warp-threads by the following mechanism:

The heddle I is moved laterally by means of the rocking movement of the rod G' , the said rod G' being rocked by means of a horizontally-swinging lever N, which is pivoted at its rear end to a suitable cross-piece a' of the frame, and at its forward or free end it has a pin-and-slot connection with a rearwardly-extending arm or tailpiece g^2 , which arm is secured to move with the said rocking rod G' . The horizontally-swinging lever N is moved back and forth by means of a cam c^3 , located on the shaft C. The bar K' of the heddle I is secured within the ends of forwardly-projecting arms k k' , which arms are secured to rock with the rocking bar or rod G' . The opposite bar K of the heddle I is secured within the forwardly-extended ends of a pair of arms k^2 k^3 , which arms are free to rock on the vertical rocking bar G of the main heddle F.

The auxiliary heddle H is moved laterally by the rocking movement of the bar or rod

G, which bar is rocked by means of a horizontal swinging lever O, which is pivoted at its rear to the cross-piece a' of the frame and has a pin-and-slot connection at its forward end with a rearwardly-extending arm or tailpiece g^3 , secured rigidly to the bar G. The said lever O is rocked laterally by means of a cam c^4 upon the shaft C. The upright bar J of the auxiliary heddle H is secured in the free ends of rearwardly-extending arms j j' , which in turn are secured to rock with the bar G. The bar J' at the other end of the auxiliary heddle H is mounted in the free ends of rearwardly-extended arms j^2 j^3 , which arms are free to rock around the bar G' of the main heddle.

The arms j^2 j^3 are prevented from sliding down the bar G' by the forwardly-extended arms k k' of the auxiliary heddle I, and the forwardly-extended arms k^2 k^3 are prevented from sliding downwardly on the rod G by the rearwardly-extended arms j j' of the auxiliary heddle H.

The cams c^3 c^4 upon the shaft C may be so timed that they cause the auxiliary heddles H and I to be moved laterally at the proper intervals to secure the weave which may be desired. It will be seen that the said cams c^3 c^4 may be arranged to give a lateral vibratory movement to their respective heddles once for every shed or twice for every shed, or even, if so desired, to skip one shed.

The cams c c' c^2 upon the shaft C may be so arranged as to give to the heddles the required number of vertical movements for shifting the sheds of warp as may be required for the particular weave which is being completed.

The mechanism which is above described for operating the heddles will enable the loom to be run at a very great speed and at the same time insure absolute accuracy of weave in the fabric being formed, as the auxiliary heddles are positively shifted back and forth laterally to the main heddle, thereby insuring the shifting of their respective warp-threads to one side or the other of the needles in the main heddle.

When it is desired to cause the loom to produce a plain weave, the swinging levers N and O are disconnected from the auxiliary heddles, thereby permitting the warp-threads which they guide to be raised and lowered regularly upon one side of their corresponding needles in the main heddle. When it is desired to weave a plain gauze weave, the cams c^3 c^4 upon the shaft C are so arranged as to shift the auxiliary heddles simultaneously laterally in the same direction at the proper times to permit the threads which they guide to be crossed back and forth over their respective needles in the main heddle. When it is desired to produce a double cross-weave, the cams c^3 c^4 are so arranged as to simultaneously shift the auxiliary heddles laterally in opposite directions, so that the threads which they guide will be caused to travel, respectively, toward and away from

each other and at the same time back and forth to permit them to be passed up and down upon opposite sides of their needles in the main heddle. It will also be seen that the
 5 movements of the heddles may be arranged so as to permit one of the auxiliary heddles to be shifted laterally, while the other heddle is permitted to remain stationary with respect to its lateral movement, whereby another
 10 style of weave in the shape of a combination straight and gauze weave is formed.

What I claim as my invention is--

1. In a loom, a main heddle, a plurality of auxiliary heddles, means for imparting a vertical reciprocating movement to the heddles
 15 and means for reciprocating the auxiliary heddles laterally independently of each other, substantially as herein set forth.

2. In a loom, a main heddle, an auxiliary heddle along the front of the main heddle, an auxiliary heddle along the back of the main heddle, means for imparting to the several heddles their vertical reciprocating movements
 20 and means for reciprocating the front and back auxiliary heddles laterally, substantially as set forth.

3. In a loom, a main heddle, an auxiliary heddle along the front of the main heddle, an auxiliary heddle along the back of the main heddle, means for imparting to the heddles their vertical reciprocating movements
 30 and means for reciprocating the front and back auxiliary heddles laterally independently of each other, substantially as herein set forth.

4. In a loom, a pair of auxiliary heddles each carrying a single bank of needles, a main heddle carrying two banks of needles one for each of the auxiliary heddles, means for im-

parting to the several heddles their vertical
 40 reciprocating movements and means for imparting independent laterally-reciprocating movements to the auxiliary heddles, substantially as herein set forth.

5. In a loom, a pair of rocking rods mounted in suitable bearings in the frame, a main heddle having a vertical reciprocating movement along the said rods, a pair of auxiliary heddles supported by said rocking rods in position to be reciprocated vertically, and means
 45 for securing the auxiliary heddles to the said rods so that the rocking movement of one rod will reciprocate the one and the rocking movement of the other rod will reciprocate the other auxiliary heddle laterally, substantially
 50 as herein set forth.

6. In a loom, a pair of rocking rods mounted in suitable bearings in the frame, a main heddle mounted to reciprocate vertically along said rods, a pair of supporting-arms extended forwardly from each of the rods, a pair
 55 of supporting-arms extended backwardly from each of the said rods, heddle-bars supported by the backwardly-extended arms, heddle-bars supported by the forwardly-extended
 60 arms, and back and front auxiliary heddles mounted to reciprocate vertically on the said bars, the supporting-arms being secured to the heddle-bars so that the rocking of one rod will reciprocate one of the auxiliary
 65 heddles laterally and the rocking of the other rod will reciprocate the other auxiliary heddle laterally, substantially as herein set forth.

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Witnesses:

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