

J. A. BIDWELL.  
 LOOM,  
 APPLICATION FILED APR. 11, 1910.

1,002,122.

Patented Aug. 29, 1911.  
 4 SHEETS—SHEET 1.

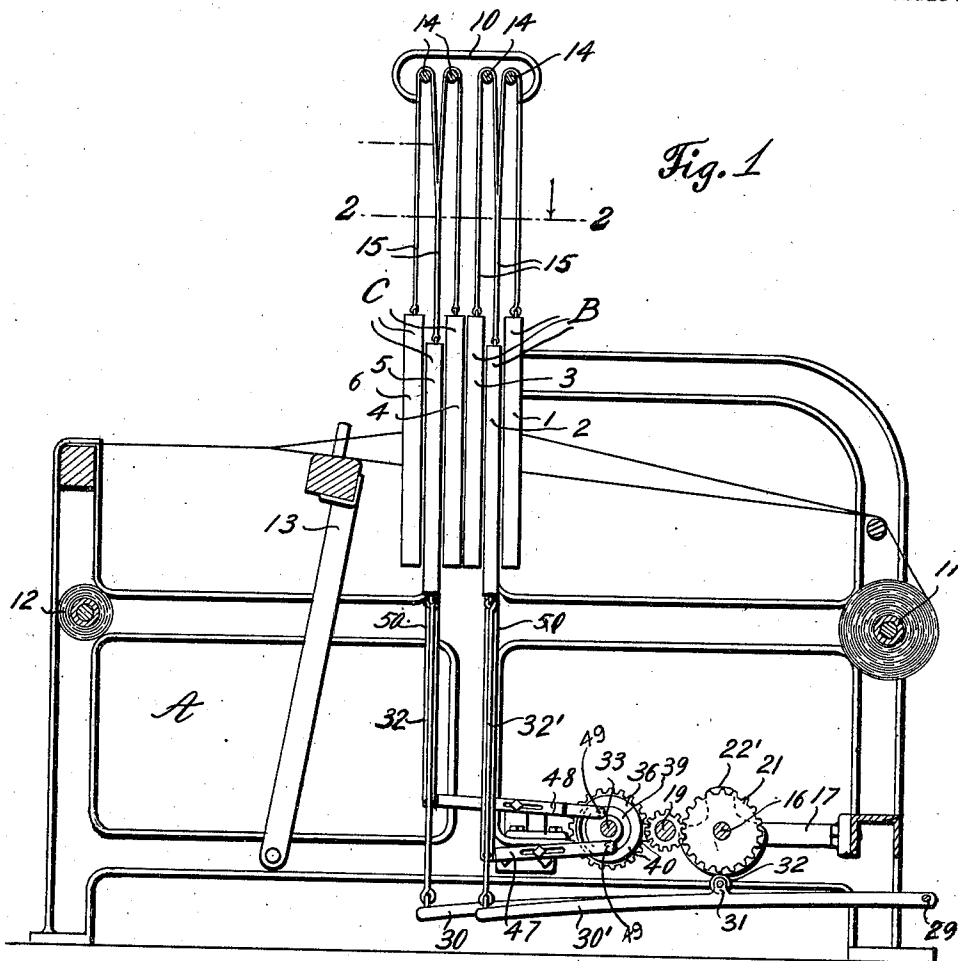


Fig. 1

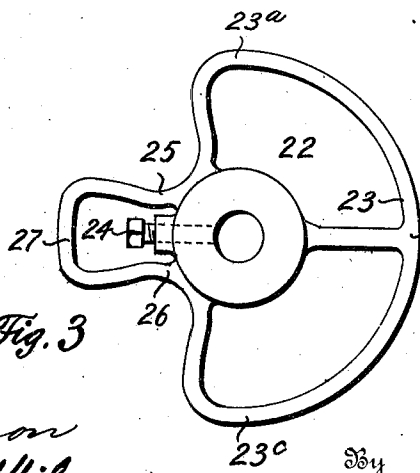


Fig. 3

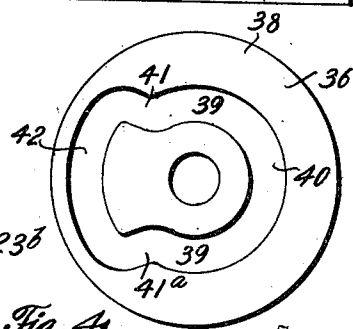


Fig. 4

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4 SHEETS—SHEET 2.

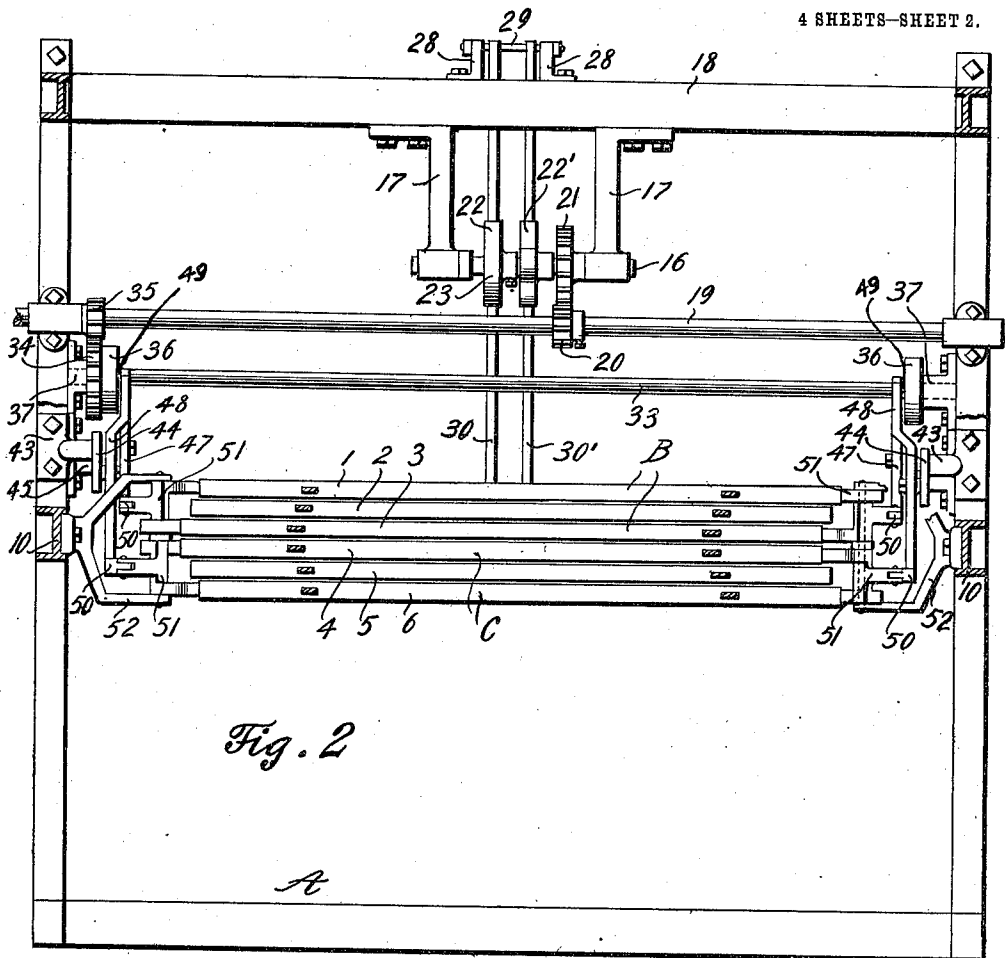


Fig. 2

A

Fig. 16

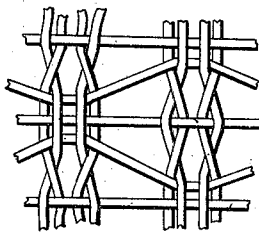
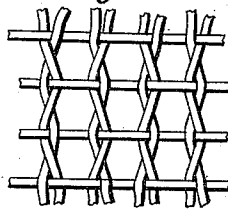


Fig. 17



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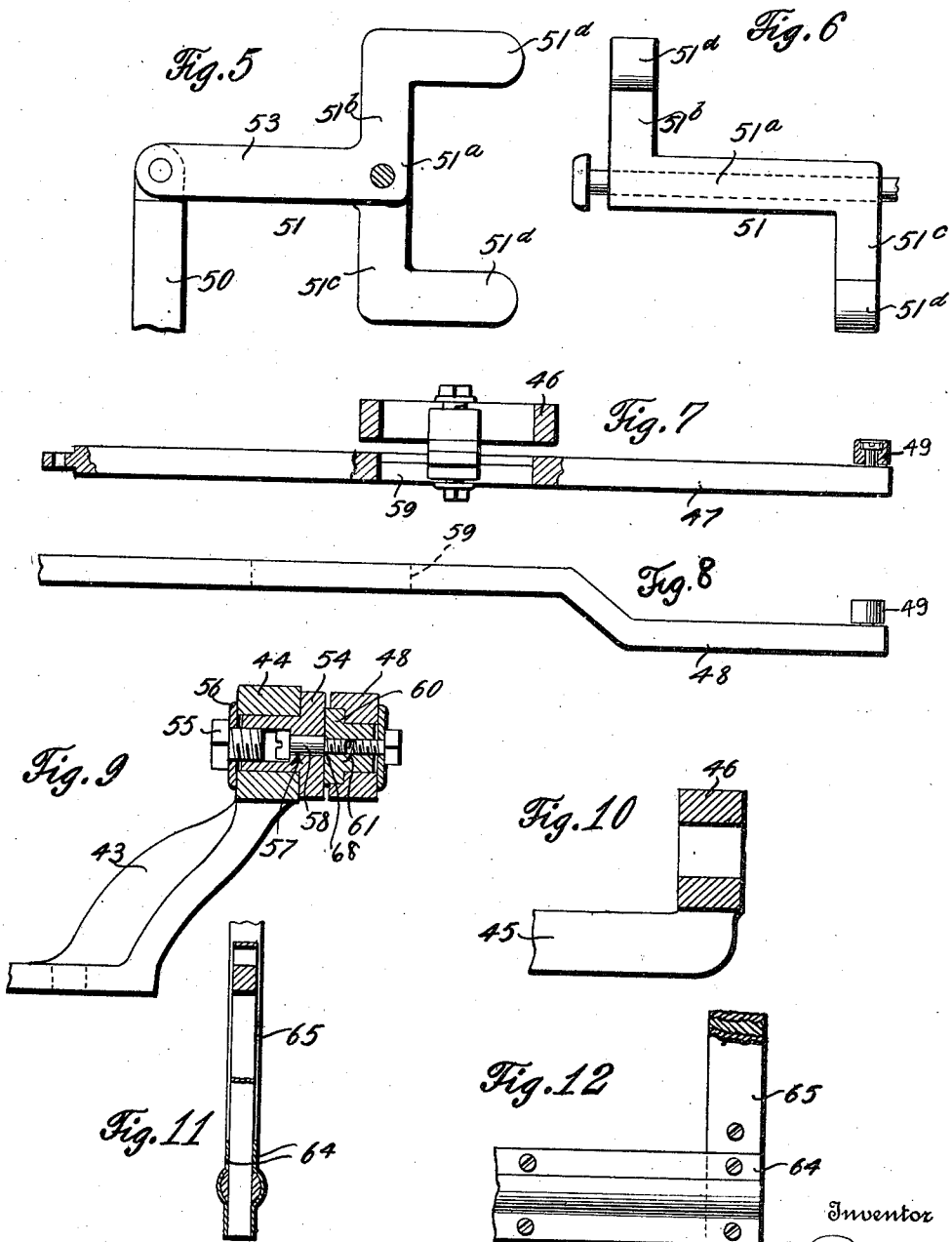
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4 SHEETS—SHEET 3.



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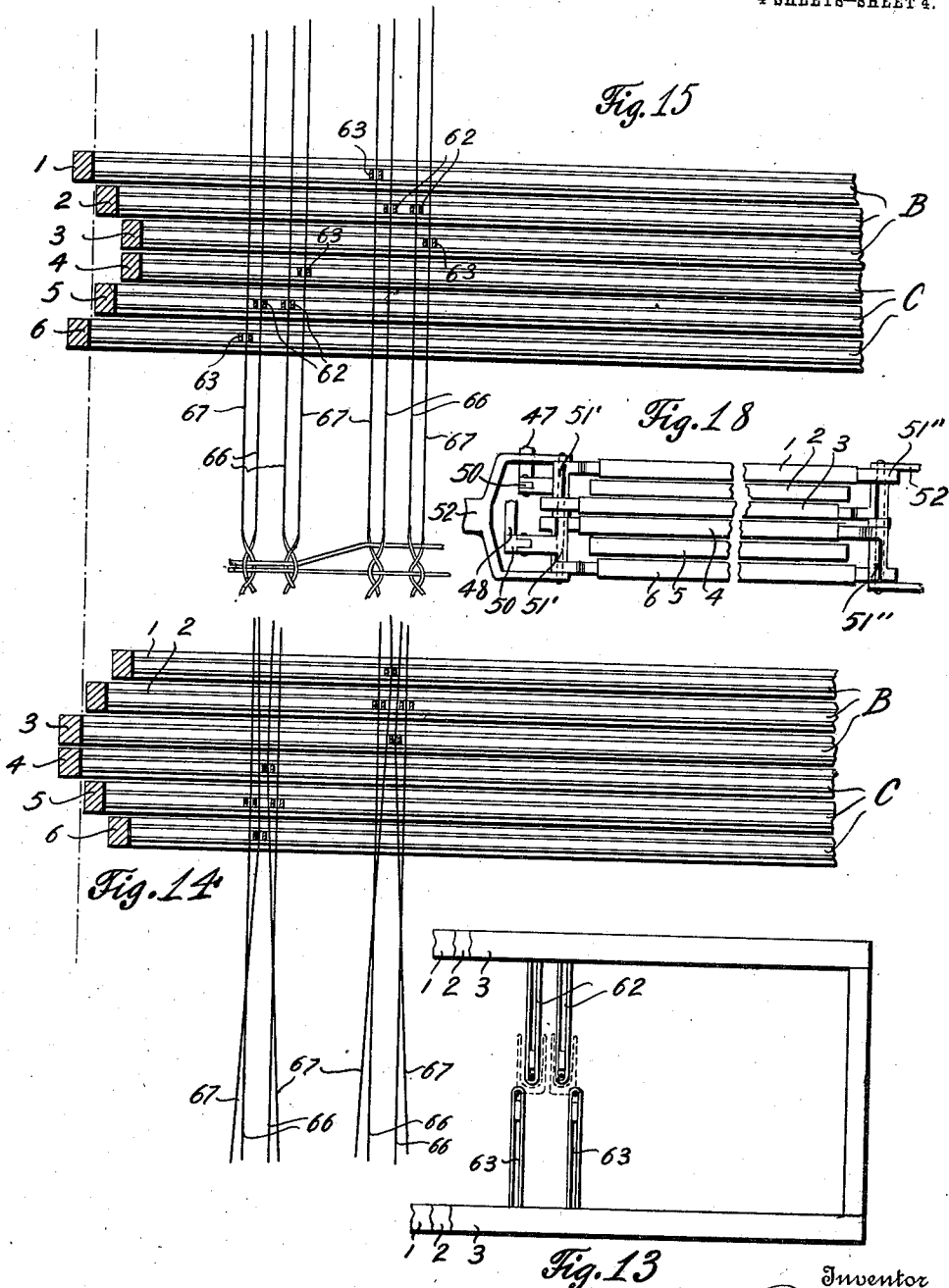
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4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

JOHN A. BIDWELL, OF PHILADELPHIA, PENNSYLVANIA.

LOOM.

1,002,122.

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Application filed April 11, 1910. Serial No. 554,660.

To all whom it may concern:

Be it known that I, JOHN A. BIDWELL, a citizen of the United States, residing at Germantown, Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Looms, of which the following is a specification.

This invention relates to looms, particularly to cross weaving looms, and is designed to construct a loom of this nature wherein Brussels or spider gauze and faced gauze may be woven on the same loom with the identical set of heddle frames, the only change necessary being a slight adjustment of the operating cams.

It also contemplates constructing a loom wherein the necessity of cord doup harness is eliminated, said harness having heretofore been necessary in the weaving of faced gauze, and has been found to be very objectionable, due to the breaking of the same, damaging the textile thereby.

It is also one of the objects of this invention to provide a transverse movement to the heddle frames as well as a vertical movement, the power for said vertical and transverse movements being derived from counter shafts, said counter shafts being set at a ratio of two to one to the bottom shaft of the loom, which makes one-half a revolution to the pick.

The gauze produced by a loom constructed in accordance with the present invention is oppositely faced gauze, that is, the movable warp threads in the same bar operate over and under the weft threads, two of said warp threads being stationary with respect to the transverse movement.

With the above and other objects in view, this invention consists of the construction, combination, and arrangement of parts all as hereinafter more fully described, claimed, and illustrated in the accompanying drawings, wherein:

Figure 1 is a longitudinal section of a loom constructed in accordance with the present invention, illustrating the mechanisms for imparting vertical and transverse movements to the heddle frames; Fig. 2 is a top plan view of a loom, the upper frame thereof being sectioned along the line 2—2 of Fig. 1; Fig. 3 is an elevation of the cam which operates against the treadles to impart a vertical motion to the heddle frame; Fig. 4 is a similar view of a cam directing

the transverse movement; Fig. 5 is an end elevation of the yoke operated by the cam illustrated in Fig. 4; Fig. 6 is a front elevation of Fig. 5; Fig. 7 is a top plan view partly in section of the lever and bracket operating one set of heddle frames, and driven by the cam illustrated in Fig. 4; Fig. 8 is a top plan view of a similar lever operated by the same cam and directing the motion of the second set of heddle frames; Fig. 9 is a section of the bracket supporting the lever illustrated in Fig. 7; Fig. 10 is a section illustrating the bracket supporting the lever illustrated in Fig. 8; Fig. 11 is a partial section of a heddle frame; Fig. 12 is a fragmentary front elevation of the corner of one of the heddle frames; Fig. 13 is an elevation of one set of heddle frames, partially illustrating the location of the heddles therein; Fig. 14 is a central longitudinal section of the heddle frames illustrating the position of the threads after the first movement thereof; Fig. 15 is a similar view illustrating the position after the completion of one complete reciprocatory and vertical movement of said frames; Fig. 16 is a fragmentary view of the spider weave or Brussels gauze; Fig. 17 is a similar view of the faced gauze; Fig. 18 is a modification of the mechanism for imparting a transverse vibration to the heddle frames.

The loom forming the subject-matter of the present invention resides in the provision of two sets of heddle frames, each set comprising three frames, the middle frame of each set carrying two warp threads while the forward and rear frames carry only one thread each to the bar. Each draft or set of bars comprises eight warp threads and four weft threads, that is, assuming each bar to be a unit. The central frames of each set remain stationary while the forward and rear frames are going through transverse movements in opposite directions, but move vertically in opposite directions to the rear and forward frames.

The vertical motion is imparted to the central frame through the instrumentality of a pair of cams operating on the treadles which are connected to said central frames, each central frame imparting motion to the forward and rear frames through the connection thereto by straps operating over rollers.

The transverse movement of the heddle frame is obtained from a pair of yokes op-

erating against the forward and rear frames of each set at each extremity thereof, said yokes being pivotally mounted and operating against the ends of said frames in such a manner that as the forward frame of one set is reciprocated in one direction by the yoke at one extremity thereof, the rear frame will be operated in an opposite direction by the yoke bearing against the opposite end of the set. In the modification, one set of yokes is not operated mechanically but is operated by the movement of the frames reciprocated by the opposite set of yokes.

Referring more particularly to the drawings, A indicates the conventional frame of a loom, said frame being provided with the superstructure 10, supply roll 11, and the textile roll 12, and also the lay 13 operating in the usual manner. A plurality of heddle frames 1, 2, 3, 4, 5 and 6 are reciprocatingly mounted in the vertical frame 10, the heddle frames 1, 2, and 3 forming one set designated as B while the frames 4, 5 and 6 form another set indicated as C, each set weaving one-half of a bar. The central frames 2 and 5 of the sets B and C respectively operate in a vertical movement only, while the extreme frames 1—3 and 4—6 operate both vertically and transversely. In order that a vertical motion may be imparted to the extreme frames by the central frames, a plurality of straps 15 extend from the central frames over a plurality of rollers 14 to the extreme frames, thus when the central frames are reciprocated vertically, the extreme frames will take a similar motion in an opposite direction.

A countershaft 16 is journaled in the brackets 17 carried by the transverse bar 18 of the frame to the rear of the middle of the bottom shaft 19 of the loom. This shaft is driven by a gear 20 keyed on the bottom shaft which meshes with and drives a gear 21 on the countershaft 16, said gear 21 being twice the size of the small gear 20. Consequently the countershaft operates with half the speed of the bottom shaft. This countershaft is located centrally with respect to the transverse dimension of the frame and directs the vertical motion of the heddle frames.

A pair of cams 22 and 22' are mounted centrally on the countershaft 16 through the medium of the set screws 24 and thereby supply a means whereby the treadles operating the central frames 2 and 5 are swung about their pivots. These cams are so constructed that while the frame 2 is moved downwardly during three picks, the frame 5 is moved downwardly during one pick, after which it moves upwardly and is in this position for three picks and vice versa. These cams are constructed with a semi-circular section 23, said semi-circular section being adapted to create a shed during three

picks, the first of said picks being taken while the roller of the treadle is bearing at 23<sup>a</sup>, the second at 23<sup>b</sup> and the third at 23<sup>c</sup>, thus retaining the frames dead during said picks. Adjacent to said semi-circular section are the depressions 25 and 26, the depression 25 being located adjacent the section 23<sup>a</sup> while the depression 26 is located adjacent the section 23<sup>c</sup>. These depressions are adapted to receive the roller and retain the frames stationary with respect to the vertical movement thereof during the transverse motion to the right and to the left. Adjacent to the depressions 25 and 26 is formed a projection 27 opposite to the semi-circular section 23 and about substantially one-third of the length thereof, said projection 27 being adapted to retain a shed during a single pick of the weft. The cams are so arranged on the shaft that the portion 27 of the cam 22' coincides with the portion 23 of the cam 22, consequently the set of frames B driven by the cam 22' will operate oppositely to the set C driven by the cam 22. Thus it will be seen that while the threads carried by the set B will create a bar having three picks, the threads carried by the set C will create a bar having one pick.

A pair of angle brackets 28 are mounted on the exterior of the transverse bar 18 and have pivoted to the pin 29 carried thereby the treadles 30 and 30', the treadle 30' cooperating with the cam 22' while the treadle 30 cooperates with the cam 22. These treadles are curved upwardly and are provided with the ears 31 between which are journaled the rollers 32, said rollers adapted to bear against the cams as heretofore described. A link connection 32 and 32' is provided between the forward extremities of the treadles 30 and 30' and the central frames 5 and 2 respectively. Thus it will be seen that as the cams operate the treadles 30 and 30' the same will impart a vertical motion to the frames at the periods heretofore described.

The mechanism for transmitting the vibratory motion to the frames comprises a disk provided with a cam groove therein, mounted at each extremity of an auxiliary shaft which is driven at a ratio of two to one by the bottom shaft, therefore at a ratio of four to one to the main shaft. A plurality of pivotally connected levers are operated by said cam and shift at the upper extremities thereof a pair of yokes, said yokes spanning the central frames of each set and being adapted to shift the extreme frames of each set in opposite directions.

The auxiliary shaft 33 is mounted on the opposite side of the bottom shaft 19 to the auxiliary shaft 16 and is provided at one extremity thereof with the large gear 34 meshing with the small gear 35 keyed on the bottom shaft 19. This shaft is supported by

main stationary with respect to the transverse movement and consequently the threads 67 carried by the extreme frames operate about the threads 66 and thereby create a twist about said stationary threads.

The movements of the heddle frames are as follows: a vertical movement which creates a shed for one pick; then a return vertical movement which engages the weft thread; a transverse movement then takes place as is shown in Fig. 14 which creates a twist as shown; a vertical movement then takes place creating a shed for three picks of the weft thread, after which there is a return vertical movement locking said picks and finally a return transverse movement. As there are four picks to the bar, the necessity of rotating the main shaft once while the counter shafts revolve a quarter of a revolution is evident *prima facie* as there is one pick for each revolution of the main shaft. It will also be noted, as heretofore stated, that while the frames of set B are operating through three picks, the frames of set C operate for a single pick.

By changing the positions of the cams 22 and 22' so that the sections 27 coincide, the frames will weave a gauze known as faced gauze which is illustrated in Fig. 17 without the necessity of the cord doup harness as has heretofore been necessary.

The modification set forth in Fig. 18 for transmitting transverse motion to the heddle frames comprises the yokes 51' operated as in the preferred form and bearing against one extremity of the heddle frames. Oppositely disposed to these yokes are the idle yokes 51'' which are not provided with the lever or rod 53 as are the yokes 51', and are operated by the movement of the frames. From this construction, it will be seen that when one bearing arm of the yoke 51' bears against the heddle frame 1, the movement of the frame will operate the oppositely disposed yoke 51'', the downwardly extending arm of which will impart a transverse motion in an opposite direction to the frame 3. This modification eliminates the necessity of providing a double set of mechanisms as in the preferred form.

Having thus described my invention, what is claimed as new is:

1. In a loom, the combination with a frame, of a series of sets of heddle frames mounted for movement therein, a main driving shaft located in said frame, and means operable from said driving shaft for imparting a transverse movement in opposite directions to the extreme frame of each set, comprising a counter shaft located adjacent said driving shaft, means whereby said counter shaft may be driven from said main shaft, cam-grooved disks mounted on said shaft adjacent to the terminals thereof,

yokes mounted adjacent the ends of said heddle frames and adapted to bear against the extreme frame of each set, arms pivoted to the frame adjacent to each of said disks, said arms adapted to oscillate about their pivotal points by the groove of said disks, and links connecting said yokes to said arms.

2. In a loom, the combination with a frame, of a series of sets of heddle frames mounted for movement therein, means whereby the heddle frames of each set may move vertically creating a shed for one pick, then take a returned vertical movement to engage the weft thread, means whereby a transverse movement in opposite directions of the extreme heddle frames of each set may be taken, means whereby a vertical movement may take place creating a shed for three picks, and then a return vertical movement locking the picks, and means whereby a return transverse movement may be had.

3. In a loom, the combination with a frame, of a series of sets of heddle frames mounted for movement in said frame, said set comprising three frames, means whereby the extreme frames of each set may be moved transversely, and means whereby said central heddle frame may be moved vertically in an opposite direction to the extreme heddle frames.

4. In a loom, the combination with a frame, of a series of sets of heddle frames mounted for movement in said frame, said set comprising three frames, means whereby the central heddle frames of each set may be moved vertically in an opposite direction to the extreme heddle frames, the frames of each set moving in opposite directions to the corresponding frames of the adjacent set, and means whereby the extreme frames of each set may be moved transversely in opposite directions between the vertical movements of said frames.

5. In a loom, the combination with a frame, of a series of sets of heddle frames mounted for movement therein, each set comprising three frames, a main shaft mounted in said loom, a counter shaft adapted to be rotated by said main shaft, a series of cams mounted on said counter shaft, each cam being constructed with an elongated bearing space and a short bearing space oppositely disposed thereto, the short bearing space of one cam being on the opposite side of the counter shaft to the elongated bearing surface of the adjacent cam, treadles pivoted to said frame below said cams, one treadle cooperating with each cam, a link connecting the free terminal of each treadle to the central frame of each set, and means whereby the extreme frames of each set may be moved transversely.

6. In a loom, the combination with a

the brackets 37 carried by the frame of the machine and is provided adjacent each bracket with the cam 36, the formation of said cam being specifically set forth in Fig. 4. These cams comprise a disk 38 provided with the cam groove 39, said cam groove being somewhat similar in formation to the cams 22 and 22'. This groove is provided with an extended enlarged section 40 opening into the depressions 41 and 41<sup>a</sup> at each extremity thereof, after which said depressions open into the smaller enlarged section 42. While the lever operating one set of frames travels in the enlarged section 40, the frames are held stationary with respect to the transverse movement to correspond with the vertical movement of the enlarged section 23 of the cams 22 and 22', that is, during three picks; and when the lever is operating in the section 42 the frames are held stationary with respect to the transverse movement to correspond with the section 27 of the cams 22 and 22', that is, during one pick: but when the levers operate in the depressions 41 and 41<sup>a</sup>, the frames move transversely and are held stationary vertically by the depressions 25 and 26 of the cams 22 and 22'.

On the upper surface of the longitudinal side bars of the frame A are carried the brackets 43, said brackets extending inwardly and upwardly and provided at their inner terminals with the longitudinal slotted bar 44. A pair of somewhat similar brackets 45 are carried on the inner side of the side bars and are provided at their inner terminals with the longitudinally slotted vertical bar 46. A pair of levers 47 and 48 are adjustably pivoted to the bars 46 and 44 respectively, as hereinafter more fully described, the lever 48 being off-set to provide for a complete clearance of the same with respect to the lever 47. The rear terminals of the levers are provided with roller bearings 49 which are engaged by the cam groove 39 and thereby supply a means whereby an oscillatory motion is imparted to said levers. As the lever 48 is superposed over the lever 47 the same will operate in an opposite side of the groove to the lever 47. Thus when the lever 47 operates in the section 40 the lever 48 will be operating in the section 42. A link 50 extends upwardly from the opposite terminals of each of said levers and connects the same to the yokes 51 (set forth in Figs. 5 and 6), which are pivoted to the brackets 52, which are carried by the superstructure 10 adjacent the central portion of the frames, said yokes being adapted to bear against the ends of said frames as hereinafter more fully described. These yokes comprise a main bar 51<sup>a</sup> extending longitudinally with respect to said brackets and having at one extremity thereof an upwardly extending arm 51<sup>b</sup>, and

at the opposite extremity the downwardly extending arm 51<sup>c</sup>, each of said arms being bent inwardly at their terminals to form the bearing projections or lugs 51<sup>d</sup>. On the outer surface of the bar 51<sup>a</sup> is a lever or rod 53 which is pivotally connected to the upper extremity of the link 50. From the construction of these yokes, that is, by the provision of the bar 51<sup>a</sup>, each of the same spans the center frame 2 or 5 while the projections 51<sup>d</sup> bear against the ends of the extreme frames. It will also be seen that through the oscillatory motion imparted to the levers 47 and 48, the links 50 will move vertically and consequently swing the yokes about the bracket as an axis. This movement will be such that as one projection 51<sup>d</sup> bears against (for example) the frame 1, the lower arm 51<sup>a</sup> will move away from the frame 3, while the corresponding arm on the opposite yoke will bear against said last named frame. Thus the frames will move in opposite directions. It will be understood by this that the frames 1 and 4 will move in similar directions while the frames 3 and 6 will move in similar directions but opposite to 1 and 4.

It will be seen that by adjusting the position of the fulcrums of the levers 47 and 48, the movement of the frames will be regulated through the movement which will be imparted to the work arms of said levers. In order that this may be done, a block 54 reciprocates in the slot of the bars 46 and 44, said block being secured therein by the screw 55 operating against the washer 56 on the outer side of said bar. This block is provided with a central opening 57 through which operates a screw member 58. Each of the levers 47 and 48 are provided with a shouldered slot 59 in which operates a block 60 secured therein similarly to the block 54. This block is provided with a central opening 61 in which is threaded the terminal of the screw 58 and as said screw is provided with a shoulder 68, the blocks will be loosely and pivotally connected. From this it will be seen by shifting the position of the blocks in their respective slots, the fulcrums of the levers will be changed accordingly and the movement of the links 50 thereby.

Referring to the construction of the heddle frames the center heddle frames 2 and 5 are provided with two heddles 62 to cooperate with a single heddle 63 carried by each of the extreme heddle frames 1, 3, 4 and 6, said heddles being spaced approximately a distance of the width of two heddles. The heddles are mounted in the usual manner and are retained in said position by the clamping plates 64 at the top and bottom of the heddle frame. Interposed between the upper and lower plates 64 and on each side of the frame are the bracing plates 65 forming a secure and firm frame. The threads 66 carried by the central heddle frames re-

frame, of a main shaft mounted thereon, a series of sets of heddle frames mounted for movement in said frame, each set comprising three frames, means whereby the central heddle frame of each set may be moved vertically in an opposite direction to the extreme heddle frames of each set, a counter shaft located adjacent said main shaft and adapted to be driven therefrom, cam grooved disks located on said shaft, levers pivoted to said frame, one of said levers adapted to cooperate with one set of heddle frames, said levers adapted to be oscillated by the groove of said disk on opposite sides thereof, a yoke disposed at each end of each set of heddle frames adapted to span the central frame and bear against the extreme frames of each set, links connecting said levers to said yokes adapted to oscillate said yokes about their pivotal points and move said extreme frames in opposite directions respectively and in opposite directions to the corresponding frames of the adjacent sets.

7. In a loom, the combination with a frame, of a main shaft mounted thereon, a series of sets of heddle frames mounted for movement in said frame, each set comprising three frames, means whereby the central heddle frame of each set may be moved vertically in an opposite direction to the extreme heddle frames of each set, a counter shaft located adjacent said main shaft and adapted to be driven therefrom, cam grooved disks located on said shaft, levers pivoted to said frame, one of said levers adapted to cooperate with one set of heddle frames, said levers adapted to be oscillated by the groove of said disk on opposite sides thereof, a yoke disposed at each end of each set of heddle frames adapted to span the central frame and bear against the extreme frames of each set, links connecting said levers to said yokes adapted to oscillate said yokes about their pivotal points and move said extreme frames in opposite directions respectively and in opposite directions to the corresponding frames of the adjacent sets and means whereby the transverse movement of said heddle frames may be adjusted through the instrumentality of the pivotal point of the oscillating levers.

8. In a loom, the combination with a frame, of a main driving shaft located therein, a series of sets of heddle frames mounted in said frame, and means operable from said driving shaft for imparting a transverse movement in opposite directions to the extreme frames on each set, comprising a countershaft located adjacent to said driving shaft, means whereby said countershaft may be driven from said main shaft, cam-grooved disks mounted on said countershaft adjacent to the terminals thereof, yokes mounted adjacent to the heads of said

heddle frames, said yokes spanning the central frame of each set and having fingers adapted to bear against the extreme frame of each set, and means whereby said yokes may be oscillated from their pivotal point by the movement of said disks.

9. In a loom, the combination with a frame, of a main driving shaft located therein, a series of sets of heddle frames mounted in said frame, and means operable from said driving shaft for imparting a transverse movement in opposite directions to the extreme frames on each set, comprising a countershaft located adjacent to said driving shaft, means whereby said driving shaft may be driven from said main shaft, cam-grooved disks mounted on said countershaft adjacent to the terminals thereof, yokes mounted adjacent to the heads of said heddle frames, said yokes spanning the central frame of each set and having fingers adapted to bear against the extreme frame of each set, levers pivotally mounted adjacent to said cam-grooved disks and adapted to oscillate thereby, and means whereby the forward terminals of said levers may be operatively connected with said yokes.

10. In a loom, the combination with a frame, of a main driving shaft located therein, a series of sets of heddle frames mounted in said frame, and means operable from said driving shaft for imparting a transverse movement in opposite directions to the extreme frames on each set, comprising a countershaft located adjacent to said driving shaft, means whereby said driving shaft may be driven from said main shaft, cam-grooved disks mounted on said countershaft adjacent to the terminals thereof, yokes mounted adjacent to the heads of said heddle frames, said yokes spanning the central frame of each set and having fingers adapted to bear against the extreme frame of each set, levers pivotally mounted adjacent to said cam-grooved disks and adapted to oscillate thereby, links connecting the forward terminals of said levers with said yokes, and means whereby the movement of said levers and yokes may be adjusted.

11. In a loom, the combination with a frame, of a main driving shaft located therein, a series of sets of heddle frames mounted in said frame, and means operable from said driving shaft for imparting a transverse movement in opposite directions to the extreme frames on each set, comprising a countershaft located adjacent to said driving shaft, means whereby said driving shaft may be driven from said main shaft, cam-grooved disks mounted on said countershaft adjacent to the terminals thereof, yokes mounted adjacent to the heads of said heddle frames, said yokes spanning the central

frame of each set and having fingers adapted to bear against the extreme frame of each set, levers pivotally mounted adjacent to said cam-grooved disks and adapted to oscillate thereby, links connecting the forward terminals of said levers with said yokes, and means whereby the movement of said levers and yokes may be regulated com-

prising an adjustment for the pivotal points of said levers. 10

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

JOHN A. BIDWELL.

Witnesses:

THORNTON BRIERLEY,  
WINFIELD S. H. KNOPP.

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