

UNITED STATES PATENT OFFICE.

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LOOM FOR CROSS OR GAUZE WEAVING.

994,018.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HARRY M. MARSH, of the city of Hamilton, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Looms for Cross or Gauze Weaving, of which the following is a specification.

This invention relates to looms in which the warp ends are twisted over one another between each pick of the weft producing what is known as a cross weave.

When the warp threads are so manipulated that the even numbered warp ends are all twisted in the same direction and the odd numbered warp threads in an opposite direction after each pick a single or plain gauze weave is produced. When alternate warp ends in each set are twisted in opposite directions a double or diamond gauze weave is produced and my object is to devise simple and effective means for producing a diamond gauze weave when desired.

I attain my object by a mechanism which may be briefly described as follows:

Two heddles are each formed as a comb with alternate long and short teeth. Between each pair of teeth in each comb is located a dent or split so that in effect a reed is combined with each heddle. In gauze weaving each heddle is given a lateral movement as well as an up-and-down movement. If the lateral movements are caused to take place after the points of the long teeth in one heddle have passed the warp ends in the eyes of the long teeth of the other heddle and before the short teeth have passed one another a diamond gauze weave is produced. If the lateral movements take place before the points of the long teeth have passed the warp ends as aforesaid a plain gauze weave is produced, substantially as hereinafter more specifically described.

Figure 1 is a front elevation of part of a loom illustrating my invention. Fig. 2 is a side elevation of parts of the same. Fig. 3 is a detail of the means for imparting a lateral movement to the heddles. Fig. 4 is a diagrammatical plan view illustrating the nature of the diamond gauze weave. Fig. 5 is a detail of one of the long needles.

In the drawings like letters of reference indicate corresponding parts in the different figures.

A and B are two heddles. Each heddle is formed with two cross bars *a* and two vertical end pieces *b*. To the heddle A are se-

cured the needles C forming the teeth of a comb. Each needle is provided with an eye *c* and the points D of alternate needles are made of some considerable length as shown. (See Fig. 5.)

The heddle B is provided with the needles or teeth E also provided with eyes *c* and also having alternate needles provided with the elongated points F. The teeth of one heddle extend downward from the upper cross bar *a* while the teeth in the other heddle extend upward from the lower cross bar *a* as shown.

With each heddle is combined a reed formed by the dents or splits G which are connected to the cross bars *a* between each pair of needles and thus form the reed.

The heddles are balanced one against the other by means of cords H passing over pulleys *i* suitably journaled on a stationary part.

Treadles J serve to vertically reciprocate the heddles being connected thereto by suitable cords. These treadles will be operated in any ordinary manner.

As in cross weaving the heddles must be given a lateral movement as well as a vertical movement I provide the following mechanism for that purpose. Rock arms K are suitably fulcrumed on the stationary part and have their ends adapted to engage the angle guides L formed on the sides of the heddles. Each rock arm is provided with an extension *d*.

A rocking lever M suitably fulcrumed on the stationary part has a link *e* pivotally connected with its upper end, which link is adjustably pivoted at its other end to the extension *d* by means of the bolt and slot connection *f*.

The lower end of the rocking lever M is provided with a projection *g* adapted to engage the double helical groove *h* in the drum N secured to the shaft O, which will be rotated in any suitable manner. Only one lever M is shown in the drawing, but it will be understood that each side of the machine is provided with such a lever, these being timed to operate in synchronism.

The operation of the device is as follows: If a diamond gauze weave is to be produced it will be seen from an inspection of Fig. 4 that it is essential that the odd numbered warp ends must alternately be crossed in opposite directions over the even numbered warp ends. This result is produced by ver-

tically moving the heddles until the ends of the points of the long teeth in one heddle have passed the warp ends in the long teeth of the other heddle. The warp ends
 5 carried by these teeth will then be crossed, say to the left. If now the heddles be moved laterally until the warp ends in the short needle have crossed, say, to the right, the vertical movement of the heddles may be
 10 continued and the warp ends will remain twisted alternately right and left, since the points of the long needles prevent the warp ends which they carry from being crossed to the right when lateral movement is made
 15 to cross the ends carried by the short teeth in that direction. I am using the terms "right" and "left" as applied to the movements made by the warp ends carried by the upper teeth, the movements of the warp ends
 20 carried by the lower teeth being, of course, in the reverse direction.

In single cross or plain gauze weaving the odd numbered warp ends are all crossed in the same direction over the even num-
 25 bered warp ends. The nature of a plain gauze weave will be readily understood on reference to Fig. 4 by supposing alternate pairs of warp ends to be omitted. All the warp ends will then appear as crossed in a
 30 similar manner. Such a weave can be made with my loom if the lateral movements of the heddles be caused to take place before the long points of the teeth have crossed one another, consequently all the warp ends car-
 35 ried by the upper teeth are carried in one direction and the warp ends carried by the lower teeth in the other direction alternately.

To understand properly the operation
 40 of this device, it is necessary to keep in mind the process of simple plain weaving and the difference in the manipulation of the warp threads necessary to produce the gauze weave. In plain weaving, the shed for the
 45 weft is produced by alternately raising and lowering the warp ends. In gauze weaving, the warp ends must in addition be twisted around one another. This means that the warp ends must be moved laterally, odd
 50 numbered ends to one side and even numbered ends to the other alternately, before the shed is formed. This is easily accomplished when all the even numbered ends are moved in the same direction at the same
 55 time and all the odd numbered ends in the other direction. In many well known devices, needles are employed in the heddles all of the same length so that odd numbered warp ends may be shifted to one side and
 60 even numbered to the other by lateral movement of the heddles before they move to form the shed. A weft thread is then placed at the first pick of the loom. The heddles then reverse their positions laterally and
 65 also vertically to again form a shed for the

next pick of the loom. Diamond gauze weave, however, demands more than this simple operation. All the even ends are not crossed in the same direction after each pick but alternate ends are crossed in oppo-
 70 site directions, and the same is true of the odd ends (see Fig. 4). This means that after a heddle has moved laterally to move alternate odd ends in one direction, it must move laterally in the opposite direction to
 75 move the remaining odd ends and the same is true of the heddle carrying the even ends. This double movement must take place between each pick and the problem naturally is to keep the first moved warp ends on the
 80 sides to which they are moved, while the other ends are crossed in opposite directions. Ordinary needles it is evident cannot do it as they would of course move back to the right all the ends they had previously car-
 85 ried to the left, and vice versa.

The long points I employ on alternate needles have proved the solution of the prob-
 lem. After the heddles have moved later-
 90 ally in opposite directions, they move in a vertical direction and the ends of the long pointed needles in each heddle pass the warp ends carried by the long pointed needles in the opposite heddle. If now the heddles re-
 95 verse their positions laterally, the long pointed needles maintain the crossing of the ends they carry as their points cannot pass the warp ends between which they have moved, and the warp ends carried by the
 100 short pointed needles may by reversing the lateral positions of the heddles be crossed in the opposite direction to those carried by the long pointed needles. A further ver-
 105 tical movement of the heddles will now form the shed and a pick of the weft is passed. By a reversal of the movements a shed is again formed and by continuing the cycle of operations, a diamond gauze fabric is produced.

From the above description it will be seen
 110 that by providing alternate teeth with the long points and by suitably timing the lateral movements of the heddles either form of cross weaving may be produced at will.

What I claim as my invention is:—

1. In a loom the combination of a pair of vertically and laterally movable heddles, each provided with comb teeth having eyes therein for the passage of the warp ends, the teeth having alternately long and short points.
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2. In a loom the combination of a pair of vertically and laterally movable combined heddles and reeds, each provided with comb teeth having eyes therein for the passage of
 125 the warp ends, the teeth having alternately long and short points.

3. In a loom the combination of a pair of vertically and laterally movable heddles, each provided with comb teeth having eyes
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therein for the passage of the warp ends, the teeth having alternately long and short points and means for laterally moving the heddles, after the ends of the long pointed teeth in the one heddle have passed the warp ends in the long pointed teeth of the other to cross the warp ends. 15

4. In a loom the combination of a pair of vertically and laterally movable combined heddles and reeds, each provided with comb teeth having eyes therein for the passage of

the warp ends, the teeth having alternately long and short points and means for laterally moving the heddles, after the ends of the long pointed teeth in one heddle have passed the warp ends in the long pointed teeth of the other, to cross the warp ends.

Hamilton this 4th day of June 1910.

HARRY M. MARSH.

Signed in the presence of—

LORNE D. GRAHAM,

HARDY S. AWREY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
