(No Model.) 5 Sheets—Sheet 1.

C. A. LITTLEFIELD.

LOOM FOR CROSS WEAVING.

No. 386,477. Patented July 24, 1888.

FIG. 1

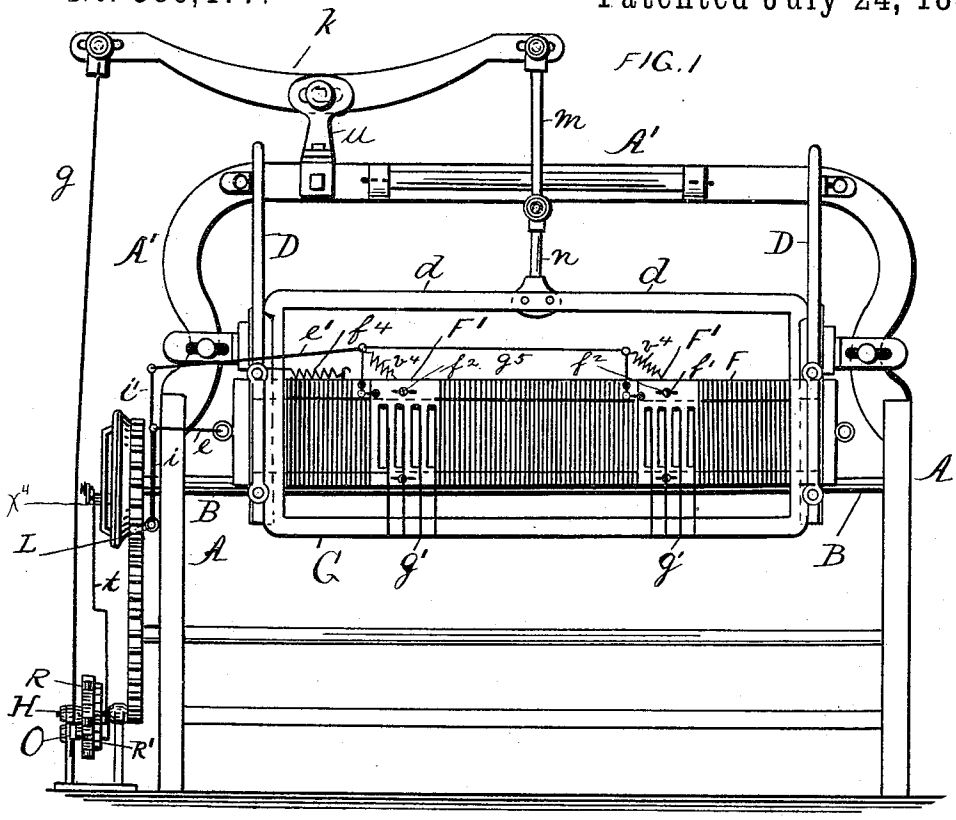
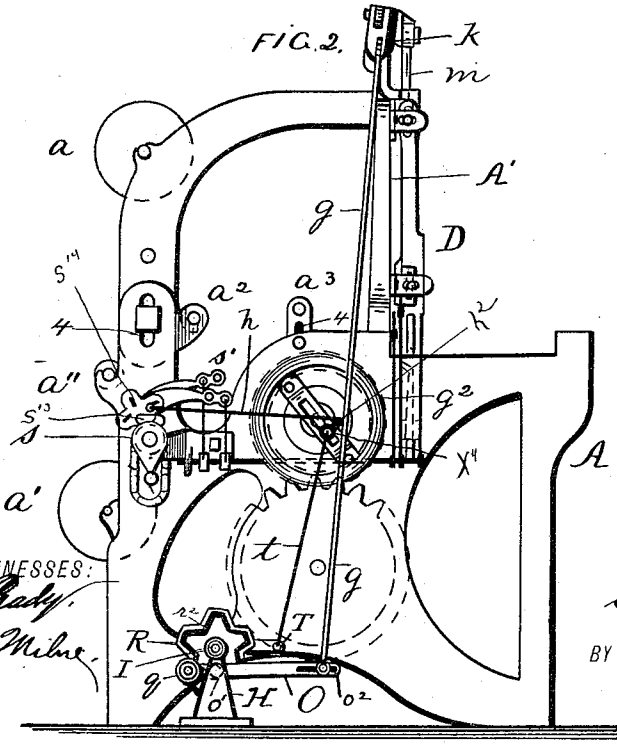


FIG. 2.



WITNESSES:
Robt. S. Brady.
James T. Milne.

INVENTOR:
Charles A. Littlefield.
BY Lewis F. Brous?
ATTORNEY,

N. PETERS, Photo-Lithographer, Washington, D. C.

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C. A. LITTLEFIELD.

LOOM FOR CROSS WEAVING.

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FIG. 3.

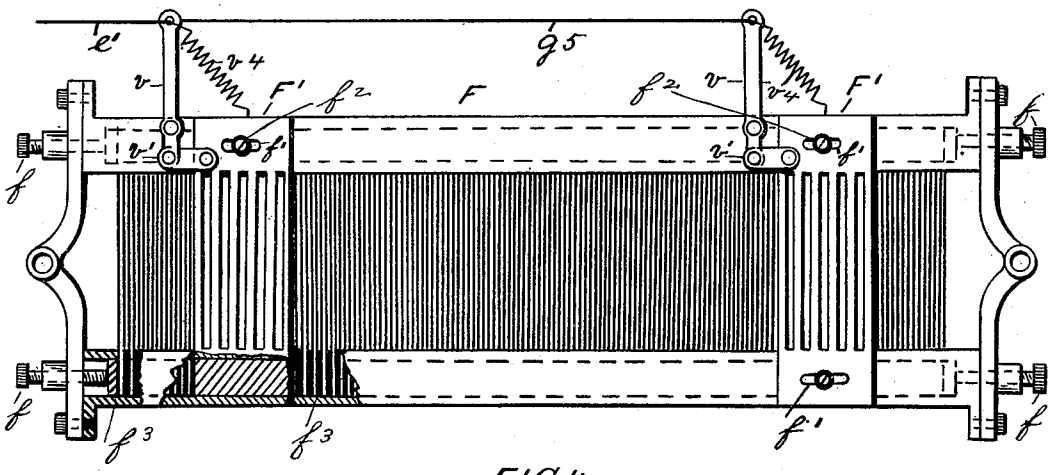


FIG. 4.

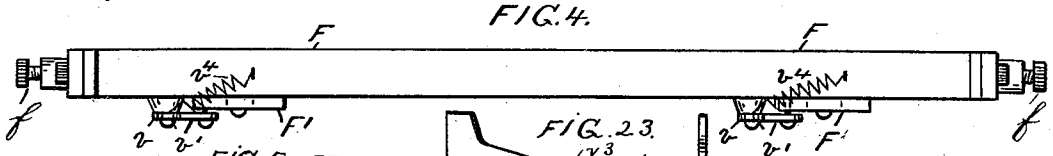


FIG. 5.

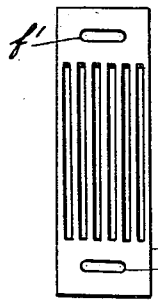


FIG. 6.

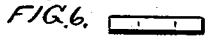


FIG. 25.



FIG. 23.

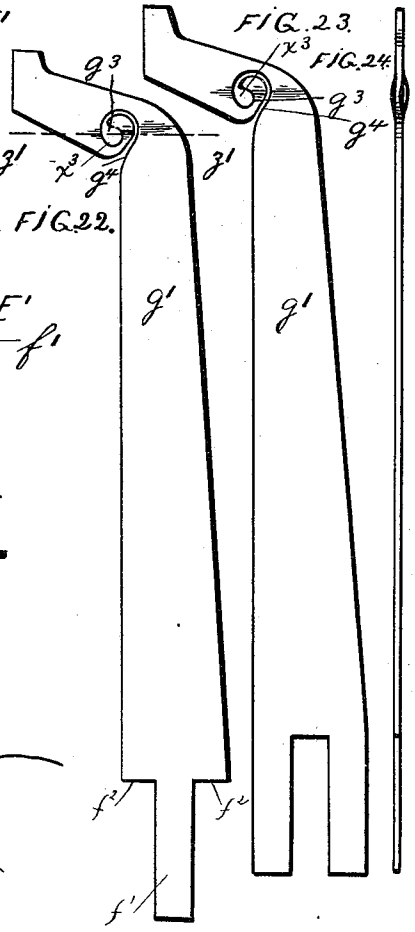


FIG. 24.

FIG. 22.

FIG. 26.

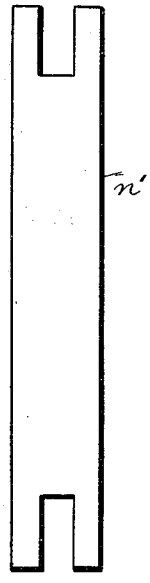
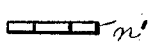


FIG. 27.



WITNESSES:

Thos. S. Grady.

James T. Milne.

INVENTOR,

Charles A. Littlefield.

BY Lewis F. Brown.

ATTORNEY,

N. PETERS. Photo-Lithographer. Washington, D. C.

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FIG. 7.

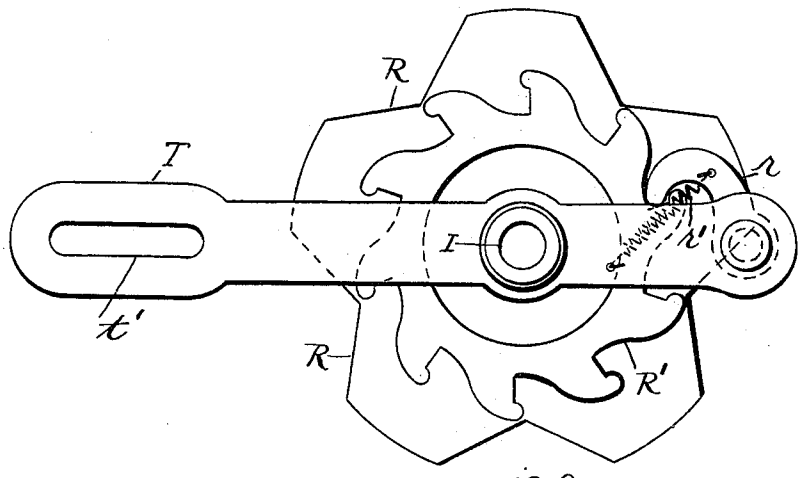
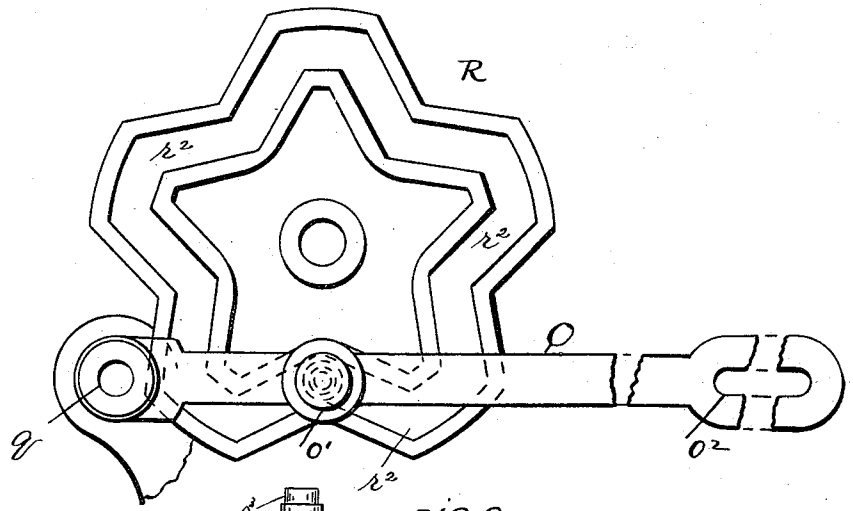


FIG. 8.



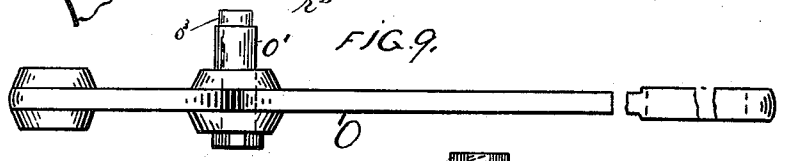
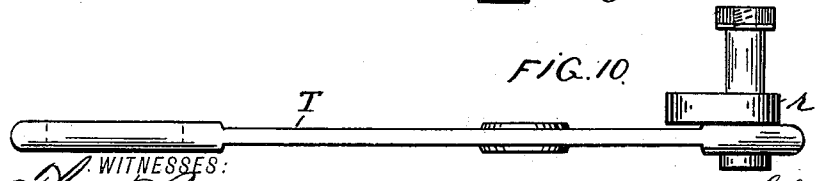


FIG. 9.

FIG. 10.



WITNESSES:

Thos. F. Brady

James F. Milne.

INVENTOR.

Charles A. Littlefield

BY Lewis F. Brous,

ATTORNEY.

N. PETERS, Photo-Lithographer, Washington, D. C.

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C. A. LITTLEFIELD.

LOOM FOR CROSS WEAVING.

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FIG. 11.

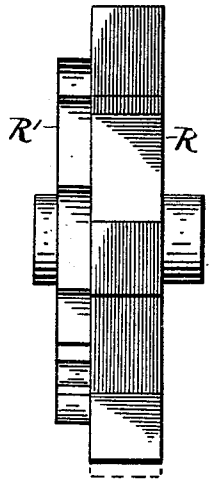


FIG. 12.

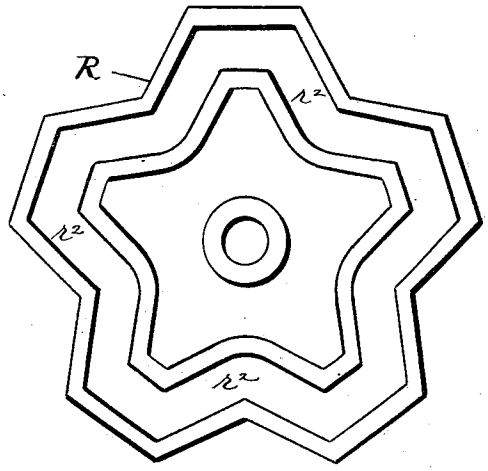


FIG. 14.

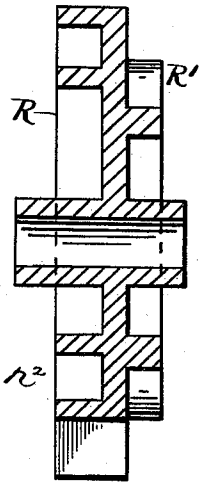


FIG. 13.

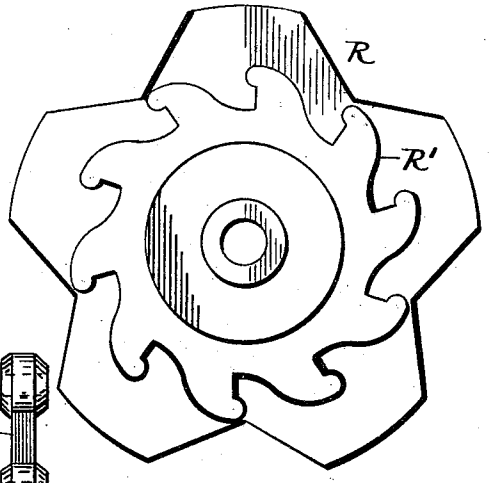


FIG. 15.

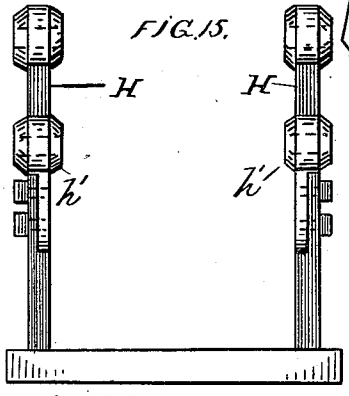


FIG. 16.

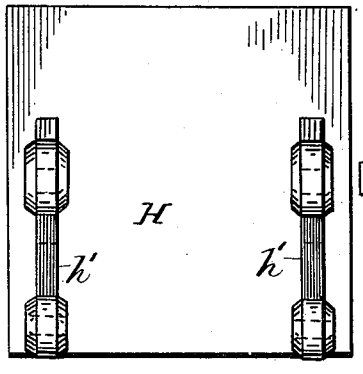
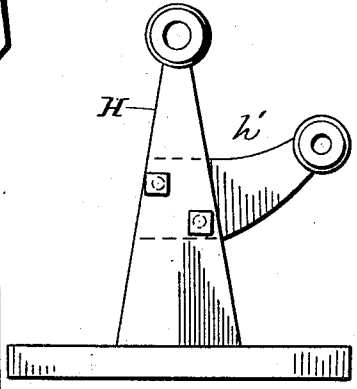


FIG. 17.



WITNESSES:
Thos. S. Brady
James T. Milne.

INVENTOR
Charles A. Littlefield,
BY Lewis F. Brous
ATTORNEY.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 5 Sheets—Sheet 5.

C. A. LITTLEFIELD.

LOOM FOR CROSS WEAVING.

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FIG. 18.

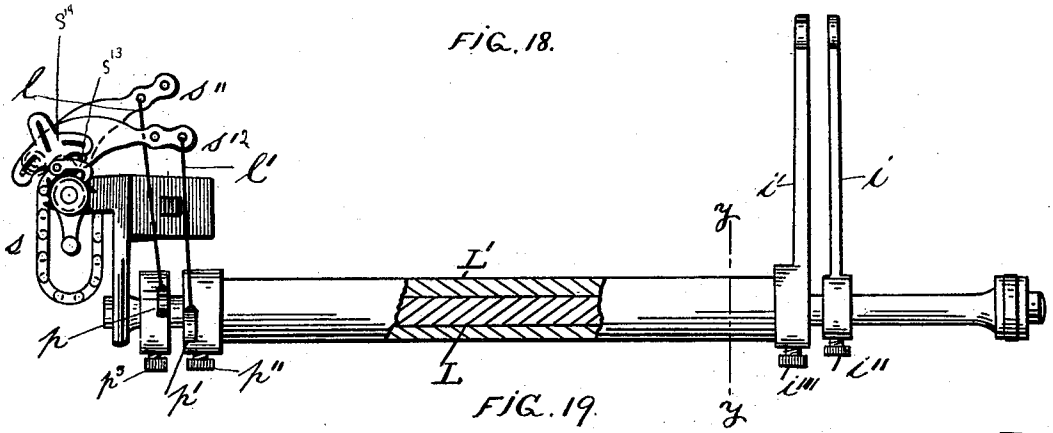


FIG. 19.

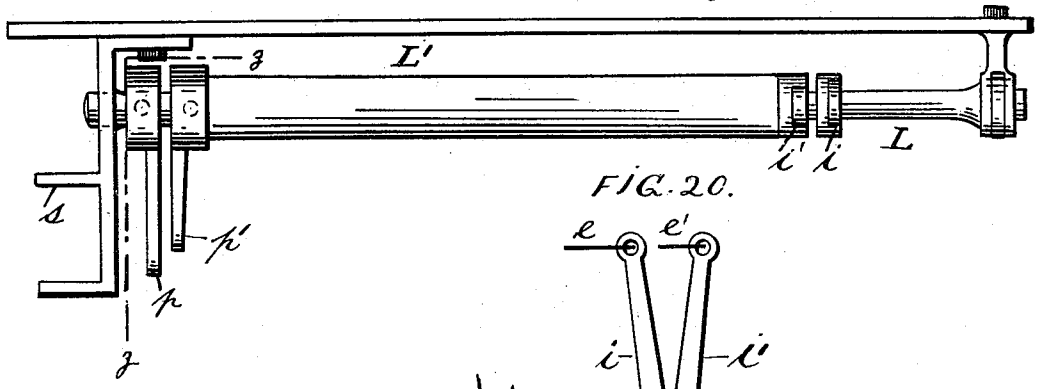


FIG. 20.

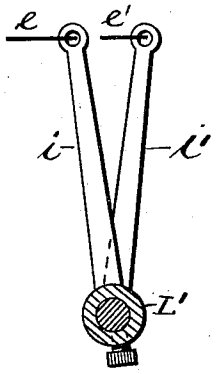
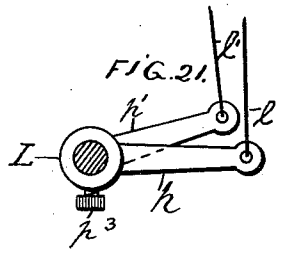


FIG. 21.



WITNESSES:
Thos. E. Brady.
James T. Milne.

INVENTOR.
Charles A. Littlefield.
BY Lewis F. Brous.

ATTORNEY.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

CHARLES A. LITTLEFIELD, OF FALL RIVER, MASSACHUSETTS, ASSIGNOR TO ELIAS A. TUTTLE AND JAMES T. MILNE, BOTH OF SAME PLACE.

LOOM FOR CROSS-WEAVING.

SPECIFICATION forming part of Letters Patent No. 386,477, dated July 24, 1888.

Application filed February 19, 1887. Serial No. 228,168. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. LITTLEFIELD, a citizen of the United States, residing at Fall River, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Looms for Cross-Weaving; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists in an improved construction of devices for effecting the crossing of the threads in the weaving of leno, and especially in the construction whereby I am enabled to weave fabrics such as are suitable for the production of curtains and similar articles or dress-goods, and having longitudinal cross-woven stripes or borders, and at intervals transversely-extending cross-woven bars or portions, such as to constitute, for instance, headings.

In the accompanying drawings, Figure 1 is a view in front elevation of a portion of a loom-frame sufficient to illustrate the application of my invention, with the invention applied thereto. Fig. 2 is a view of the same in side elevation. Fig. 3 is a front view of the laterally-sliding reed and parts applied thereto. Fig. 4 is a top view thereof. Fig. 5 is a front view of one of the sliding plates shown in Fig. 3 applied to the reed. Fig. 6 is a top view thereof. Fig. 7 is a view in side elevation of the needle-raising cam and part of its actuating devices. Fig. 8 is a view of the said cam from the opposite side, showing the lever operated thereby, which is connected with the needle-carrying frame. Fig. 9 is a top view of the said lever. Fig. 10 is a similar view, partly in section, of the lever and pawl for actuating the cam. Figs. 11, 12, 13, and 14 are views of the said cam. Figs. 15, 16, and 17 are views of the frame in which the cam is mounted. Figs. 18, 19, 20, and 21 are detail views of the pattern devices and their connections. Figs. 22, 23, 24, and 25 are views of the needles, Fig. 23 representing a modification; and Figs. 26 and 27 are views of one of the dents of the reed.

A is the main frame of the loom. A′ is the arch thereof; B, the crank-shaft; *a*, the beam for the warps, which are passed through the eyes of the needles, hereinafter described. *a′* is the beam for the main or ground warps, which are controlled by harnesses in the usual manner.

a″ is a guide-roll, over which the warps from beam *a′* are passed on their way to the harness and reed, and a^2 a^3 are guide-rolls for the warps from beam *a*.

g′ are needles having eyes x^3, (see Figs. 22, 23, 24, and 25,) through which eyes are passed, either singly or in groups of two or more, as desired, the warps from beam *a*.

To facilitate the introduction of the crossing warp-threads, the eye of each needle is open, a curved or winding slot or opening, g^4, leading into the same from the edge of the head of the needle, as shown in Figs. 22 and 23, and the material of the needle adjacent to the eye preferably is bent or curved laterally on opposite sides of the said eye to avoid any abrupt bending or deflection of the warp-thread passed through the eye, the tongue g^3 adjacent to the eye being thinned at its end and bent in the opposite direction. The needles are attached to the lower bar of a frame, G, (see Fig. 1,) sliding vertically between guides D D, attached to the arch A′, and preferably constructed in manner similar to the guides lettered N shown and described in detail in my application, Serial No. 228,363, filed February 21, 1887. The needles may be applied to the said bar in either of two equivalent ways. Thus the lower end of each needle may be formed with a tongue, x', and shoulders x^2, as in Fig. 22, and be applied to a slotted lower bar, the tongues of the needles fitting the slot, as indicated in dotted lines in Fig. 22, and the adjacent needles being separated by having interposed between the tongues separating-pieces corresponding with those lettered f^3 in Fig. 3, and shown and described in my application, Serial No. 228,363, filed February 21, 1887; or the lower end of the needle may be slotted and forked, as shown in Fig. 23, and caused to straddle the lower bar of the frame G, correspondingly-forked separating-pieces being used.

To the top bar, *d*, of frame G is attached a stand, *n*, to which is pivoted the lower end of rod *m*, which is pivoted at its upper end to the

inner arm of lever *k*, the latter being pivoted upon bracket *u*, secured to the arch A′, and having pivoted to its outer arm the upper end of rod *g*, which at its lower end is pivoted to the lever O. Slots are formed in the ends of the levers *k* and O and in the bracket *u*, to provide for adjustment of the pins connecting the rods *m* and *g* to the said levers and of the pivotal pin of the lever *k*. Lever O carries a stud or roller, *o*′, (see Fig. 9,) working in the groove r^2 of a cam, R, mounted in the stand H, (see Figs. 15, 16, and 17,) placed at the side of the loom, as shown in Figs. 1 and 2. The cam R has cast with it or attached thereto a ratchet-wheel, R′, which is engaged by a pawl, *r*, pivoted at the free end of a lever, T, turning loosely upon the shaft or arbor of the cam, said pawl being held in engagement with said ratchet-wheel by a spring, *r*′, connected at its opposite ends to the lever and the pawl, as shown in Fig. 7, and said lever being actuated by a rod, *t*, that is connected with one end thereof, the lever being slotted at *t*′ to permit of adjustment of the connecting-pin. The rod *t* at its other end is connected with a crank-pin, x^4, on the crank-shaft. The cam R, through the intermediate devices described, raises and lowers the needle-holding frame, or holds the same stationary in either raised or lowered position, as required for the production of the desired pattern. Its contour will be varied according to the character of the pattern to be woven. At the rear of the needle-holding frame and mounted in guides D D, so that it may slide freely therein from side to side of the loom, is a reed, F. This reed F is given a lateral movement in either direction after each depression of the needle-holding frame, so as to shift the standing warps (those which are not passed through the eyes of needles *g*′, but which are crossed by the latter threads) from one side to the other of the points of the needles, the rod *e* being connected at one end to one end of the reed F, and at the other to the arm *i* at the forward end of the horizontal rock-shaft L, the arm *p* on the rear end of said rock-shaft being connected by the link *l* to the arm s^{11}, resting on the surface of the pattern-chain *s*. Said chain is provided with risers for acting upon the arm s^{11} and the corresponding arm s^{12}, hereinafter referred to, and is actuated by means of the pawl s^{13}, carrier s^{14}, and rod *h*, the latter being connected with a crank, h^2, upon the crank-shaft, as shown.

The reed-operating devices, so far as already described, are substantially as shown, described, and claimed by me in my application filed February 21, 1887, Serial No. 228,363.

In order to provide for the production of a greater variety of patterns than it is possible to produce with the devices of the said application, and for the production of entirely different effects, I apply to the reed F, either at the ends thereof, as shown, or at other desired places in the length thereof, plates F′, slotted vertically, as shown, for the passage and movement of the warp threads. These plates are secured to the side bars of the reed F by screws $f^2 f^2$, that pass through horizontal slots $f' f'$ in the said plates, so as to allow the latter to slide freely in the direction of the length of the reed. Each plate F′ is connected by a link, *v*′, to the lower arm of a lever, *v*, pivoted upon the upper side bar of the reed F, said lever being acted upon to move the plate in one direction by a spring, v^4. The levers *v* are connected so as to move together by a rod or rods, g^5, and a rod, *e*′, extends from one of said levers to the upper end of an arm, *i*, at the forward end of the sleeve L′, fitted upon and moving freely around the rock-shaft L, as shown in Figs. 18, 19, 20, and 21. An arm, *p*′, at the rear end of sleeve L′ is connected by a rod, *l*′, to the end of arm s^{12}, hereinbefore described. By this means an independent movement upon the reed F may be communicated to the plates F′. When reed F is held stationary, the plates F′, which constitute auxiliary reed-sections, may thus be moved to produce lateral movement of the warps passed through the spaces thereof, and to cross-weave longitudinal borders or stripes in the fabric being woven, while, when lateral movements are again imparted to the reed F for the production of portions of the pattern extending more generally across the width of the fabric, cross-borders, or headings, the auxiliary reed sections or plates F′ will move jointly with the latter.

The reed is constructed in substantially the manner already indicated in describing the manner of applying the needles to the needle-holding frame, the dents *n*′ being separated by separating-pieces f^3, as indicated in Fig. 3; and in practice both the dents of the reed and the needles in the needle-holding frame will be divided off into groups, as required by the pattern, by spacing-blocks, such as presented in my application, Serial No. 228,363. *f f* are the screws for holding the dents, &c., of the reed clamped tightly in position. If desired, the reed-dents may be formed with slotted ends, as shown in Figs. 26 and 27, and be strung upon supporting-bars with forked separating-pieces and spacing-blocks interposed.

Having described my invention, I claim—

1. The combination, with the needles and needle-holding frame, of levers *k* and *o*, rods intermediate said levers and frame, cam R, ratchet-wheel R′, lever T, pawl *r*, rod T, and the crank-shaft, substantially as described.

2. The combination, with the reed F and mechanism for imparting lateral movement thereto, of auxiliary reed-sections movable with said reed F, and mechanism for imparting an independent lateral movement to said reed-sections, substantially as described.

3. The combination, with the reed F, the pattern-chain, its actuating devices, and intermediate devices for imparting lateral movement to said reed F, of the auxiliary reed-sections F′, movable with said reed F, and devices, substantially such as described, inter-

mediate the pattern-chain and said auxiliary reed-sections for imparting an independent lateral movement to said reed-sections, substantially as described.

4. The combination, with reed F, the pattern-chain, its actuating devices, and intermediate devices for imparting lateral movement to said reed F, of an auxiliary reed-section, F′, sleeve L′, and devices, substantially such as described, intermediate the pattern-chain and said sleeve and the latter and said reed-section for imparting independent lateral motion to said reed section, substantially as and for the purpose set forth.

5. The needle g', having an open eye, x^3, and a tongue, g^3, forming an integral part of the needle-body, and having its tongue and the material adjacent to the said eye curved in opposite directions, substantially as described.

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

CHARLES A. LITTLEFIELD.

Witnesses:
THOS. T. BRADY,
LEWIS F. BROUS.