2 Sheets—Sheet 1.

E. INGRAHAM.

Shedding Mechanism for Looms.

No. 232,038. **Patented Sept. 7, 1880.**

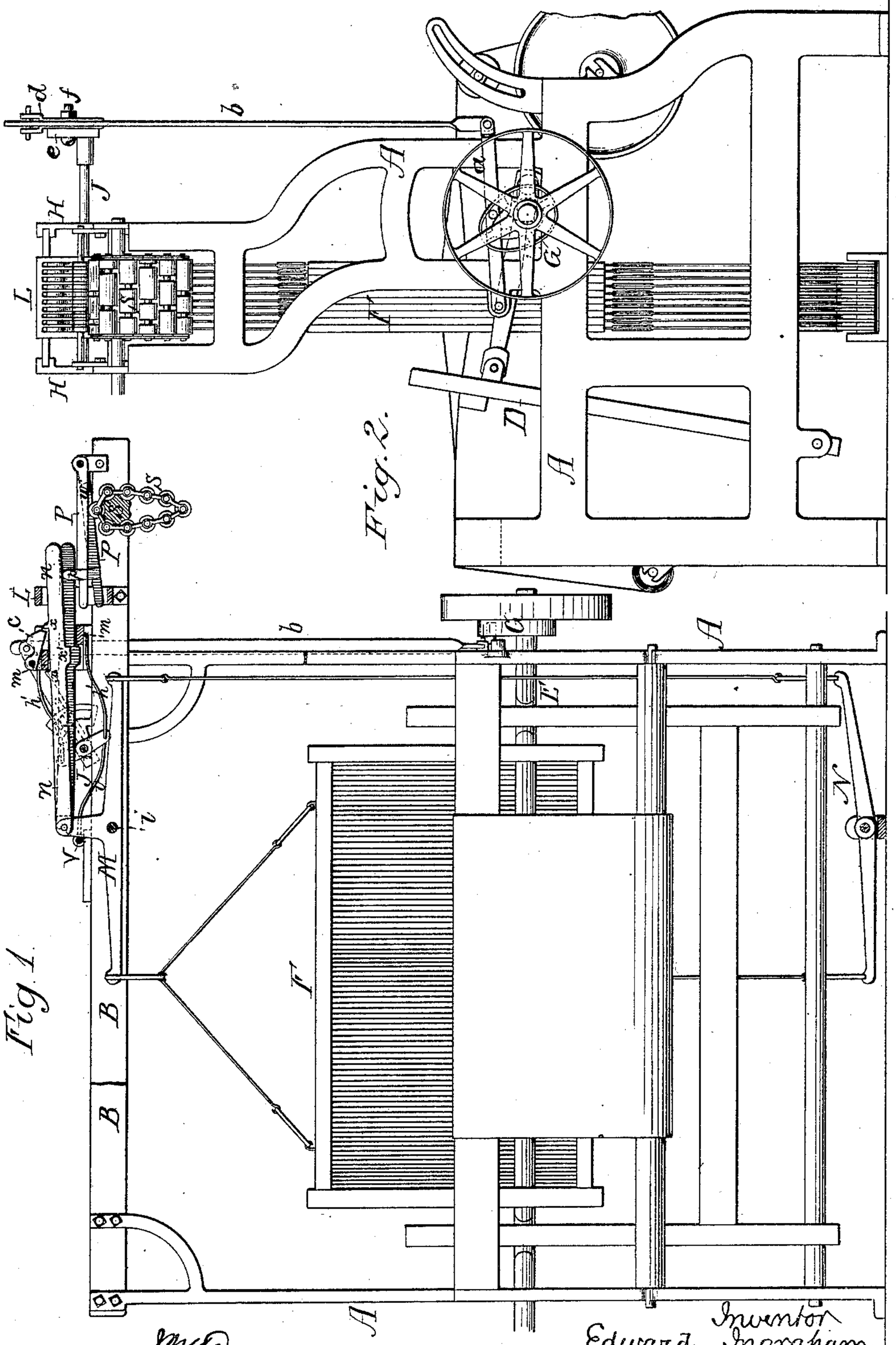

Fig. 1.

Fig. 2.

Witnesses
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2 Sheets—Sheet 2.

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Fig. 3.

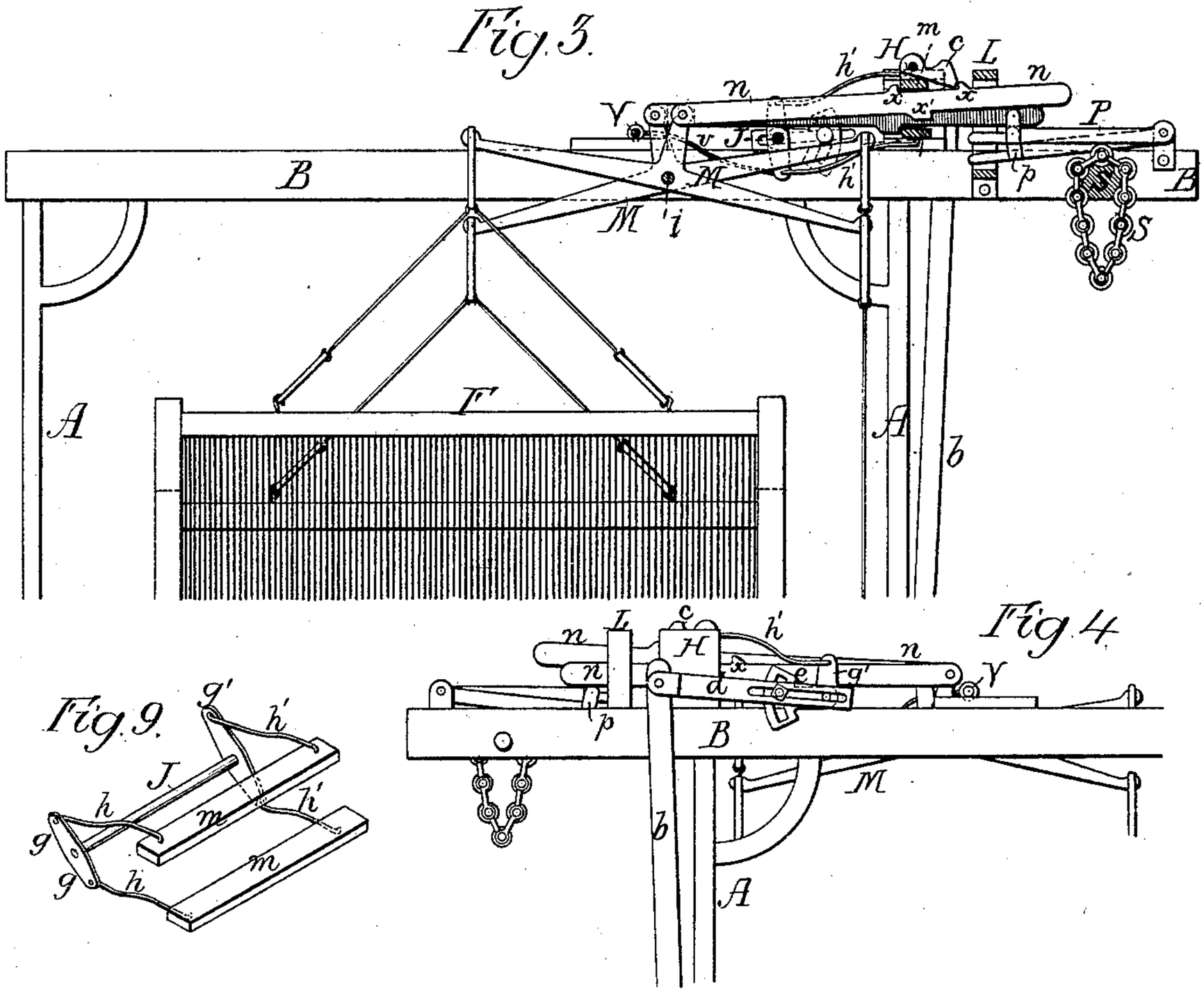


Fig. 4

Fig. 9.

Fig. 10

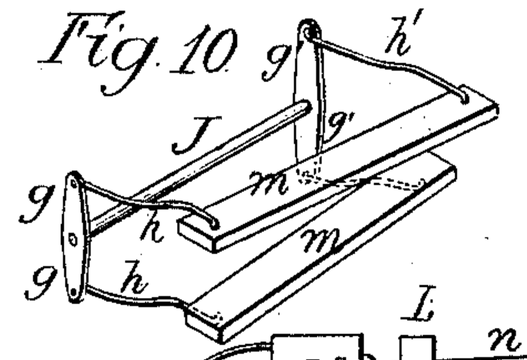


Fig. 6

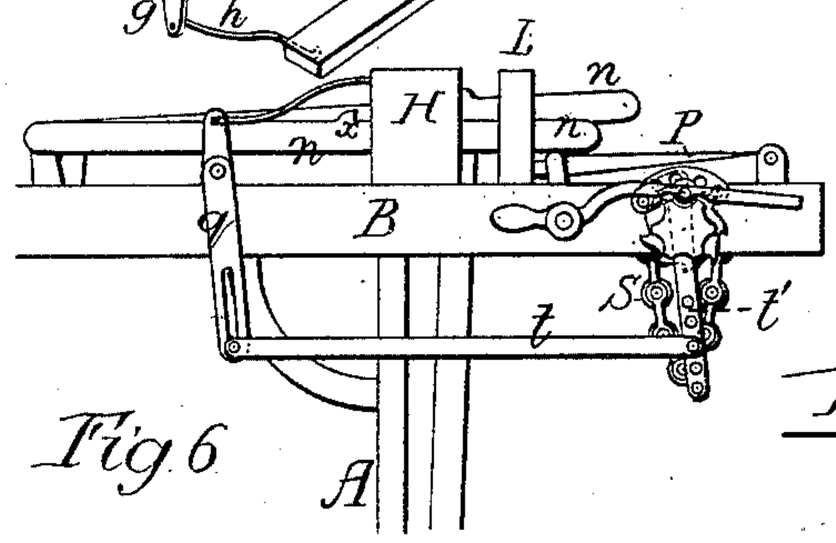


Fig. 8.

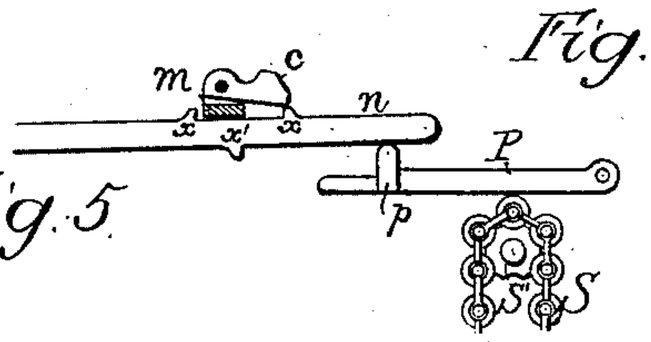


Fig. 5

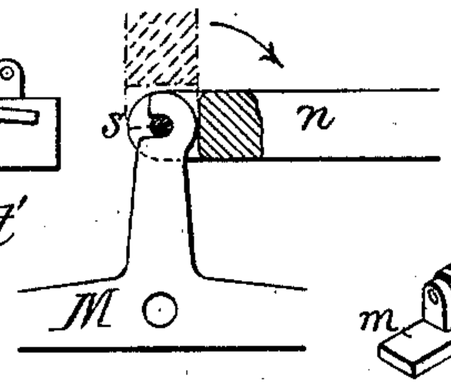
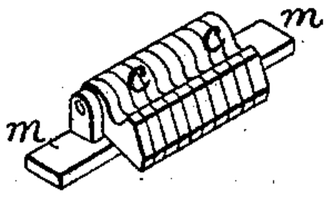


Fig. 7



Witnesses
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UNITED STATES PATENT OFFICE.

EDWARD INGRAHAM, OF PHILADELPHIA, PENNSYLVANIA.

SHEDDING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 232,038, dated September 7, 1880.

Application filed January 12, 1880.

To all whom it may concern:

Be it known that I, EDWARD INGRAHAM, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Shedding Mechanism for Looms, of which the following is a specification.

The objects of my invention are to effect the rapid operation of the heddle-frames and the formation of a perfect shed, to so operate the heddle-frames that the loom can be used for either plain or figured work, and to insure accuracy in the working of the parts.

The invention consists of a particular combination of certain levers, arms, bars, shafts, and cams, too fully described hereinafter to need a detailed preliminary explanation, whereby the above objects are attained.

In the accompanying drawings, Figure 1, Sheet 1, is a front view, partly in section, of a loom with my improvements; Fig. 2, a side view; Fig. 3, Sheet 2, a view of part of Fig. 1 with the parts in a different position; and Figs. 4 to 10, inclusive, detached views of various parts of the loom.

A A represent the opposite side frames of the loom; B B, transverse top frames; D, the lay; E, the driving-shaft, and F the heddle-frames.

The shaft E carries a grooved cam-disk, G, which acts on an arm, *a*, pivoted to one of the side frames, A, and connected by a swivel-joint to the lower end of a rod, *b*, the upper end of which is jointed to the outer end of an arm, *d*, the latter having its opposite end slotted and adapted to the projecting end of a rock-shaft, J, fitted to suitable bearings in the frames B.

The arm *d* is connected to the shaft J through the medium of an arm, *e*, on said shaft, the latter arm having a segmental slot, to which and to the slot in the arm *d* is adapted the confining-bolt *f*. By this means the arm *d* can be so adjusted in respect to the shaft J that the extent of vibration of the latter and its positions when at rest may be regulated with nicety.

The shaft J carries near one end two arms, *g*, and near the opposite end two arms, *g'*, the latter being somewhat longer than the arms *g*, for a purpose explained hereinafter.

In a frame, H, on the top of the loom are guided two bars, *m m*, these bars being connected, by means of rods *h h'*, to the arms *g g'* of the shaft J, whereby, on the vibration of said shaft, the bars will be reciprocated, one bar being moved outward as the other bar is moved inward.

The space between the two bars *m m* is occupied by a series of bars, *n*, arranged side by side and guided by a slotted frame, L, as many of these bars being employed as there are heddle-frames F in the loom, and the inner end of each bar *n* being connected by means of a bell-crank lever, M, to one of said heddle-frames, the movement of which is steadied and rendered positive by a supplementary lever, N, located beneath the frame and connected to the operating-lever M.

In order to permit the ready connection or disconnection of the bars *n* and levers M, the inner end of each of said bars *n* is slotted and provided with a transverse pin, *s*, and the upper end of the short arm of each lever M has a recess adapted to the pin and a rounded edge concentric with the rounded inner end of said recess, so that if the bar *n* is held vertically, as shown by dotted lines in Fig. 5, the pin may be slipped laterally into the recess of the lever-arm, and may be retained therein by turning the bar in the direction of the arrow to its proper horizontal position, as shown by full lines in said figure. The detaching of the bar is effected by reversing this operation.

The outer end of each of the bars *n* is acted upon by a lug, *p*, on an arm, P, pivoted to a suitable pin or shaft on the frame B, the series of arms being acted on by a pattern-chain, S, hung to a pattern-wheel, S', the intermittent operation of which is effected by means of the usual pawl-and-ratchet mechanism, operated by an arm, *q*, on the shaft J through the medium of the connecting-rod *t* and arm *t'*. The upper edge of each bar *n* has shoulders *x*, and the lower edge of each bar is provided with a shoulder, *x'*, these shoulders serving as the means whereby the bars *n* are operated on the reciprocation of the bars *m*. Thus if the parts are in the position shown in Fig. 1 the outer ends of certain of the bars *n* have been elevated by the pattern-chain through the medium of the arms P, so that the shoulders *x* of these arms abut against the ends of pawls *c*,

carried by the upper bar *m*, the shoulders *x'* of those bars which have not been elevated abutting against the edge of the lower bar *m*. On the vibration of the shaft J the upper bar *m* is caused to move outward and the lower bar *m* is drawn inward, a like movement being imparted to the bars *n*, controlled by said bars *m*, so that some of the heddle-frames are elevated and others depressed in order to form the shed.

When the parts are in the position shown in Fig. 1 the weight of the heddles is borne by a bar, V, connected to the lower arms, *g g'*, of the shaft J by rods *v*. The shoulders *x* of the bars *n* are then free from contact with the upper bar *m* or its pawls, and the shoulders *x'* of said bars *n* are free from contact with the lower bar *m*. The upper bar *m* has as many pawls *c* as there are bars *n*, the object of these pawls being to permit the operation of the bars *n* by the pattern mechanism while the bars *m* are in motion—that is to say, while the upper bar *m* is being drawn inward and the lower bar *m* moved outward. At such time the strain is removed from the depressed bars *n* by the contact of the bar V with the short arms of their levers M; hence any of said bars are free to be elevated, the outer shoulder, *x*, of each bar so elevated lifting the corresponding pawl *c* of the upper bar *m*, so that when the said bar *m* reaches the position shown in Fig. 1 the pawls fall and engage with said shoulders. Those bars *n* which have been elevated, but which, by the operation of the pattern-chain, are deprived of the support of the arms P, will fall when the upper bar *m* reaches the position shown in Fig. 1, in which position the shoulders *x* of said bars *n* are free from contact with the upper bar *m* or its pawls.

In the absence of the pawls *c* it would be necessary to bring the parts to the position shown in Fig. 1 before the pattern mechanism could operate to change the bars *n*.

The bars *m* do not move to the same extent throughout, one end of each bar having a greater extent of movement than the other, owing to the fact that the arms *g'* are longer than the arms *g*. (See Figs. 9 and 10.) By this means there is a gradual increase in the extent of the lift and drop of the heddles from the front to the back of the loom, so that a perfect shed is formed.

The cam G is such that the shed is opened rapidly, and the dwell occurs when the shed is open, the pattern-chain operating while the shed is closing, so that there is no necessity for an extended dwell with a closed shed, the warps being crossed to form a new shed before the lay commences to move back after beating up. The weft is thus prevented from being drawn out of place by the reed on the retraction of the lay, and the loom is adapted for the production of figured work as well as plain work.

Instead of connecting the arms *g g'* of the rock-shaft J to the bars *m m* by means of rods *h h'*, the said shaft J might be arranged between the bars *m m*, and the arms *g g'* connected directly thereto, the bars *n* in this case being wider than those shown, and being slotted longitudinally for the reception of the shaft.

In some cases the evener-bar and the mechanism for operating the same may be dispensed with, the tension of the warp-threads tending to bring the heddles and the bars *n* to the position of rest—a tendency which may, if desired, be supplemented by providing each bar with two shoulders *x'* as well as two shoulders *x*.

I claim as my invention—

1. The combination of the bars *n*, having shoulders *x x'*, the heddle-frames F and connecting devices, the pattern mechanism, the bars *m m*, the upper of which has a number of pivoted pawls, *c*, one for each bar *n*, and devices for reciprocating said bars *m* and operating the pattern mechanism, all substantially as set forth.

2. The combination of the bars *n*, having shoulders *x x'*, the heddle-frames F and connecting devices, the pattern mechanism, the bars *m m*, the upper of which has a number of pivoted pawls, *c*, one for each bar *n*, the bar V, and devices for reciprocating said bars *m* and V and operating the pattern mechanism, all substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD INGRAHAM.

Witnesses:

ALEXANDER PATTERSON,

HARRY SMITH.