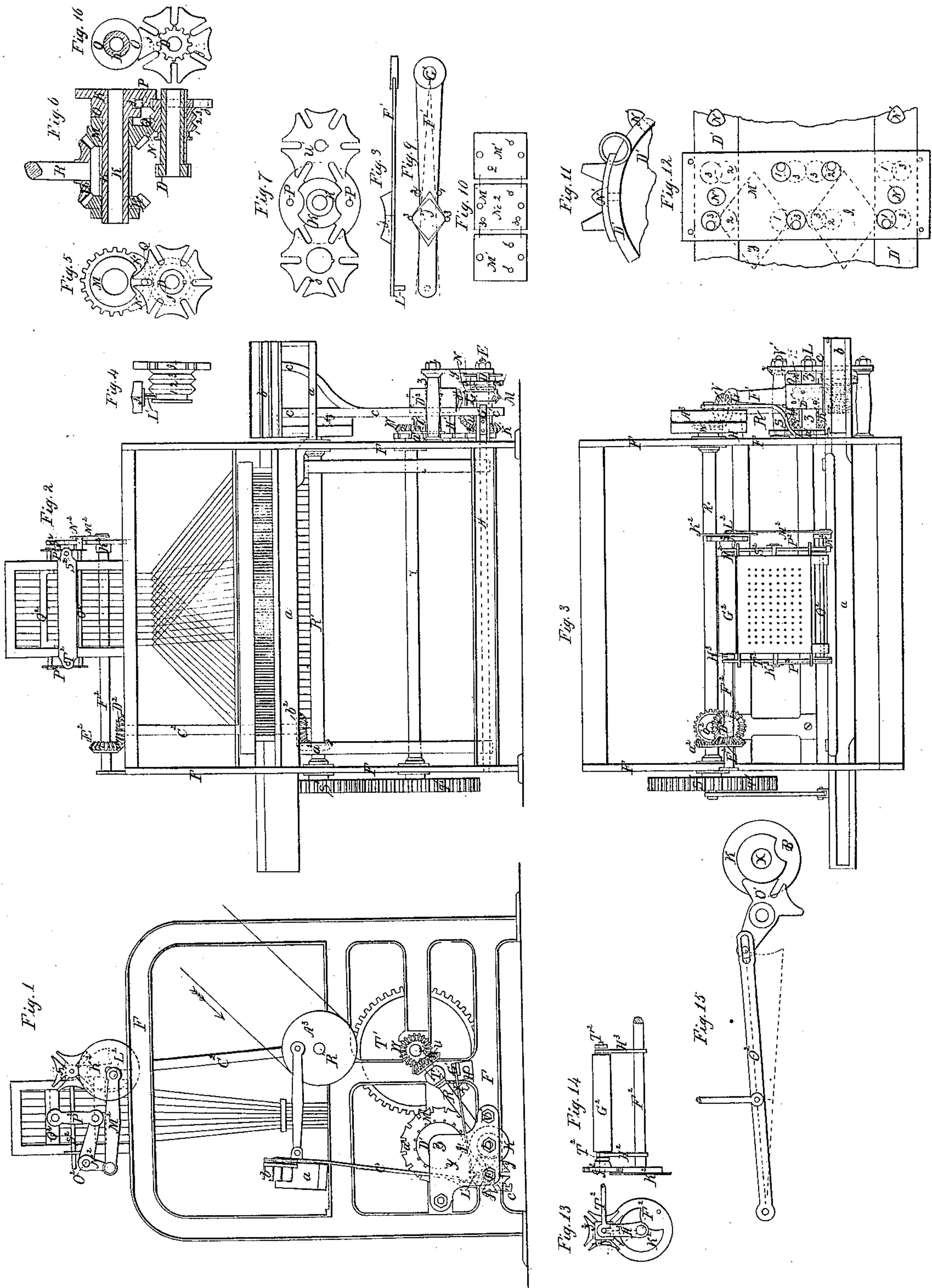
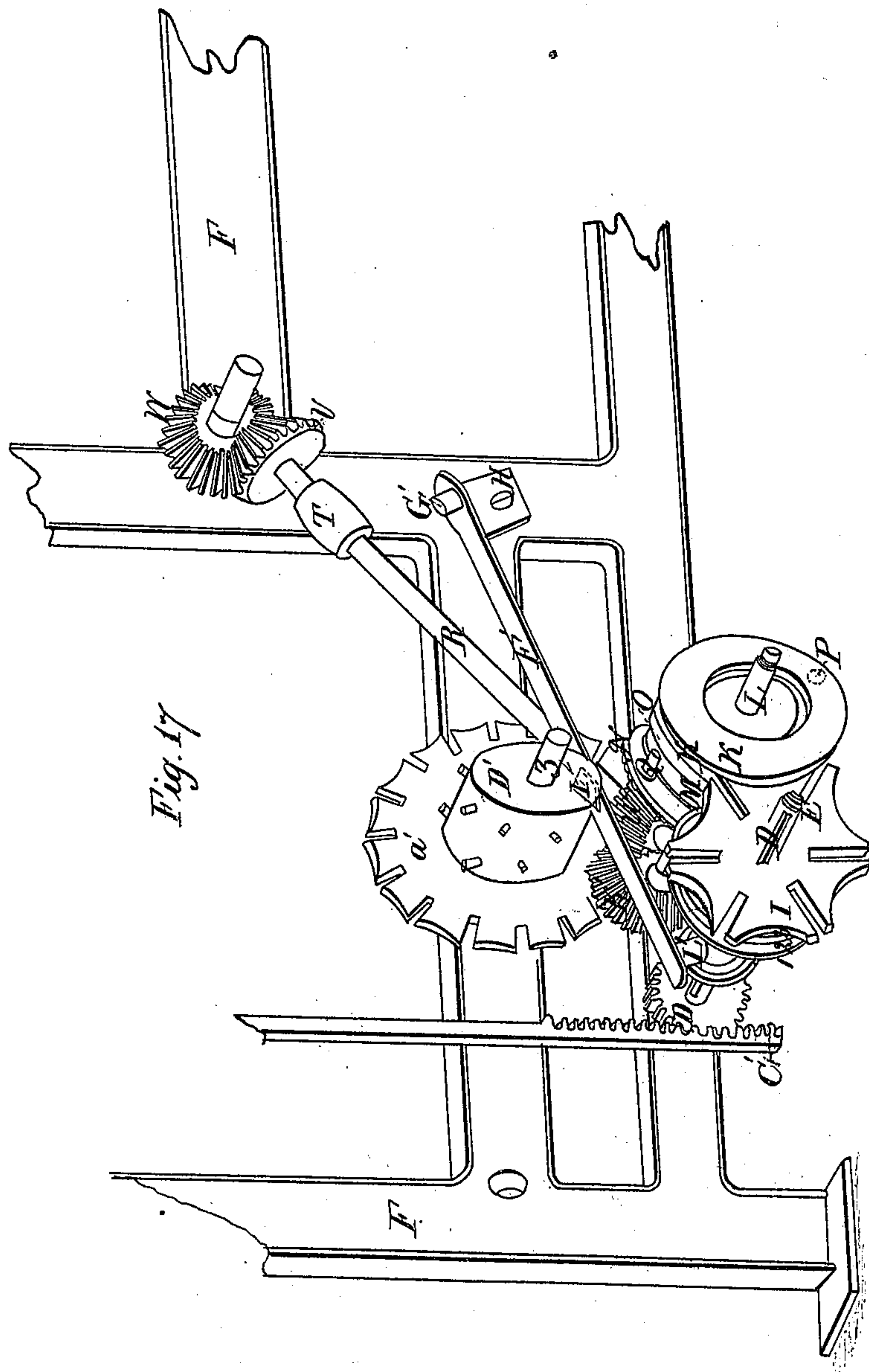


*S. & J. Eccles.*  
*Jacquard Weaving.*  
*N<sup>o</sup> 9,168.* *Patented Aug 3, 1852.*



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# UNITED STATES PATENT OFFICE.

SAML. ECCLES AND JAS. ECCLES, OF KENSINGTON, PENNSYLVANIA.

## IMPROVEMENT IN LOOMS FOR WEAVING FIGURED FABRICS.

Specification forming part of Letters Patent No. 9,168, dated August 3, 1852.

*To all whom it may concern:*

Be it known that we, SAMUEL ECCLES and JAMES ECCLES, both of Kensington, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Power-Looms for Weaving Figured Fabrics; and we hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a right side elevation of the loom. Fig. 2 is a front elevation of the loom. Fig. 3 is a plan of the loom. Fig. 4 is a front view of the star-wheel I, and an end view of lever F' and diamond-shaped inclined planes I', and also shows the pin L' in the square groove formed on the hub of star-wheel I. Fig. 5 represents the side of the miter star-mover M and star-wheel I, showing the guide N in action, the star-wheel I being half moved. Fig. 6 is a transverse section of part of the improved mechanism for moving shuttle-boxes. Fig. 7 is a side elevation of part of the improved mechanism for moving two series of shuttle-boxes. Fig. 8 is a side view, and Fig. 9 is a plan, of the lever F, and the diamond-shaped four-sided inclined plane I', and also shows the pins 1, 2, and 3. Fig. 10 represents the improved pattern-plates formed into a chain, showing the different positions of the pins 1, 2, and 3. Fig. 11 is an end view, and Fig. 12 is a plan, of the pattern-plate M' and part of cylinder D'. Fig. 13 is an end elevation, and Fig. 14 is a front elevation, of the improved mechanism for turning the Jacquard card-cylinder. Fig. 15 is a part of the improved combination required and used when only two shuttles are used. Fig. 16 shows the star-wheel on the neutral surface O, also an end view of pinion D. Fig. 17 is a perspective view of the mechanism for operating shuttle-boxes. Figs. 1, 2, 3, 13, and 14 are to the scale of one inch and a half to the foot. Figs. 4, 5, 6, 7, 8, 9, 10, 15, and 16 are as one-fourth or three inches to the foot. Figs. 11 and 12 are full size.

The loom-framing and all other necessary parts and the different motions that are the same as in power-looms now in public use (although part of them are represented in the annexed drawings) are in this specification

mentioned only when their connection with the improvements claimed require it.

Corresponding letters of reference are used in the different parts of the loom represented on the drawings.

*a* represents the lay.

*b* is a representation of an ordinary rise-and-fall box for three shuttles.

C is an upright rod, secured to the movable shuttle-boxes *b*. On the lower end of upright rod C is fixed a toothed rack, C', Figs. 1 and 2.

D is a pinion with a long hub working loose on stud E. Said stud E is held firmly by screws and nuts to frame F and stay-plate Y. The rack C' and pinion D are held in gear by guide G. Said guide G is secured to rocking-tree H, (shown by dotted lines on Fig. 2,) and vibrates with the lay *a*. The pitch-lines of pinion D and rack C' are (at the point of action) opposite the center of rocking-tree H, so that the shuttle-boxes do not vary in height by their oscillation with the lay *a*.

I is a star-wheel connected to the hub of pinion D by a feather-key. Two and one-half V-grooves and one square groove are formed on the hub of star-wheel I for the purposes hereinafter described. (See Fig. 4.)

K is a star-mover with a long hub, Figs. 1, 2, 3, and 6, revolving loose on stud L, said stud L being fixed to frame F and stay-plate Y.

K' is a miter-wheel keyed on the end of the hub of star-mover K. On the back of said miter-wheel K' is a rim and pin (forming a star-mover) to give action to the pattern star-wheel A'.

M is a miter-wheel revolving loose on the hub of star-mover K, and in a contrary direction to said star-mover K. The miter-wheel M serves as a star-mover, being furnished with a rim and pin Q, (see Figs. 5 and 6,) and on the outer edge of wheel M is a projection extending part of the way round and inclined to an edge, N, which we shall call a "guide," more fully described hereinafter.

O represents a neutral surface in the center of the star-movers K and M. The said neutral surface O is a complete unbroken circle, Fig. 16, and is turned precisely the same diameter as the rims on star-movers K and M, so that the star-wheel I may slide from any one of the surfaces K, M, or O to any other of said surfaces K, M, or O when acted upon by the mechanism hereinafter explained. The



neutral rim O is here (Fig. 6) shown as part of the same casting as star-mover K, and we find it to answer well so made, but a separate piece may be put loose on the hub of star-mover K. In such case the neutral rim O would be stationary when the star-wheel was on its surface, as shown in Figs. 2 and 16. The star-mover K is furnished with a pin, P, of sufficient length to act upon the star-wheel I, when the said star-wheel I is on the surface of star-mover K. Q is another pin of similar length, firmly fixed on star-mover M. There is just sufficient space between the said pins P and Q to allow the star-wheel to rest on the neutral surface O, and not be touched by either of the said pins P or Q in the course of their revolutions.

R is a shaft revolving in carriers S and T. Said carrier S is fixed to the stay V.

U is a miter-wheel keyed onto the end of shaft R, and is in gear with the miter-wheels K' and M. V is another miter-wheel, also keyed on the shaft K, and is in gear with and receives action from miter-wheel W, said miter-wheel W being keyed on the cam-shaft X.

Y is a stay-plate that holds the studs E and L firm and immovable. The star-wheel I and star-movers K and M are held by the said stay-plate Y in a correct position, thereby effectually preventing any play or vibration in the star-wheel I and all connected thereto.

A' is a star-wheel divided into sixteen parts, keyed on short shaft Z. D' is a pattern-cylinder, also keyed on shaft Z. The said shaft Z is carried by the frame F and stay-plate Y. The cylinder D' is furnished with pins M' to give action to the star-wheel I by the said pins coming in contact with the diamond-shaped four-sided inclined plane I' fixed on lever F', Figs. 8 and 9. When a short pattern is required, the pins may be inserted in the cylinder D', as shown in Fig. 1, but in such case the pattern would be completed when the cylinder D' had made one revolution; therefore a pattern-chain of new and peculiar construction is employed.

F' is a lever working on stud G', secured to frame F by carrier H'. On the said lever F is fixed a steel diamond-shaped projection or four-sided inclined plane I'.

L' is a pin or stud riveted (or otherwise secured) to said lever F'. The said pin L' works in the square groove formed in the hub of star-wheel I, for the purpose of communicating action from the pins 1, 2, or 3 on pattern-plates M' on cylinder D' to the said star-wheel I.

M', Figs. 10, 11, and 12, represents the improved pattern-plate, before referred to. Figs. 11 and 12 also show part of the cylinder D' and pattern-plate M', suitable for two separate series of shuttle-boxes, (full working size.)

N' are pins securely fixed in pattern-cylinder D', Figs. 11 and 12, for the purpose of holding the pattern-plates M', and by which the said plates M' are moved backward or forward, as required. On the upper face of the plates M'

are cast the pins 1, 2, and 3. The position of these pins determine the movement of the shuttle-boxes *b*. Three different positions are necessary, as shown in Figs. 10, 11, and 12. On part of the outer circumference of miter-wheel star-mover M is fixed a V-shaped guide. Its length may be seen on Fig. 5. The two ends and sides of said guide N are filed to an edge, forming a V. The duty of said guide is performed, just previous to the pins P or Q entering into the slots in star-wheel I, by the said guide N entering into a corresponding groove, 1, 2, or 3, formed on the hub of the star-wheel I, and thereby forcing the said star-wheel in a correct position—that is, in other words, if the pins 1, 2, or 3 on pattern-plates M' do not place the star-wheel I into a positively-correct position by the mechanism before described, (in consequence of any circumstance that may occur,) the guide N, entering into the groove formed on the hub of star-wheel I, will complete the necessary movement and prevent any accidents.

The operation of the above-described mechanism is as follows: Motion is communicated to the loom by a belt (in the usual way) working on a fast pulley, A<sup>3</sup>. A loose pulley is also placed as usual. The pulley A<sup>3</sup> is keyed on shaft R'. S' is a crank, and T' is a tappet-wheel giving action to the cam-shaft X, and by the before-described miter-wheels W, V, U, M, and K', being all geared as described, the star-movers K and M receive a continual positive rotary motion, the star-mover K revolving in one direction and the star-mover M revolving in the opposite direction simultaneously. The pattern-chain is first put in motion (when the pick is being made from the stationary box at the left-hand side of the loom) by the pin in star-mover K' giving action to star-wheel a', fixed on shaft Z, and thereby turns the pattern-cylinder D' one-sixteenth part of a revolution. The pins on pattern-plate (by the aforesaid movement) act upon the inclined plane I' on lever F'. We will suppose, then, the star-wheel I to be in the neutral position O—that is, in other words, the shuttle-box *b* is not required to be moved. The pins 3 will, in such case, hold the inclined plane I', as represented on Figs. 2 and 12, diamond I''. Said diamond I'' is shown on the upper side of Fig. 12. The pins P and Q will then revolve clear of the star-wheel I, and of course no motion could be given to the shuttle boxes. By the next movement of pattern-chain we will suppose the pin 1 on plate M' to come into action. As the said pin 1 moves in a straight direction it will come in contact with one side of the inclined plane I', and force the said inclined plane into the position as shown by dotted lines on the lower part of Fig. 12, and by the inclined plane I being connected to the lever F', as described, and the said lever F' being connected to the star-wheel I by pin L', the said star-wheel I is forced from the neutral surface O onto the permanent revolving rim of the star-wheel M. The guide



N then enters into the groove 3 on the hub of star-wheel I, as before explained. The pin Q in star-mover M then enters into the slot of star-wheel I, and turns (it the said star-wheel I) and pinion D one-sixth of a revolution. When the said pin Q has completed the movement, the star-wheel will be found to be fairly and fully bearing on the permanent surface of the star-mover M, and the shuttle-boxes will be (by the above-described operation) brought down and held positively in a correct position, (thereby dispensing with all the usual contrivances heretofore used for steadying and holding shuttle-boxes while the pick is being made,) and is then prepared to deliver or receive a shuttle. When the shuttle-boxes are required to be lifted, the pin 2 on plate M' is brought in contact with the inclined plane I'. The star-wheel I in such case is forced (by the above-described means) from off the surface of star-mover M, clear over the neutral surface O, onto the rim of star-mover K. The guide N then enters the half-groove on the hub of star-wheel I, as before described. The pin in star-mover K then enters into upper part of the slot of star-wheel I, and turns the said star-wheel I and pinion D one-sixth of a revolution, and by the pinion D being in gear with the rack C' on upright C the shuttle-boxes rise as required. Now, when a neutral plate is introduced, (see pins 3 on plate N<sup>2</sup>, Fig. 10,) the star-wheel I will be forced from either of the star-movers K or M onto the neutral surface O. The guide will in that case enter into groove 2 on the hub of star-wheel I. The pins P and Q will revolve clear of the star-wheel I, and the said star-wheel I, with all connected thereto, will remain stationary, as before explained.

It will be now perceived that the pattern-chain must be arranged according to the figure required for the cloth, and after the chain is applied the action of the whole is certain, and no part of the mechanism can be altered by the weaver, nor can a wrong shuttle be brought into action under any circumstances.

There is ample time for all the above motions to act in. For example, we take seven-sixteenths of the revolution of the crank-shaft R' in moving the shuttle-boxes, and one-fourth of a revolution of said shaft R' for moving the star-wheel I from any one of the three positions M, O, or K to any other of said positions M, O, or K by the means fully described. When one or more picks are required to be taken out of the cloth, or is lost by any circumstance, and the shuttles are required to be brought back, so that the weaver can replace the picks so lost, the motion of the loom, being reversed, will effect the desired point, for it will be seen that the whole mechanism is geared with the prime mover-shaft R', and when the said shaft R' is turned the reverse way all and every motion of the loom is reversed, and the shuttles can be thereby brought into any position they previously occupied, for the purpose above mentioned—a circum-

stance of so much importance as to require no further comment, for no combination of mechanism on any loom ever made (to the knowledge of the inventors of these improvements) has been so formed as to effect the above most desirable object prior to the one now described. In all looms heretofore made and used, when a pick or two is lost, the weaver is compelled to replace the shuttle-boxes by hand and turn back the pin-wheel or pattern-chain until the right pick is found, and much time is lost and much experience is required by the weaver to replace the whole combination, so as to insure a correct figure. It will be seen now that by the reversing of the loom the pattern-chain M' returns on the cylinder D', and the pins 1, 2, or 3 come in contact with one of the two inclined planes on the other end of diamond I'; (hence the necessity of the four-sided diamond-shaped projection I'.) The star-wheel will be thereby forced in the position it occupied prior to the reversing of the loom. If it is moved onto either star-mover K or M, the pin P or Q (as the case may be) will enter into the slot of the said star-wheel I, and as the said pins P and Q are revolving the reverse way the star-wheel I and pinion D will be turned the reverse way, and thereby the shuttle-boxes will be found to be in the position they previously occupied. Internal inclined planes may be used instead of the external, as here shown.

The star-wheel I is divided into six parts, but only three boxes are here shown; therefore, in fact, only three sides of the said star-wheel I can be used by the said three boxes; but the star-wheel I is here shown as being applicable to the moving of any number of shuttle-boxes, and of any description now used, and the loom may be speeded up to the highest point consistent with the well working of the yarn and shedding motions. Some alteration would have to be made in the arrangement necessary to communicate action from the star-wheel I to the boxes used in some kind of looms, but they will be such as any experienced workman may at once understand from the description here given.

Fig. 15 represents the segment of a star-wheel, O', giving action to lever O<sup>2</sup> for the purpose of moving rise-and-fall boxes where two shuttles only are used.

Fig. 7 represents part of the arrangement used where there are two series of movable shuttle-boxes. Motion is communicated to the left-hand series of boxes by the star-wheel U' being keyed on a shaft that crosses the loom. On the other end of said shaft may be keyed a spur-wheel, said spur-wheel being geared into another spur-wheel that will give action to the rack, as shown in the arrangement used for the moving of the shuttle-boxes at the right-hand side of the loom. Each series of boxes will be separate and detached; (or they may be worked together.) Two levers, F', with the necessary attachments, will be required, and the double-ended pattern-plate M', Figs. 11 and 12, will be necessary for mov-



ing two series of shuttle-boxes, when said boxes are separate and detached from each other, as in carpet-loom.

On looms where a Jacquard machine is used the star-wheel I may be slid by connection from the trap or lifting-board. The pattern in such case will be formed on the cards. We have worked a loom by the said means, but prefer keeping the Jacquard machine and the mechanism for moving the shuttle-boxes separate.

Motion may be communicated to the star-movers by various means. For instance, when they are placed on the cam-shaft, as in Fig. 15, the star-mover K may be driven by the cam-shaft X by a feather-key. The star-mover M may be connected by spur-wheels to crank-shaft R', and a reverse motion may be thus attained.

The star-movers K and M may be slid sidewise, instead of star-wheel I, for some looms. In such case the star I would be stationary so far as the side movement is concerned. In fact, many different arrangements can be made from the principles here clearly laid down without changing or deviating from the invention as made known.

A<sup>2</sup> is a miter-wheel on crank-shaft R. b<sup>2</sup> is a miter-wheel on shaft C<sup>2</sup>.

D<sup>2</sup> and E<sup>2</sup> are two miter-wheels geared to give a positive rotary motion to shaft F<sup>2</sup>, Fig. 14. G<sup>2</sup> is a card-cylinder.

H<sup>2</sup> and H<sup>3</sup> are two connecting rods or arms. Said arms H<sup>2</sup> and H<sup>3</sup> work loose on shaft F<sup>2</sup>, and on the journals of cylinder G<sup>2</sup>. The cylinder G<sup>2</sup> is held by the said arms H<sup>2</sup> and H<sup>3</sup> in a proper position. Consequently the cylinder G<sup>2</sup> vibrates in the arc of a circle (see Fig. 13) as it leaves the point of the needles. The distance between the center of the cylinder G<sup>2</sup> and the shaft F<sup>2</sup> is therefore not changed by the said cylinder moving to and from the needles.

I<sup>2</sup> is a star-wheel keyed on the end of cylinder-shaft G<sup>2</sup>.

K<sup>2</sup> is a star-mover keyed onto the shaft F<sup>2</sup>.

Motion is communicated to the lifting or trap board Q<sup>2</sup> by the crank-pin L<sup>2</sup> and the connecting-rods M<sup>2</sup>, N<sup>2</sup>, and P<sup>2</sup>, which will be clearly seen on referring to the drawings. The cylinder is forced to and from the needles by a scroll or inclined plane in the usual way, said scroll (not shown) acting upon the rods T<sup>2</sup> and S<sup>2</sup>.

The operation of the above is as follows: The shaft F<sup>2</sup> and star-mover K<sup>2</sup> receives a rotary motion by the wheels and shafts before mentioned, and when the pin in star-mover K<sup>2</sup> enters into the star-wheel I<sup>2</sup> the said cylinder G<sup>2</sup> is turned one-fourth of a revolution, and thereby brings a fresh card, as required. The board Q<sup>2</sup> then descends, and the said-card is brought against the face of the needles by the mechanism before explained and described.

The advantages derived from the above combination are numerous. We will state a few.

First. Certainty of action. The cylinder

can in no case be brought against the needles on its edge.

Second. The cards (and the lacings that connect the cards together) endure and last much longer in consequence of the ease and gentle manner they are used, being free from the sudden jerks that are given to them where springs and catches or hooks are employed.

Third. By the use of this improved combination the turning of the card-cylinder by cords and pulleys (by hand) separately and distinctly from all and every other motion of the loom is entirely dispensed with. When one or more cards are required to be brought back on this improved loom, (a circumstance that often occurs, notwithstanding the perfection the weft stop-motion has attained,) the reversing of the crank-shaft R' will cause the cards to return in their proper order; therefore the weaver need not fear getting astray with the pattern. And when both combinations (that is, the improved box-motions and card-cylinder motion) are used on the same loom the shed of the warp will in all cases correspond with the shuttles and boxes, a point never gained by any combination heretofore used in the knowledge of the inventors of this improvement. The motions may be used separately or combined—for instance, the box-motions are applicable to looms with any description of shedding-motions, and the Jacquard-card motions are applicable to looms with any kind of shuttle-box motions now in use.

Motion may be communicated to the shaft F<sup>2</sup> by a chain and two chain-wheels, one wheel fixed to the crank-shaft R', or on cam-shaft X, and the other chain-wheel on the shaft F<sup>2</sup>—that is, when it is not convenient to fix wheels and shaft as first described. Neither is absolutely necessary to work the lifting-board as here shown, and other contrivance may be substituted, if required.

Having thus fully described the nature of our improvements in looms for weaving figured fabrics, and having also shown and set forth several different modifications thereof, it is to be understood that we are aware that several things described in this specification have been in use before, Letters Patent having been granted to one of the inventors of these improvements (Samuel Eccles, bearing date March 5, 1850) for the use of a star and star-mover, in combination with other mechanism for moving shuttle-boxes.

We are also aware that the Jacquard-card cylinder has been operated upon by hooks, cams, and other similar things.

It is to be distinctly understood that we do not limit ourselves to any of the particular arrangements here described, as we are fully aware that different forms and arrangements will be found necessary for effecting the same objects in looms for weaving various kinds of figured fabrics, and to which these improvements are applicable.

What we claim as constituting our inven-



tions, and which we desire to secure by Letters Patent, is the following, viz:

1. The star-movers, whether they be arranged to slide instead of the star-wheel, or otherwise, and neutral surface, in combination with the star-wheel, (sliding or otherwise,) arranged substantially in the manner and for the purpose herein specified.

2. The pins on pattern-plates, or their equivalents, in combination with the diamond-shaped projection or four-sided inclined plane, lever, and star-wheel, arranged substantially as described, for the purposes herein specified.

3. The guide N, in combination with star-movers and star-wheel, as described.

4. The combination formed by the mechanism herein described, for giving a positive

and correct motion to the Jacquard-card cylinder—that is to say, the star-mover, star-wheel, and connecting-arms H<sup>3</sup>, with miter-wheels, or their equivalents, as herein fully made known, and the above mechanism is also intended to be applied to other descriptions of looms where lags and other similar devices are used instead of the cards, as on barrel and other similar looms; therefore the claim is not limited to the turning of a Jacquard-card cylinder.

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Witnesses:

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