2 Sheets—Sheet 1.

G. CROMPTON.

Mechanism for Shifting the Shuttle-Boxes of Looms.

No. 211,708. **Patented Jan. 28, 1879.**

Fig: 1.

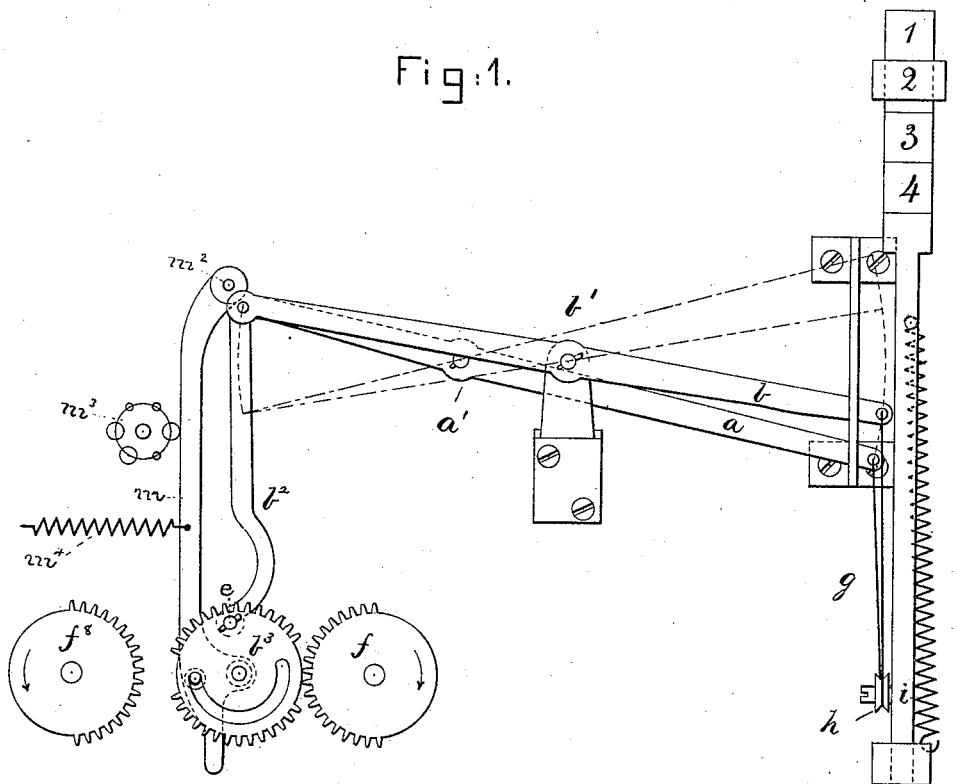
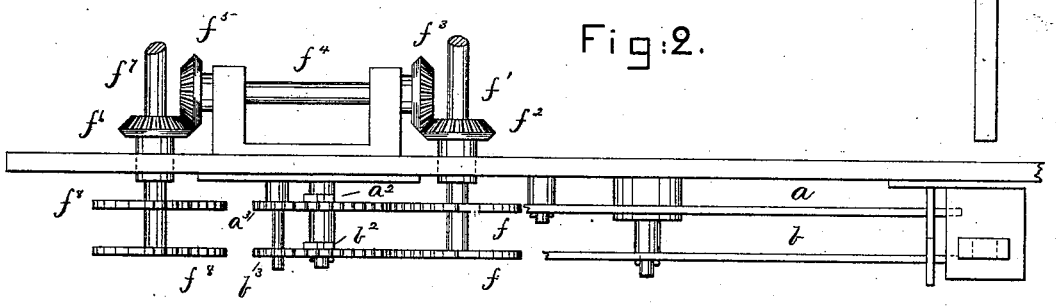


Fig: 2.



Witnesses.
N. E. Whitney.
Jos. P. Livermore

Inventor.
George Crompton,
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2 Sheets—Sheet 2.

G. CROMPTON.

Mechanism for Shifting the Shuttle-Boxes of Looms.

No. 211,708. **Patented Jan. 28, 1879.**

Fig: 3.

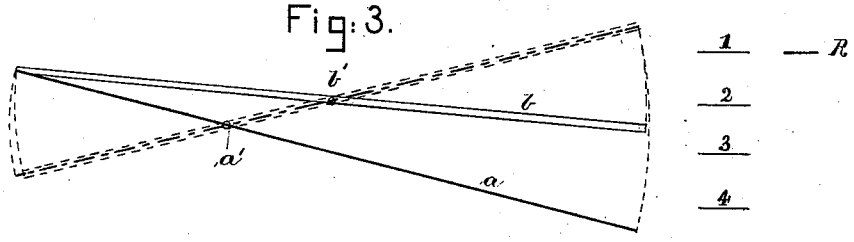


Fig: 4

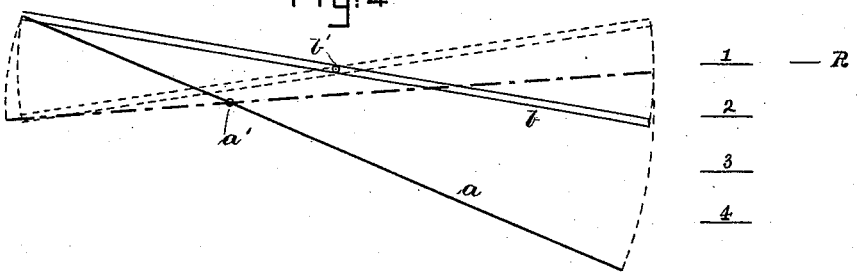


Fig: 5.

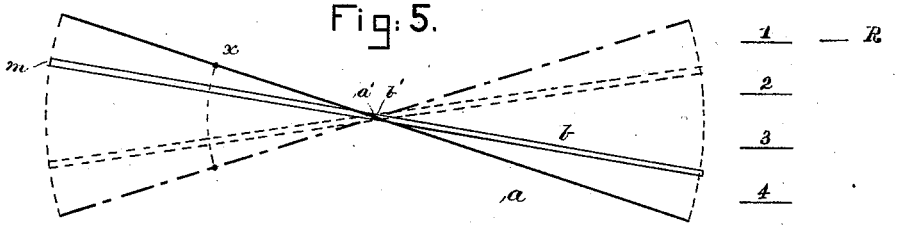
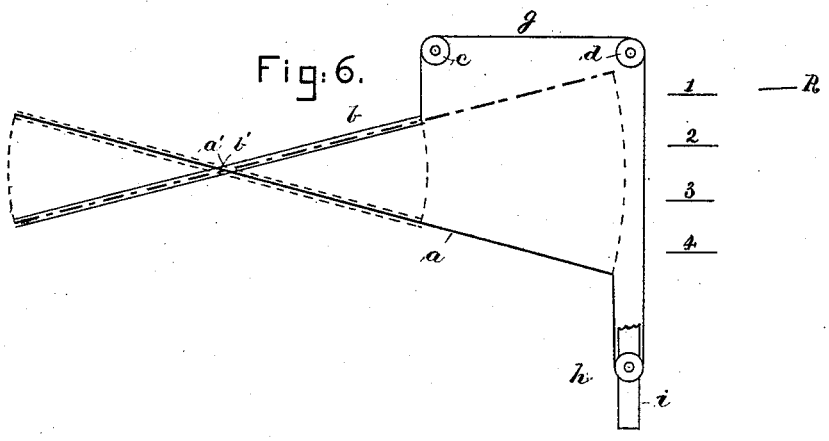


Fig: 6.



Witnesses.

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UNITED STATES PATENT OFFICE.

GEORGE CROMPTON, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN MECHANISMS FOR SHIFTING THE SHUTTLE-BOXES OF LOOMS.

Specification forming part of Letters Patent No. **211,708**, dated January 28, 1879; application filed May 1, 1878.

To all whom it may concern:

Be it known that I, GEORGE CROMPTON, of Worcester, in the county of Worcester, State of Massachusetts, have invented a new and useful Mechanism for Shifting the Shuttle-Boxes of Looms; and that the following, taken in connection with the drawings, is a full, clear, and exact description thereof.

In the drawings, Figure 1 is a front elevation, showing my improved levers connected with a tier of four shuttle-boxes, the said figure also showing mechanism for actuating the said levers, the full and dotted lines exhibiting the different positions of the levers and the manner in which a tier of four shuttle boxes or cells may be placed and held in proper position opposite the lay-race. Fig. 2 is a top view of Fig. 1, with a portion of the levers and radius-bars broken away. Fig. 3 is a diagram, showing that the levers will act in the same way when their fulcra have a different relative arrangement from that shown in Figs. 1 and 2. Fig. 4 is a similar diagram, showing the levers with a third arrangement of their fulcra. Fig. 5 is also a diagram of a modification of the apparatus, with the levers pivoted upon a fulcrum common to both of them; and Fig. 6 is a diagram of another arrangement still, showing how the invention may be worked when the points of attachment of the cord to the levers are not both substantially in line with the pulley on the box-rod.

In the diagrams one lever is represented in one position by a heavy line, in its other position by a single dotted line; and the other lever in one position by two full lines, and in its other position by two dotted lines.

The letter R represents the line of the shuttle-race, and the figures 1 2 3 4 the positions of the boxes when the levers are as shown in full lines.

This invention consists in the combination of two levers, each mounted upon a fixed fulcrum, with a pulley and cord or chain, in such manner that four shuttle-boxes may be worked by the contrivance, the gist and controlling feature of the invention being that the points of the levers for moving a tier of four shuttle-boxes, and to which the ends of the cord are attached, move through different distances, as hereinafter shown and described, one lever having twice the range of motion of the other lever.

In all the drawings one of the levers is represented at *a*, the other at *b*; and proceeding to describe, first, the arrangement represented in Figs. 1 and 2, it will be seen that these levers are each mounted upon a fixed fulcrum, a^1, for lever *a*, and b^1 for lever *b*, and that each lever has pivoted upon one end of it a connecting-rod, a^2, for one lever, and b^2 for the other, and that these rods are at their other ends each connected to similar crank-pins *e*, one for each connecting-rod, these crank-pins being each attached to one of the cogged wheels or disks a^3 b^3.

At the ends of the levers farthest from the connecting-rods each lever is attached to one end of the same cord-connector or chain *g*, and the bight of this cord lies under a pulley, *h*, attached to the shuttle-box rod *i*, or so connected with the boxes that the axle of the pulley moves with the boxes. This rod supports on its upper end the tier of shuttle-boxes 1 2 3 4. Now, as the throws of the crank-pins are the same, and the levers of the same length, or nearly so, but with fulcra in different parts of their length, it is clear that the ends of the levers or points to which the cord is attached must move through different distances, as herein provided, for the effective shuttle-box moving part of one lever has twice the range of motion of the other lever when their crank-pins are moved through the same distance, which is in practice nearly or exactly from one dead-center to the other, from up to down, or vice versa, when the levers are arranged horizontally or through an arc of one hundred and eighty degrees, or, as usual in practice, a little more than one hundred and eighty degrees.

In consequence of this range of motion of one lever being greater than that of the other, the comparison being made at the points of attachment of the cord, these two levers will, by the aid of the cord and pulley, actuate a tier of four shuttle-boxes, and move and hold any one of the four that may be desired opposite the shuttle-race.

By referring to Fig. 1, it will be seen that when both levers have their ends where the cord is attached lifted, as in dotted lines, then

the lowest box in the tier, or box No. 4, will be opposite the race; when the same end of *a* is up and that of *b* down, then box No. 3 will be opposite the race; when the end of *b* is up and that of *a* down, then shuttle-box No. 2 will be opposite the race; and when the ends both of *a* and *b* to which the cord is attached are down, as in full lines, then the shuttle-box No. 1 will be opposite the race.

Referring now to diagram Fig. 3, it will be seen that the same results will be produced with *a* and *b* both up, with *a* up and *b* down, with *b* up and *a* down, and with both *a* and *b* down, although the fulcra are differently arranged, and although *a* and *b* when both up are in a line—that is, have their ends to which the cord is attached at the same height.

Referring to Fig. 4, an attentive consideration of it will show that the same results will be effected by similar positions of the levers.

By comparison of Figs. 1, 3, and 4, it will also appear that the ends of the levers to which the cords are attached may have the arcs through which they oscillate in different relative positions. For instance, the arc of oscillation of *b* is central with that of *a* in Fig. 1, while in Fig. 3 the arcs have the same upper termination, and in Fig. 4 the arcs overlap each other.

In Fig. 5 the levers have a common fulcrum, or a fulcrum common to both levers, and they will be so connected with their cranks by the connecting-rods (although this is not essential,) that the arcs through which the ends to which the cords are attached oscillate, or have the same relative position as in Figs 1 and 2.

When the levers have a common fulcrum, and are of the same length, then the cranks may have different lengths of throw, if it be desired to have the connecting-rods substantially in a line, as in Fig. 1; but the cranks may have the same length of throw if one connecting-rod be connected to lever *b* at *m*, and the other to lever *a* at *x*. But in both of these arrangements the relative movements of the shuttle-box moving part of said levers, hereinbefore stated, must be observed.

In Fig. 6 the levers have a fulcrum common to both of them; but the points of attachment of the cord are at different distances from this common fulcrum, and two pulleys, *c d*, with stationary axes secured to the side of the loom-frame, are introduced in order to give the proper direction to the chain or cord *g* before it passes under the pulley *h*, which is the necessary pulley of my combination. These pulleys *c d* are mere changers of direction of motion.

In this arrangement of the parts constituting my invention box No. 4 will be opposite the race when the end of *b* to which the chain is attached is down and the same end of *a* up. No. 3 box will be opposite the race when the same ends of *a* and *b* are both up. No. 2 box will be opposite the race when the same ends of *a* and *b* are both down, and No. 1 box will be opposite the race when the same end of *b* is up and that of *a* down.

In all of these arrangements the cranks may both have the same throw, or have different throws, so long as the ends of the levers or the points or localities thereon to which the ends of the cord are attached move through different distances, substantially as represented in the diagrams, and the cranks may be capable only of rotation or oscillation on fixed centers, or may be mounted on movable centers, as in the Knowles loom; and these cranks are to be caused to move through arcs of one hundred and eighty dgrees, or thereabout, by any known mechanical means, under the direction of a pattern barrel or chain, in various ways well known in looms, or described in patents relating to box motions.

On Sheet 1 of the drawings I have shown two pinions having teeth extended partially around them, and mounted upon a rotating shaft, f^1, which may be operated directly from the main cross-shaft of the loom. This shaft f^1 has a bevel-pinion, f^2, which is to mesh with a bevel-pinion, f^3, on shaft f^4, provided with bevel-pinion f^5, to engage a bevel-pinion, f^6, on a shaft, f^7, having at its outer end two partially-toothed wheels, f^8, substantially the same as pinions *f*, but rotating in opposite directions, as shown by the arrows. The axes of the cogged wheels a^3 b^3, which carry the crank-pins, will or may be supported at the lower ends of arms *m*, one for each wheel, the arms being pivoted at m^2, and acted upon by rollers or protuberances of the pattern-surface m^3, a spring, m^4, connected with the said arms also co-operating with the pattern-surface to place either wheel a^3 or b^3 in engagement with either pinion *f* or f^8; but in all cases the points of the levers to which the ends of the cord are attached must be moved by actuating mechanism through different distances, substantially as represented in the diagrams.

I am aware that two levers, each on a fixed fulcrum, and combined with a cord and pulley, have been used to work a tier of three shuttle-boxes, the ends of the levers to which the ends of the cord were attached having in that instance the same range of motion, and the apparatus being capable of working three shuttle-boxes and no more, as in United States Letters Patent No. 37,760; and I am also aware that a tier of four shuttle-boxes has been worked by means of a compound lever—that is to say, a lever mounted on a shifting or movable fulcrum, as in Wyman's patent, dated October 29, 1867, No. 70,309, without the aid of a chain and pulley; but, although it has been a desideratum to work four boxes by means of two levers on fixed fulcra and a chain and pulley, I have known of no such contrivance prior to my invention, and that invention is based upon the discovery that when the levers have a different range of motion from each other, one twice the range of motion of the other at the points of attach-

ment of the ends of the cord, then the combination with them of a pulley and cord will enable said levers to work four boxes.

I claim as my invention—

1. In a mechanism for operating the shuttle-boxes of looms, two cranks and connecting-rods, and two levers on fixed fulcra connected therewith, one having twice the range of motion of the other, combined with a shuttle-box rod and a pulley, and a connection, substantially such as described, between the two levers and the pulley of the box-rod, whereby, by the unequal movement of the said two levers, any box of the tier of four boxes may be placed in operative position with relation to the raceway of the loom, substantially as described.

2. In a shuttle-box shifting mechanism for looms, two levers having fixed but different fulcra, as described, to thereby make levers with ends of different lengths, and mechanism to impart to one lever twice the range of motion imparted to the other lever, combined with a pulley, a box-rod, a tier of four shuttle-boxes, and a connection, such as described, between the ends of the levers and the pulley, whereby any one of the boxes of the tier of four boxes may be placed in operative position, substantially as set forth.

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

GEO. CROMPTON.

Witnesses:

J. B. SYME,

J. A. WARE.