

G. CROMPTON.
Shuttle-Box Mechanisms.

No. 142,441.

Patented September 2, 1873.

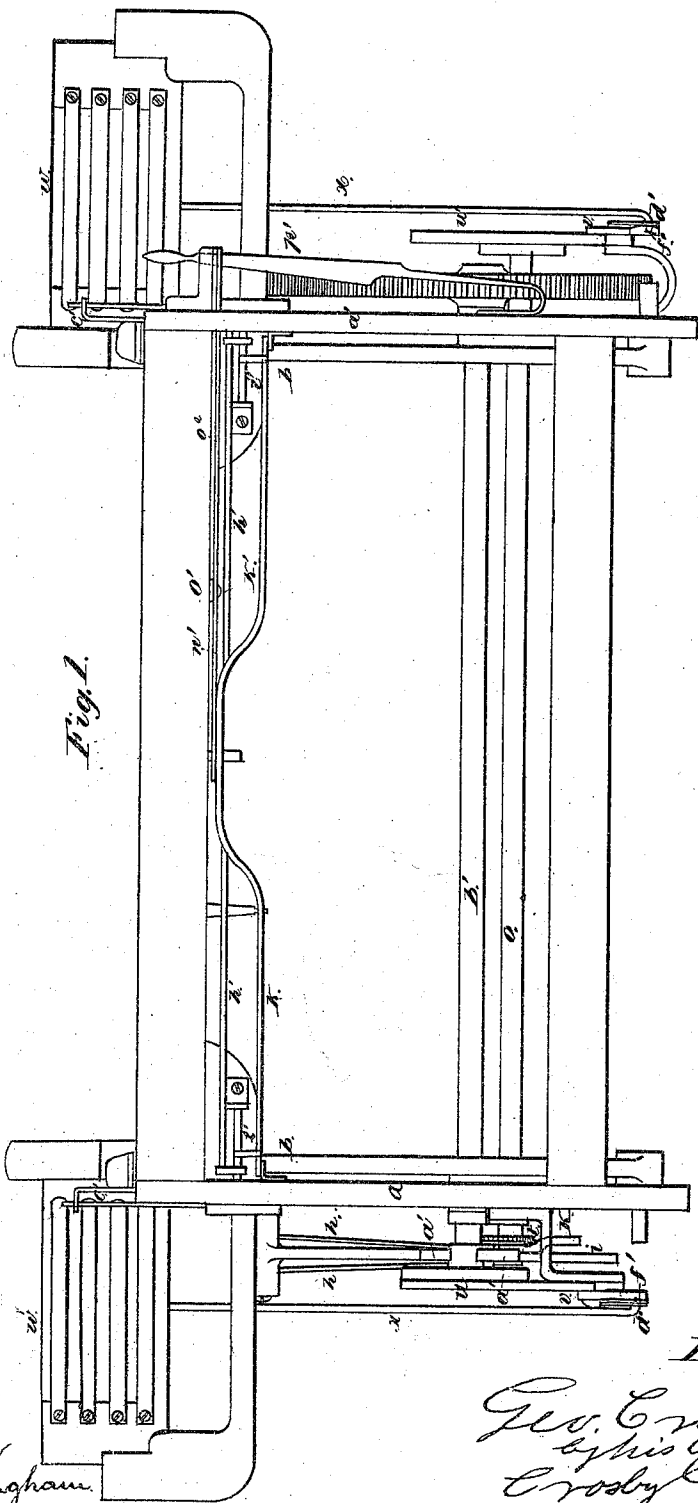


Fig. 1.

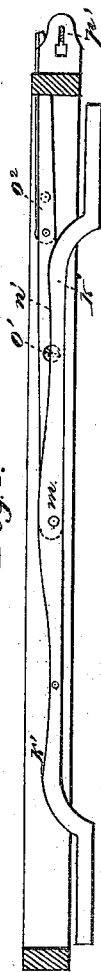


Fig. 5.

Witnesses:

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Inventor:

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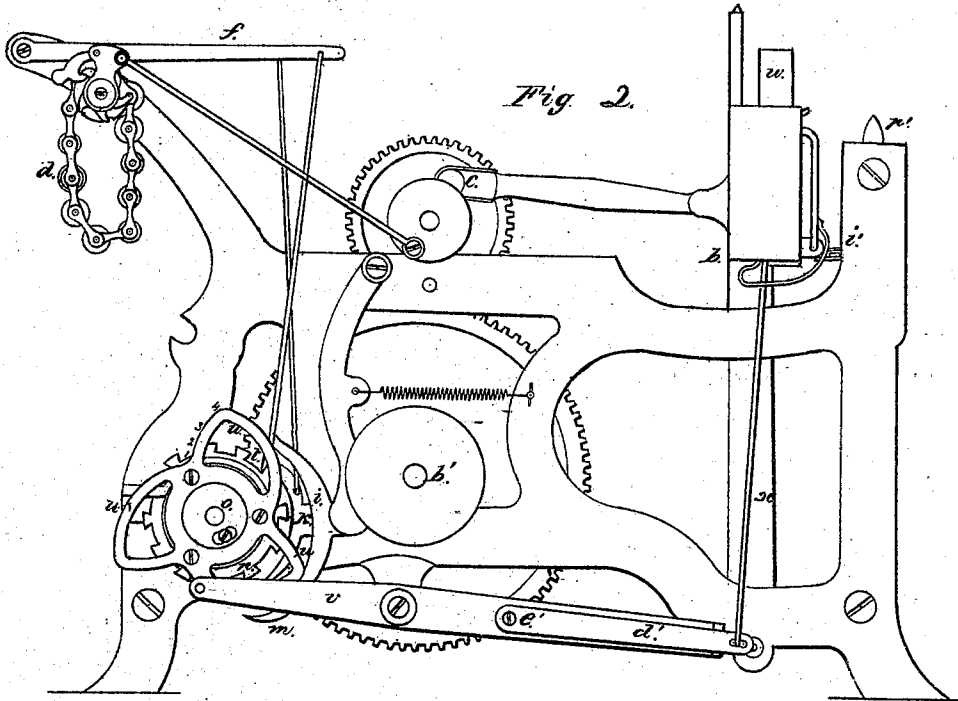


Fig. 3

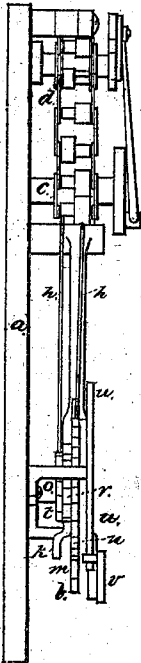
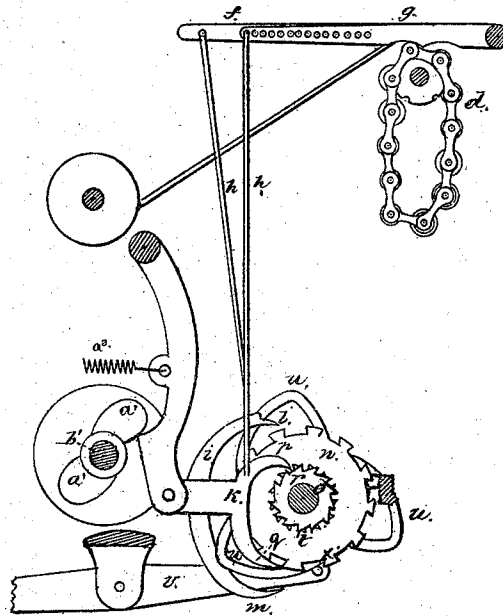


Fig. 4



Witnesses,

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UNITED STATES PATENT OFFICE.

GEORGE CROMPTON, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN SHUTTLE-BOX MECHANISMS.

Specification forming part of Letters Patent No. **142,441**, dated September 2, 1873; application filed July 10, 1868.

To all whom it may concern:

Be it known that I, GEORGE CROMPTON, of the city of Worcester, in the State of Massachusetts, have invented certain new and useful Improvements in 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 of parts of a loom, exhibiting my improvements. Fig. 2 is a side elevation of the same. Fig. 3 is a partial rear elevation; and Fig. 4 is an elevation, taken from the side nearest the loom, of the rocking lever, pawls, &c.

The improvements described and specified in this specification relate solely to the mechanism for shifting shuttle-boxes, so as to select or place opposite the race any shuttle-box of a series, and are applicable to all looms in which it is necessary or expedient to employ shuttle-boxes shifted automatically. So much of a loom only will be described as is necessary to a proper understanding of the invention. The uses and advantages of automatically-shifted shuttle-boxes are so well known that it is unnecessary herein to refer to them. My invention relates to new combinations of mechanism for shifting the boxes, either in regular or irregular succession, and by means of my invention any box in a series may be selected or brought in such position opposite the shuttle-race that the shuttle contained therein may be shot through the shed. By duplication of the contrivances invented by me, any shuttle-box of a series on each side of the loom may be selected, and by the aid of a rocking shaft extending across the loom two series of boxes on opposite sides may be worked in unison by sets of pawls and accessories upon one side of the loom only; but in that case one series will necessarily move as the other series moves—that is to say, when a box next to the one opposite the race is selected on one side of the loom, a box next to that opposite the race on the other side of the loom will be selected. If one box is passed over on one side, so that the series moves through a distance equal to twice that from the center of one box to the center of the next box, then the series on the other side will move through that same distance, and so on

for all distances between any one box and any other in either series. The mechanical novelty upon which my invention is based is the employment of a rocking or oscillating shaft, or rocking or oscillating lever, caused to oscillate through different arcs, or numbers of degrees of rotation, by means of pawls operating upon the shaft or lever at different distances from its center of oscillation, this oscillation through different arcs or degrees of revolution being by proper mechanism transferred to a series of boxes in such manner that the distance traveled or passed over by the series is proportioned to the degree of oscillation.

In the drawings, the frame of the loom is represented at *a*; the lathe at *b*; the shaft and connections for vibrating the lathe at *c*; and upon the lathe, in any usual or proper manner so as to slide up and down, are mounted two series of shuttle-boxes, *w w*, connected to rods *x x*. Another revolving shaft of the loom is represented at *b'*, and upon this shaft are two tappets or cam protuberances, *a¹ a¹*, which act upon a hanging arm, *a²*, provided with a spring, *a³*. To this arm are pivoted two sets of pawls, *l m*, *p q*; and the object of the whole contrivance is, that the pawls shall advance to perform work after a shuttle is shot and boxed, and before it is necessary to shoot another shuttle; and any other proper mechanism may be substituted for that shown in the drawings, so long as the pawls move a sufficient distance at the proper time. The pattern mechanism may be of any usual or proper construction—either a barrel, or a chain, or cards of metal or paper—and may be rotated or slid along, or have a combined rotating and to-and-fro motion, (as some pattern mechanisms have,) so long as it will properly control the pawls, as hereafter described; and I intend to substitute various kinds of pattern mechanism, variously operated, for that specially described and preferred by me, which consists of a chain, *d*, similar to the well-known Crompton chain, hanging from and actuated by a revolving drum, which is caused to revolve intermittently by means of a rock-shaft arm carrying a hooked pawl, caused to oscillate by a connecting-rod attached to a crank-pin on the lathe-shaft. (See, specially, Figs. 2 and 4.) Above the chain are pivoted levers *f g*, which are connected to the

pawls by rods or wires *h h*, the gist of this part of the contrivance being that the indications of the chain shall be transmitted to the pawls, so that the position of the latter shall depend upon the size of the particular protuberance of the chain which is acting upon the pawl; and any other proper mechanism may be substituted for that described; or the chain may be so arranged and mounted as to act directly upon the pawls; but in all cases the pattern mechanism must have a row of protuberances and depressions, or the equivalents or mechanical substitutes thereof, for each set or pair of pawls; and these protuberances and depressions in each row, whether wholly in the pattern mechanism, or partly in it and partly in the prism or drum that actuates it, must be of such character as to hold the lower pawl of each pair, or the upper pawl, in an acting position, or so hold them that neither pawl of the pair can act upon the ratchet or teeth of the rocking shaft or lever. The chain shown in the drawing is composed of balls or rings of three different diameters. Upon some proper part of the loom is mounted a shaft, *o*. This shaft has secured upon it two ratchet-wheels, *u u'* *t r*, (the latter is shown as a double wheel,) provided with teeth of such shape that the ratchets and shaft can be acted upon by the upper pawls so as to be moved in one direction, and by the lower pawls so as to be moved in the other direction; and the point or locality upon the teeth acted upon by the pawls is twice as far from the center of the shaft or its center of oscillation in one ratchet-wheel as it is in the other, so that motion is communicated to the shaft at different distances from its center. It is evident, therefore, that either pawl of one set of pawls will move the shaft through double the arc that the pawls of the other set move it. The shaft, therefore, moves through different arcs or degrees of rotation; and if this shaft were connected by a pinion thereon and a rack or some similar proper mechanical contrivance for converting circular oscillating into rectilinear reciprocating motion with the series of shuttle-boxes, then the series might be moved from the center of one box to the center of the next in succession on either side by the action of pawls upon the larger ratchet-wheel, and from the center of any one box to the center of the box second in direct succession on either side by the action of pawls upon the smaller ratchet-wheel, so that one box should be skipped over. Thus any one of three boxes in a series can be selected; and by adding a third ratchet-wheel and third set of pawls any one of four might be selected, and so on in succession, care being taken that each ratchet-wheel, when acted upon, oscillates the shaft through an arc which is a multiple of the arc through which the shaft is oscillated by the action of the largest ratchet-wheel in the series—or, in other words, care being taken that the second wheel in the series is of twice the diameter of the first, the third three times that of the first, and so on in succession.

I call the rocking or oscillating shaft with the ratchets mounted thereon (as a whole) a rocking or oscillating shaft or lever, and one way of transferring its motions to the boxes is shown in the drawings, by mounting upon it a cam or tappet wheel, *u u*. This wheel acts upon a pin attached to a lever, *v*, pivoted upon some convenient part of the loom-frame, and connected to the rod *x* either by a spring or a rigid connection. I prefer to connect it by a spring, *d'*, pivoted upon the lever at *e'*, in such manner that it can turn upon the lever when a small latch or tooth, *f'*, is forced out of its recess in the lever. This tooth enters a recess or notch in the lever with inclined sides thereto, and is held in the recess by the spring, and causes the spring to move with the lever, except when some obstruction prevents the series of boxes from moving; then the resistance causes the spring to bend laterally away from the lever and the tooth to slip out, so that the other parts of the machinery may move without being broken.

Each of the protuberances or tappets shown in the drawings has two sides or inclines, (I sometimes use both sides, and at others one side only,) and that point of the tappet nearest the center corresponds with the lowest position of the series of boxes, and that farthest from the center of oscillation of the lever with the highest position of the series of boxes. Now, if the series be in the lowest position, and a pawl act on the largest ratchet-wheel, (on the under side thereof,) then the series will be lifted by the least inclined side of the tappet acting on the lever-pin through a distance from the center of one box to the center of its next neighbor, and each action of an under pawl upon the larger ratchet will thus raise the series, in whatever position it may be, until the pin rests on the apex of a tappet. Each action of an upper pawl upon the same ratchet-wheel will depress the series through the same distance; and when it is necessary to skip a box or jump from one box to the second therefrom, then the pawls acting upon the smaller ratchet-wheel will oscillate the shaft through twice the distance before named, and cause the series to move up or down (depending upon whether the lower or upper pawl be engaged) through a distance equal to twice that from any one shuttle to its next neighbor. If the series is required to be kept at rest, then the chain holds all the pawls out of action, or so that their motion produces no effect upon the ratchet-wheels and their shaft. A series of three boxes can thus be worked with two ratchets and two sets of pawls by using one side of one tappet or cam; four boxes in a series would require three ratchet-wheels and three sets of pawls; five in a series would require four ratchet-wheels and four sets of pawls, and so in succession; and in all cases any desired box could be selected or made to take its place opposite the race irrespective of any consideration as to what box preceded it; or any box could be kept op-

posite the race as long or for as many picks as desired, it being understood that the distance from the base to the apex of the tappet should, in all cases, correspond with the distance between the highest and lowest boxes in the series.

As four boxes are as many as most kinds of patterns in fancy weaving require, and as it is of great importance to have as little complication as possible in a loom, I have devised a method by means of which a series of four boxes can be worked with two ratchet-wheels and two sets or pairs of pawls, or a series of five boxes with three ratchets and three sets of pawls, and so on in succession. When working under this plan, which I prefer, both sides of a tappet must be used, whereas in the former cases described only one side was required.

By inspection of the drawings it will be perceived that one side of the tappet (1 2 3 4) is more inclined, or of steeper grade, than the other; that if radial lines be drawn from the center of the tappet-wheel to the apex and extremities of the base of any one tappet, then the angle subtended between the apex radius and the base radius on one side of it will be thrice as great as that subtended between the apex radius and the base radius on the other side of a tappet. Now, if the series of shuttle-boxes be down at its lowest point, it can be lifted either through the distance between two adjacent boxes, or through double that distance, by the action of one or the other of the lower pawls, and the pin or roller in the lever *v* will travel on the least inclined side of the tappets; but if it be required to move the series from the lowest to the highest box, then the pattern-chain permits the upper pawl of the largest ratchet-wheel to act, and the pin moves along the line 1 2 3 4, Fig. 1, moving the series as required. When it is necessary that the series should be shifted from the highest to the lowest box, then the under pawl of the larger ratchet oscillates the lever or rock-shaft, and causes the tappet to travel over the pin in the direction 4 3 2 1. This same effect can be produced by making the angle subtended by the steep side 1 2 3 4 of each tappet two-thirds of the angle subtended by the side with the comparatively gentle inclination, and using the smaller ratchet, in place of the larger, to shift the series from outside box to outside box; but whenever the plan of using sets of pawls two less in number than that of the boxes in a series is employed, there must be tappets or cams with two sides of different degrees of inclination. When as many sets of pawls as there are boxes in the series, less one, are employed, various plans known to mechanics for converting oscillating circular motion into rectilinear reciprocating motion may be used for transmitting the oscillations of the rocking lever to the series of boxes, and will be proper connections between the lever and series of boxes.

I intend at times to counterbalance in part

the weight of the series of boxes and their shuttles, and at times to apply a friction-brake upon the oscillating shaft making part of the oscillating lever, or to apply some proper contrivance known to mechanics to prevent the series of boxes from moving or being jarred out of any position in which they may be left at times when the pawls are not acting upon the ratchets. I also intend to use proper protectors, stop-motions, &c. At times I intend to duplicate the mechanism herein described upon the other side of the loom, so that two series of boxes may be shifted independently of each other; and I have essayed with success to move two sets of boxes in unison, in the manner shown in Fig. 1, where the shaft *o* extends across the loom, and has a tappet-wheel, *u*, on each side of the loom, each tappet actuating a series of boxes by means of a lever caused to vibrate by the action of the tappets.

As various kinds of box-shifting mechanism are well known and in extensive use, it is unnecessary to give any rule for setting up or composing a pattern mechanism so that the desired shifts and pauses may be given to the series of boxes.

I do not claim a reversible tappet-shaft by itself, or in combination with pawls for oscillating it in both directions, when said pawls act upon ratchet-wheels of the same diameter; but

What I do claim is—

1. The combination of an oscillating or rocking shaft with sets of pawls proper for oscillating it in both directions, when said oscillating shaft is acted upon by each set of pawls at different distances from its center of oscillation, substantially as herein described, the combination being substantially such as hereinafore set forth.

2. The combination of an oscillating or rocking shaft and sets of pawls, each set actuating it at different distances from its center of oscillation, with a pattern mechanism, the combination being and acting substantially as described herein.

3. The combination of an oscillating shaft and sets of pawls actuating it at different distances from its center of oscillation with a series of shuttle-boxes, by means of proper mechanical connections, as described, in such manner that sets of pawls one less in number than the boxes in the series of shuttles are effective in selecting any box of the series.

4. The combination, with an oscillating shaft and sets of pawls actuating it at different distances from its center of oscillation, and with a series of shuttle-boxes having proper mechanical connections, as described, in such manner that sets of pawls one less in number than the boxes in the series of shuttles are effective in selecting any box of the series, of a pattern mechanism, the combination being and acting substantially as described.

5. The combination of an oscillating shaft and sets of pawls actuating it at different distances from its center of oscillation with a se-

ries of shuttle-boxes, by means of a tappet or cam having two sides of varying inclination, in such manner as described, so that sets of pawls two less in number than the boxes in the series of shuttles are effective in selecting any box of the series.

6. The combination of an oscillating shaft and sets of pawls actuating it at different distances from its center of oscillation with a series of shuttle-boxes, by means of a tappet or cam having two sides of varying inclination, in such manner as described, so that sets of pawls two less in number than the boxes in the series of shuttles are effective in selecting any box of the series, and with a pattern mechanism, both these combinations being and acting substantially as described.

7. An oscillating shaft the axis of which extends across a loom-frame, and is acted upon by sets of pawls actuating it at different distances from its center of oscillation, in combination with two series of shuttle-boxes, by means of proper connections, substantially as described, so that sets of pawls one less in number than the boxes of either series shall select corresponding shuttle-boxes of both series, as described.

8. An oscillating shaft the axis of which extends across a loom-frame, and is acted upon by sets of pawls actuating it at different distances from its center of oscillation, in combination with tappets or cams having sides of different inclination on both sides of the loom,

and two series of shuttle-boxes moving in unison, in such manner that sets of pawls two less in number than the boxes of either series shall select corresponding boxes of both series, as described.

9. In combination with a pattern mechanism, an oscillating shaft the axis of which extends across a loom-frame, and is acted upon by sets of pawls actuating it at different distances from its center of oscillation, combined with two series of shuttle-boxes by means of proper connections, substantially as described, so that two sets of pawls one less in number than the boxes of either series shall select corresponding shuttle-boxes of both series, as described.

10. In combination with a pattern mechanism, an oscillating shaft the axis of which extends across a loom-frame, and is acted upon by sets of pawls actuating it at different distances from its center of oscillation, and tappets or cams having sides of different inclinations on both sides of the loom, and two series of shuttle-boxes moving in unison, in such manner that sets of pawls two less in number than the boxes of either series shall select corresponding boxes of both series, as described.

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Witnesses:

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