(No Model.) 3 Sheets—Sheet 1.

W. J. LUTTON.

SWIVEL LOOM.

No. 460,477. Patented Sept. 29, 1891.

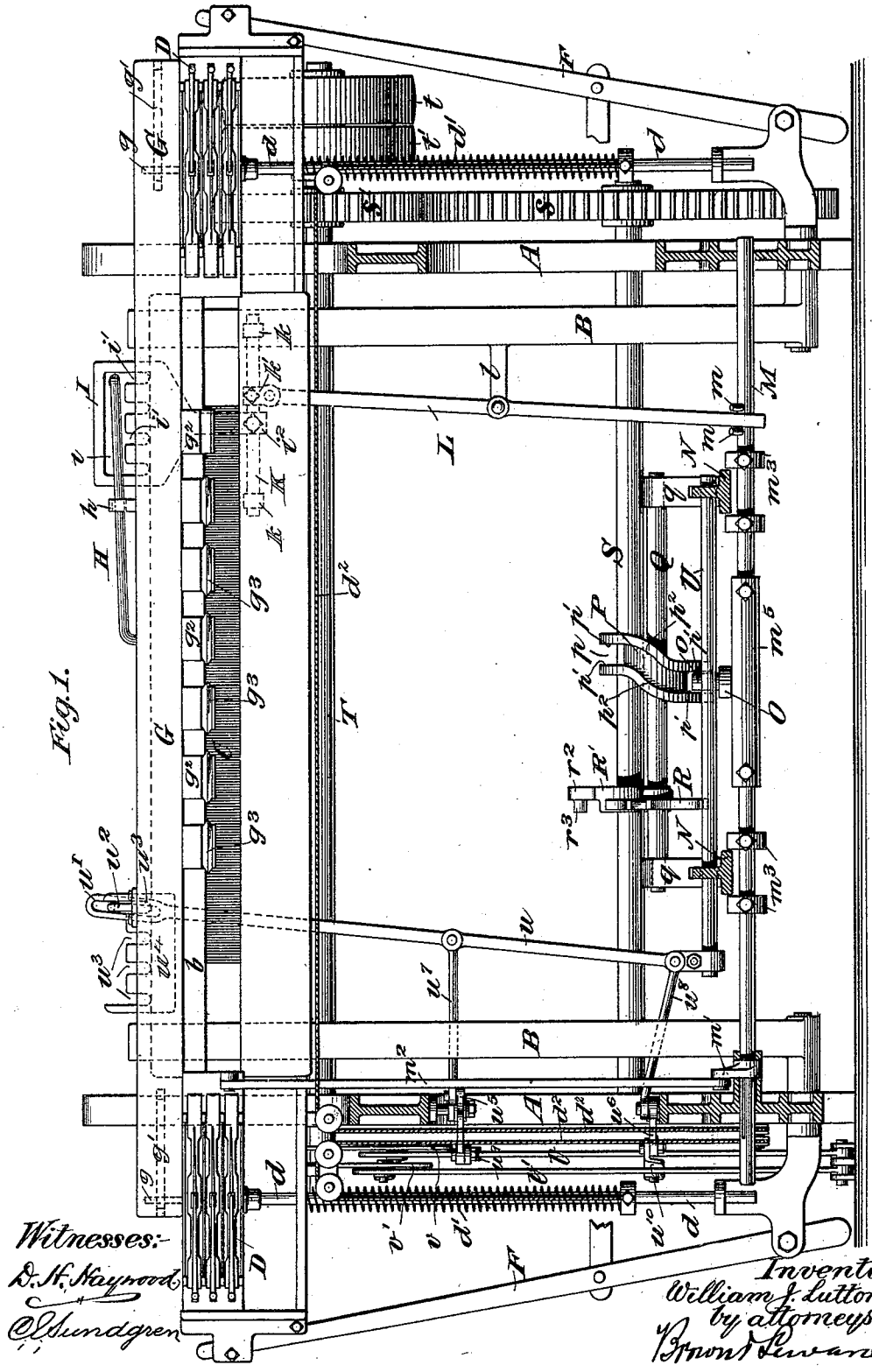

Fig. 1.

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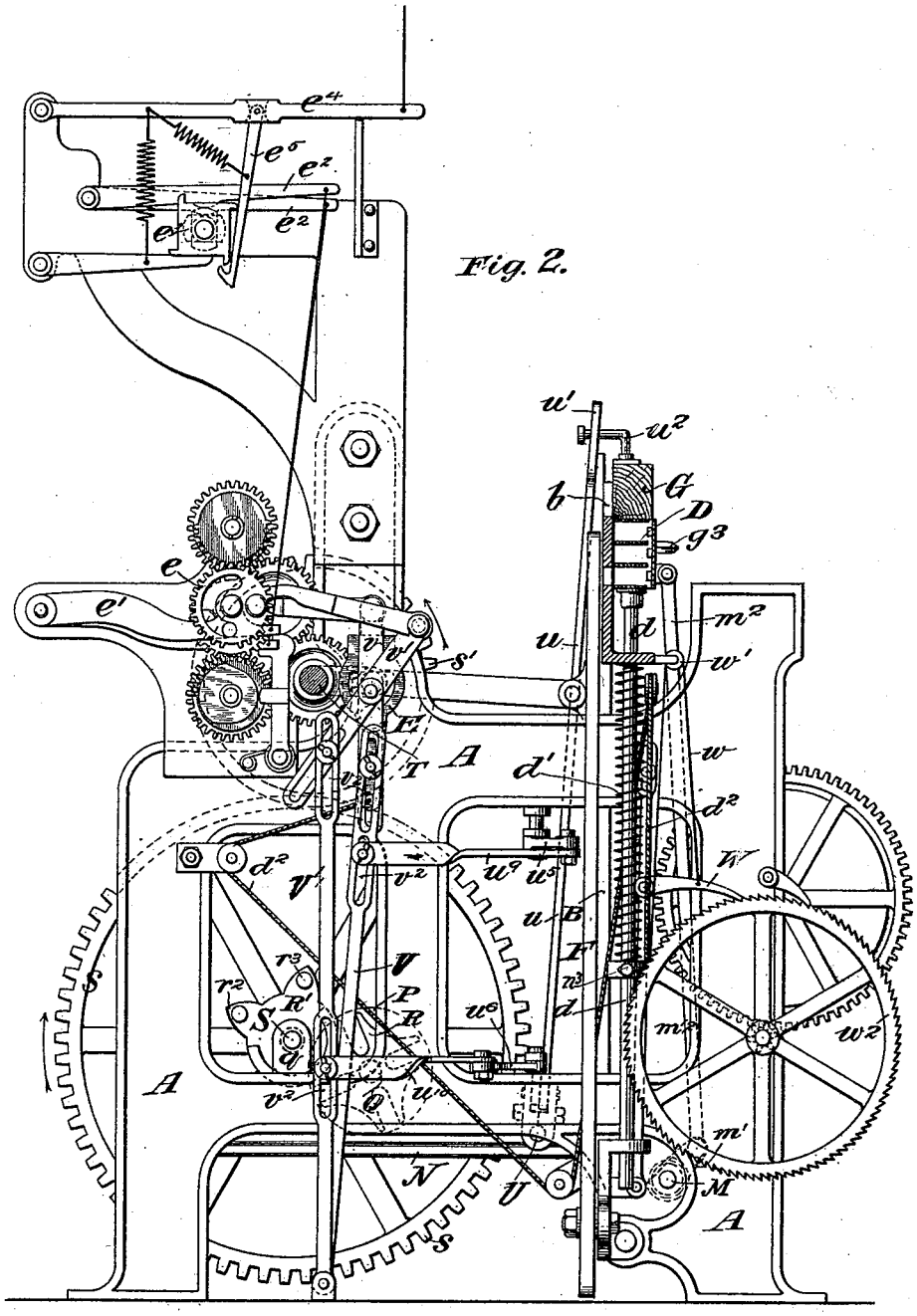

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

W. J. LUTTON.

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Fig. 3.

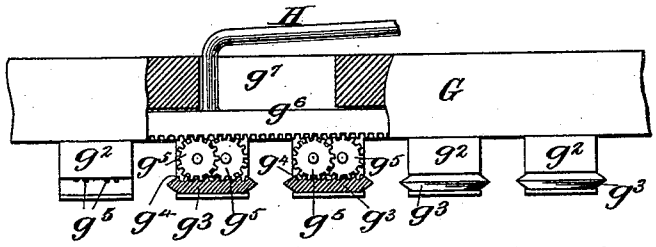


Fig. 4.

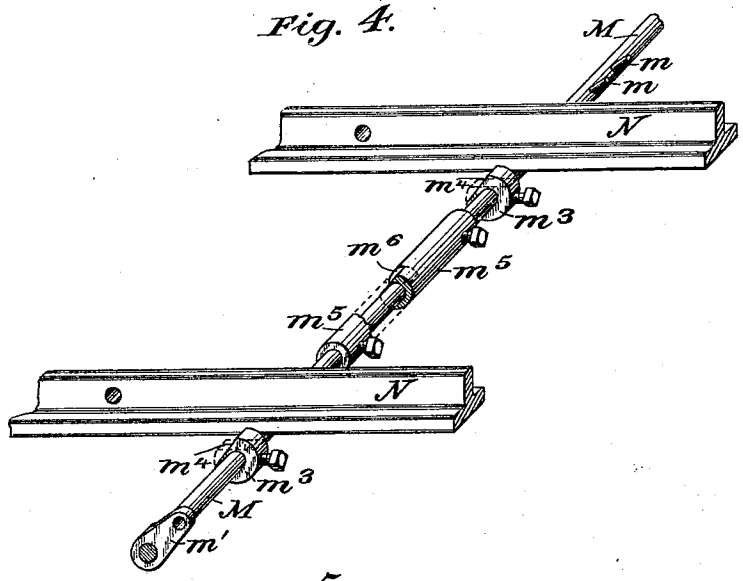
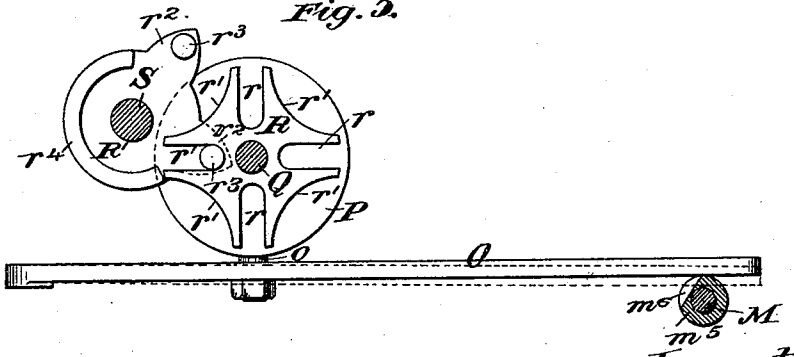


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM J. LUTTON, OF PATERSON, NEW JERSEY.

SWIVEL-LOOM.

SPECIFICATION forming part of Letters Patent No. 460,477, dated September 29, 1891.

Application filed September 17, 1890. Serial No. 365,252. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. LUTTON, of Paterson, in the county of Passaic and State of New Jersey, have invented a new and useful Improvement in Swivel-Looms, of which the following is a specification.

My invention relates to an improvement in looms, and more particularly to mechanism for adapting what are commonly known as "swivel-shuttles" to use in connection with looms of ordinary forms.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 is a view of a loom in front elevation, a portion of the frame and the feed mechanism being removed, showing the swivel-shuttles in position for use. Fig. 2 is a view in end elevation showing an attachment for connecting the shuttle-box-operating devices with the well-known "Jacquard mechanism." Fig. 3 is an enlarged view in detail, partly in section, of a portion of the swivel-shuttles and their supporting-beam. Fig. 4 is an enlarged view in detail of a portion of the swivel-shuttle-operating shaft and arms which serve to lock and release it, and Fig. 5 is an enlarged view in detail of the peculiar mutilated gear and driving-wheel by which the swivel-shuttles are operated at intervals.

The loom represented in the accompanying drawings, which I have selected for the purpose of presenting the swivel-shuttles in a practical operative combination, is of the well-known "Knowles" type now in extensive use, and illustrated, for example, in the United States patent to E. Barton, No. 414,366, dated November 5, 1889, and said patent also illustrates the means which I have indicated in this present application for connecting the "vibrator-levers" with the Jacquard machine. Brief mention will therefore be made of such well-known parts, except where their functions are intimately connected with the mechanism pertaining to the operation of the swivel-shuttles.

A represents the main frame, B the uprights, and *b* the cross-rails, of the lay; C, the reed; D, sets of drop-boxes supported upon vertically-sliding rods *d*, operated in one direction by springs d' and gravity and in the opposite direction by cords d^2, connected with the compound levers E, the latter connected with and controlled by gear *e*, carried by vibrator-levers e', the latter being adapted to be operated by arms e^2, engaged by rotary cams e^3, controlled by a Jacquard mechanism (not shown) by means of a spring-actuated arm and hook e^4 and e^5, all substantially as shown and described in Letters Patent No. 414,366, herein-before referred to.

The picker-staffs are denoted by F, the mechanism for operating them being of ordinary form and omitted for the purpose of more clearly showing the features of the present invention.

G represents a beam or bar, which carries the swivel-shuttles. It is supported upon the drop-box frame, and, together with them, it falls and rises. The beam G has also a limited endwise-sliding movement independently of its support for the purpose of bringing the series of swivel-shuttles into different positions laterally of the warp-shed. The connection of the swivel-shuttle beam with its supports is effected in the present instance by an uprising finger *g*, secured to the shuttle-box frame, which finger projects within an elongated loop g', secured to the beam. From the beam G swivel-shuttle boxes g^2 depend at intervals. A swivel-shuttle g^3 is seated in each of the boxes g^2 and is provided with series of teeth g^4 on its upper sides, which are engaged by spur-wheels g^5, two spur-wheels g^5 being provided for each box. The spur-wheels, and through them the shuttles, are operated by means of a rack-bar g^6, seated and having a sliding motion in a suitable recess in the beam G. The rack-bar g^6 is provided with an operating-handle H, which is here shown as extending upwardly through an elongated slot g^7 in the beam G, and thence in a substantially horizontal direction along the beam to a driving-plate I. The said handle H is held in position by means of a guide *h*, fixed to the beam G, through which the handle is allowed to slide. The driving-plate I is provided with an elongated opening *i* in its upper and end with a series of depressions i' along the bottom of the opening *i*. The end of the handle H is turned laterally and adapted to extend within the opening *i*. When the swivel-shuttle beam G is elevated, the free end of the handle will rest within the

opening i above the series of depressions i' along the bottom of the opening; but when the said beam G is dropped the portion of the handle H which extends within the opening i will fall into some one of the depressions i', and the said rack-bar will thereby be caused to slide longitudinally together with the movement to and fro of the plate I. For the purposes of such movement the plate I is provided with a depending stem i^2, by means of which the said plate is fixed to a longitudinally-sliding bar K, supported in guides k, fixed to the lay. An operating-lever L is fulcrumed upon a suitable support l, fixed to the lay-frame. The upper end of the lever is coupled to the bar K, as shown at k', while its lower end is loosely engaged with an operating-shaft M. The means here shown for connecting the lever L with the shaft M consist of a pair of laterally-extending pins m, fixed to the shaft. This connection is a simple one and permits the shaft M to rock freely, but at the same time causes the lever L to vibrate when the shaft is moved longitudinally.

The shaft M is mounted in suitable bearings in the main frame of the machine and is rocked by means of an arm m', the outer end of which is connected with the drop-box frame by a connecting-rod m^2. When the drop-box frame is elevated, the shaft M is prevented from longitudinal displacement by means of a pair of fixed arms N, each of which rest between the adjacent sides of a pair of collars m^3, secured to the shaft M. The collars m^3 are cut away upon one side, as shown at m^4, Fig. 4, so that when the shaft M is rocked by the downward movement of the drop-box frame through the connecting-rod m^2 and crank-arm m' the cut-away portions m^4 of the collars will come opposite the sides of the fixed arms N, and the said arms will no longer abut against the collars, and in such position the shaft M will be free to move longitudinally. The connection of the crank-arm m' with the shaft M may be by feather and groove, as here shown, or of any other well-known and approved manner to permit the shaft to slide longitudinally while causing it to rock.

Longitudinal movement is imparted to the shaft M by means of a vibrating arm O, pivotally secured at one end to the main frame and provided intermediate of its ends with a stud o, adapted to engage a cam-groove p in the periphery of a cam-wheel P. The shaft M is provided with a sleeve m^5, which sleeve is provided with a recess m^6 for the reception of the free end of the vibrating arm O. The sleeve m^5 is so adjusted upon the shaft M that when the drop-box frame is elevated the end of the vibrating arm will rest upon the periphery of the sleeve m^5 and vibrate freely back and forth without engaging the sleeve m^5 to move the shaft M; but when the drop-box frame is depressed and the shaft M thereby rocked, as hereinbefore explained, the sleeve m^5 will have been turned into position to bring the recess m^6 to register with the vibrating arm O, and the latter will fall into said recess and by its engagement with the opposite walls of said recess will cause the shaft M to be moved longitudinally to correspond with its vibratory movement.

The cam-wheel P is secured upon a shaft Q, journaled in suitable bearings q, fixed to the main frame, and said shaft has also fixed thereon a peculiarly-shaped spur-wheel R. (See Fig. 5.) The said spur-wheel R is provided with four radially-extending elongated recesses or pockets r, said recesses or pockets being here shown as spaced an equidistance apart and separated by segments of the wheel, having their peripheries curved concave toward the axis of the wheel, as shown at r'. In connection with the peculiar spur-wheel R a peculiarly-constructed driving-pinion R′ is adapted to operate. Said pinion R′ is provided with two teeth r^2, here shown as located a quadrant apart and provided at or near their outer ends with laterally-projecting pins or studs r^3, adapted to fit and slide within the recesses or pockets r in the spur-wheel R. The portion of the periphery of the pinion R′ forming one of the teeth r^2 around to its adjacent tooth is provided with a flange r^4, which, when the teeth r^2 have ceased to engage the recesses r, is adapted to fit and engage the concave faces r', and thereby lock the spur-wheel R against rotation while so engaged. The pinion R′ is fixed upon a shaft S, journaled in suitable bearings in the main frame and provided at one end with a spur-wheel s, which gears with a spur-wheel s', fixed upon the drive-shaft T. The drive-shaft T is provided with suitable drive and loose pulleys t and t', as usual, and for the purpose of the present invention the spur-wheel s' bears the relation to the spur-wheel s of one to two.

By means of the peculiar intermeshing-gear R and R′ a half-revolution of the pinion R′ will, by the engagement of the pins upon its teeth r^2 with the recesses or pockets r, give the wheel R, and hence the shaft Q and cam-wheel P, a half-rotation, and during the second half-revolution of said pinion R′ the shaft Q and cam P will be locked against rotation by the engagement of the flange r^4 with the curved face r' of the spur-wheel R. The cam-groove p upon the cam-wheel P has two oppositely-located delay portions p' and two oppositely-located inclined portions p^2. When the delay portions p' are engaged with the stud o upon the vibrating lever O, the said lever will remain at rest; but when the inclined portions p^2 are engaged therewith the said lever O will be vibrated. From this it follows that during a revolution of the shaft Q, with the cam-wheel P fixed thereon, the effect upon the vibrating lever O will be a period of rest followed by a period of movement, followed by a second period of rest, followed by a second period of movement. These periods of rest and movement are made to correspond with the engagement of the pins

upon the teeth r^2 of the pinion R′ with the successive recesses or pockets r upon the spur-wheel R, so that when the pin upon the advanced tooth of said pinion engages a recess r, and thereby gives the wheel R a quarter-turn, this will correspond to, for example, a period of rest p' on the cam P, while the engagement of the pin upon the second tooth with the next succeeding pocket r will correspond to a period of movement upon the cam P, and will thereby vibrate the lever O, and if the latter be engaged in the recess m^6 will move the shaft M longitudinally, and thereby operate the lever L, the plate I, the rack-bar g^6, and the shuttles g^3. Such movement of the vibrating arm O will be followed by a delay during a half-revolution of the shaft S and the pinion R′, secured thereto, when the pins upon its teeth r^2 will again engage two successive recesses r and vibrate the arm O in the opposite direction by the engagement of the inclined surface p^2 upon the opposite side of the cam-wheel P with the stud o. It will be observed that the effect of the continuously-rotating shaft S and the cam-wheel P rotating at intervals will only be communicated to the shaft M when the drop-box frame is lowered and the shaft M thereby rocked into position for the vibrating arm O to engage it. It will be further observed that the peculiar construction of the pinion R′ and spur-wheel R causes the movement of the said spur-wheel R to be quite slow through the beginning and ending of this quarter-movement, but may be more rapid during the intermediate part of its movement because of the gradual approach of the operating-pin r^3 toward the center of said wheel R and the gradual change of the direction of movement of the pin r^3 relative to the direction of movement of the wheel R as the pin r^3 approaches the bottom of the recess r.

The mechanism employed in connection with the swivel-shuttle-operating mechanism for the purpose of setting the swivel-shuttles to form any desired pattern is as follows: A rod U is supported in suitable bearings in the fixed arms N, so that it may slide longitudinally therein. This rod forms a support for and has coupled to one of its ends the lower end of a variable lever u, the upper end of which is provided with an elongated loop u', which embraces an arm u^2, fixed to the swivel-shuttle beam G, and by means of its engagement with the arm u^2 causes the shuttle-beam G to be slid longitudinally to correspond with its vibrations. A series of depressions u^3 is formed in a plate u^4, fixed to the lay and in such position relatively to the arm u^2 that when the shuttle-beam G is dropped the arm u^2 will fall into one or another of the depressions u^3, depending upon its longitudinal movement, and will be thereby locked in position for the time being by the engagement of the arm with the said depression. The lever u is operated by means of a pair of angle-levers u^5 and u^6, pivotally secured to the main frame and having one arm of each connected with the said lever by links u^7 and u^8. The other arms of the angle-levers u^5 u^6 are connected by means of links u^9 and u^{10} with swinging arms V and V′, respectively, which in turn are operated by means of levers v and v', connected therewith and with the gears carried by the vibrator-levers, in a manner quite similar to that in which the compound levers E, hereinbefore referred to, are operated. The arms V and V′ are provided with elongated slots v^2 at the points where they are connected with the links u^9 and u^{10} and with the levers v v' for the purpose of allowing the necessary play throughout the movement of the connecting parts.

For the purposes of illustrating the present invention I have provided two swinging arms V V′, each connected with the same operating-lever u, and have provided each of the swinging arms V and V′ with its own lever v v', operated by its own separate gear, carried by the vibrator-levers and under the control of the Jacquard machine through the spring-actuated hook e^5 and levers e^2 and cam e^3, as hereinbefore referred to. By this arrangement I am enabled to set the swivel-shuttles in any one of four positions represented by the depressions u^3 in the plate u^4 by means of the variable movements imparted to the lever u through the angle-levers and links connecting it with the swinging arms V and V′. I am further able to accomplish this and keep the throw of the lever u within reasonable limits. For example, the lever u when its connection with the link u^8 remains fixed and it is operated by the movement of the link u^7, will be swung about twice as far at its free end for a given movement of the link u^7 as it will when its connection with the link u^7 remains at rest as a fulcrum and it is operated upon by the link u^8. Thus when it is desirable to shift the beam G over two spaces of the plate u^4 the lever u may be allowed to fulcrum stationary at the connection of its link u^8 and be operated by the link u^7, while, on the other hand, if it is desired to move it but one space it will be allowed to fulcrum stationary at the connection with the link u^7 and be operated by the link u^8. Again, if it be desirable to move it three spaces in either direction the link u^8 may be used as its fulcrum and caused to move sufficient to carry it through one space, while the link u^7 is at the same time moved to carry it through two spaces, thus accomplishing its throw of three spaces, while the links u^8 and u^7 are each moved through substantially the same distance.

For the purpose of suspending the feed while the swivel-shuttles are in operation, and thereby causing the pattern woven by said swivel-shuttles to assume a raised position between the regular weft-threads, I connect the feed-operating pawl W with a portion of the drop-box frame by means of a cord w,

which extends from the pawl W up and over a pulley w' on the lay and thence down, in the present instance, to a collar w^3 upon one of the box-supporting rods d. The feed-operating pawl W is pivoted to a support which moves with the lay-frame and engages a ratchet-wheel w^2, which is in gear with a wheel for operating the cloth-roller, as is usual. The elevating of the pawl W when the boxes are dropped and the swivel-shuttles brought into position for use stops the feed until the said swivel-shuttles are again returned out of use and the regular weft introduced.

As the operation of the machine has been quite fully set forth in connection with the different groups of operative parts, it will not be necessary to repeat it in detail. It may be stated in short as follows: When it is desired to bring the swivel-shuttles into play, the regular shuttle-boxes are dropped out of use by the well-known means herein referred to. Such dropping of the regular boxes out of use rocks the shaft M into a position to free it from the stationary arms N and to engage it with the vibrating arms O. When so rocked, the rotary movement of the cam-wheel P will cause an endwise movement of the shaft M, and thereby operate the swivel-shuttles. The mechanism for setting the shuttles to the desired pattern is so timed with respect to the operating-shuttles that just before the swivel-shuttle beam G is dropped the lever u will be brought into operation to set the said beam G to the pattern, and when it drops it will be locked by the engagement of the arm u^2 with some one of the depressions u^3 in the plate u^4.

What I claim as my invention is—

1. In a loom, the combination, with the drop-shuttle boxes and means for operating them, of swivel-shuttles and a swivel-shuttle support, the support for the swivel-shuttles having a vertical movement controlled by the movement of the drop-shuttle boxes and a horizontal movement relative to the drop-shuttle boxes, and means for imparting to the support its horizontal movement and for arresting it at any desired point to vary the position of the pattern, substantially as set forth.

2. The combination, with the drop-shuttle boxes of a loom and means for operating them, of swivel-shuttles subject to the movements of the drop-shuttle boxes, swivel-shuttle-actuating mechanism, and a connection between the drop-shuttle-box frame and the swivel-shuttle-actuating mechanism, whereby the swivel-shuttles are locked against movement when the drop-shuttle boxes are elevated and released when the drop-shuttle boxes are lowered, substantially as set forth.

3. The combination, with the drop-shuttle-box frame, the swivel-shuttles, and a shaft for imparting motion to the swivel-shuttles, said shaft having both a longitudinal and rocking motion, of a connection between the drop-shuttle-box frame and the shaft for rocking it to lock and release the swivel-shuttles, a cam actuated by the main shaft, and means for connecting the cam with the first-mentioned shaft for moving it longitudinally to operate the swivel-shuttles, substantially as set forth.

4. The combination, with the swivel-shuttle-actuating shaft having both a longitudinal and rocking motion, of a vibrating arm in engagement with the shaft, the shaft being provided with an abutment upon one side with which the vibrating arm is adapted to engage when the shaft is rocked in one direction and from which it is released when the shaft is rocked in the opposite direction, substantially as set forth.

5. The combination, with the swivel-shuttle-operating shaft having both a longitudinal and rocking motion, of a fixed stop and a vibrating arm, the said shaft being provided with abutments with which the said stop and vibrating arm are adapted to engage, the said abutments being so arranged that when the shaft is rocked in the direction to bring the vibrating arm in engagement with its abutment the stop will be released from its abutment, substantially as set forth.

6. The combination, with the swivel-shuttle-actuating shaft and a vibrating arm adapted to engage therewith to actuate the shaft, of a rotary cam engaged with the vibrating arm and a driven shaft, the said driven shaft being provided with a mutilated pinion and the rotary cam-support with a spur-wheel having radial recesses or pockets adapted to receive the teeth of the mutilated pinion and with delay-surfaces, whereby the said cam is alternately moved at an accelerated speed and delayed, substantially as set forth.

7. The combination, with the swivel-shuttle support having a movement transverse to the shed of warp, of a lever for adjusting the said support, the lever having a variable fulcrum, the vibrator-levers, and mechanism connecting the support-adjusting lever with the vibrator-levers for operating it, substantially as set forth.

8. The combination, with the swivel-shuttle support having a movement transverse to the shed of warp, of a lever for adjusting the said support, a pair of swinging arms, a pair of angle-levers, one of the swinging arms being connected with one of the angle-levers and the other arm with the other angle-lever, connections between the shuttle-support-adjusting lever and each of the angle-levers, vibrator-levers, and mechanism connecting the swinging arms with the vibrator-levers, whereby a variable movement is imparted to the shuttle-support-adjusting lever, substantially as set forth.

9. The combination, with the swivel-shuttles and their support, of a shuttle-operating plate provided with a series of depressions corresponding to the several adjustments of the swivel-support transverse of the warp-

shed, a shuttle-operating handle in position to engage some one of the said depressions as the swivel-shuttle support is dropped, a plate fixed to the lay and provided with a series of depressions corresponding to the several adjustments of the swivel-shuttle support, an arm on the swivel-shuttle support adapted to engage some one of said depressions as the swivel-shuttle support is dropped, an operating-lever adapted to engage the said arm to adjust the support, a movable support for said lever, vibrator-levers, mechanism connecting said lever with the vibrator-levers, and mechanism connecting the shuttle-operating plate with the drive-shaft, substantially as set forth.

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