

(No Model.)

7 Sheets—Sheet 1.

W. WATTIE.
MULTIPLIER MECHANISM FOR LOOMS.

No. 586,374.

Patented July 13, 1897.

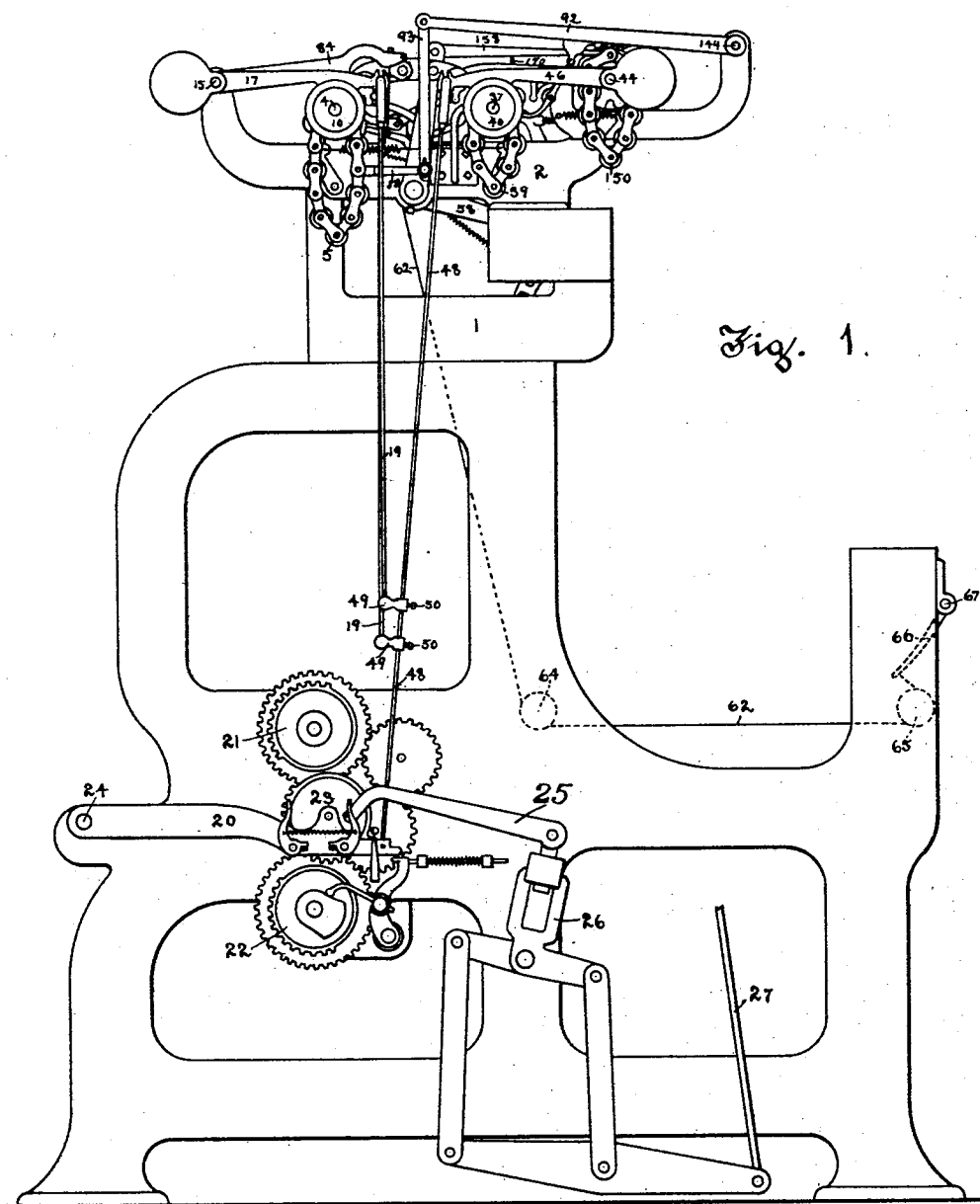


Fig. 1.

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By his Attorney
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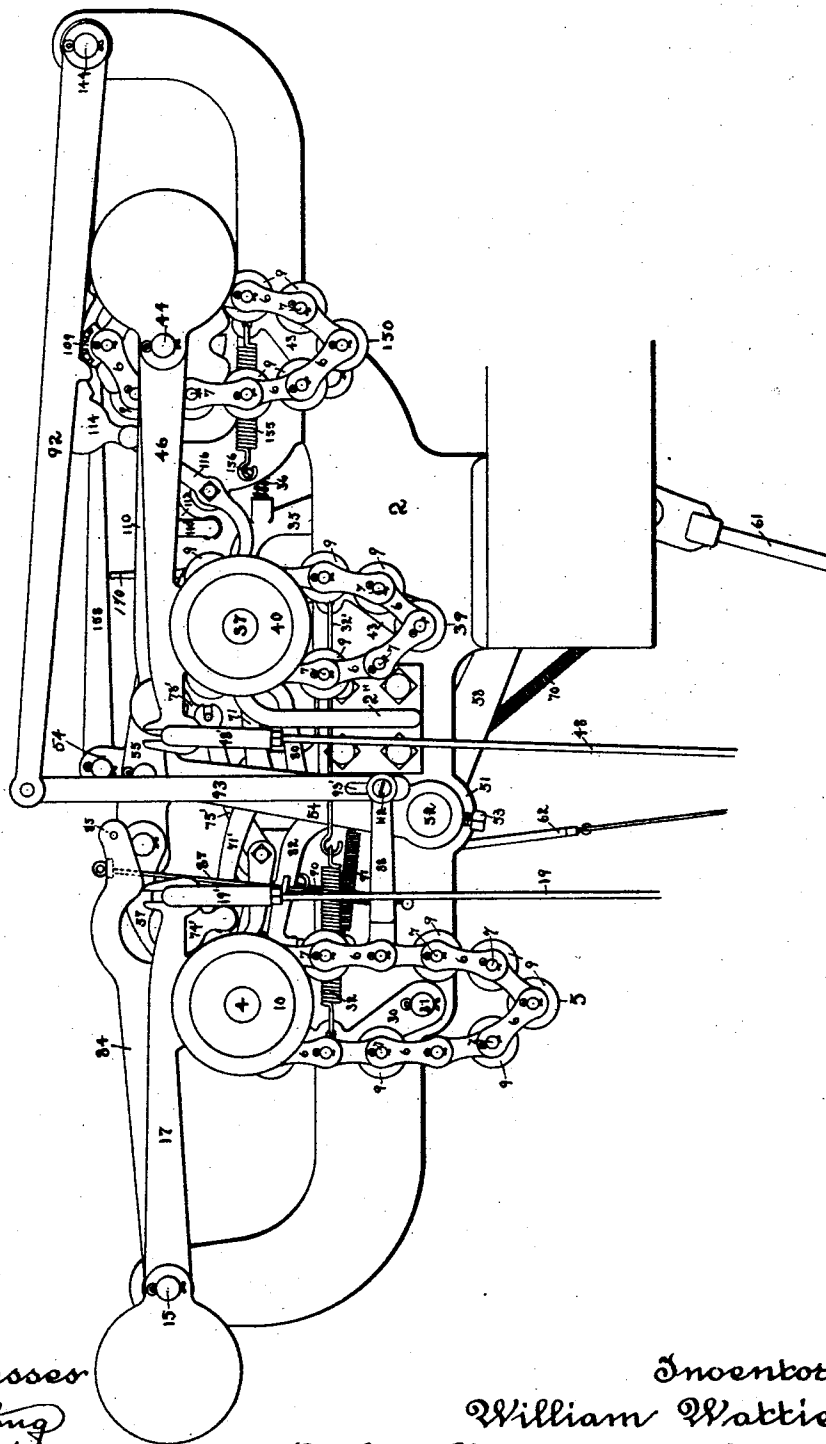
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Fig. 2.

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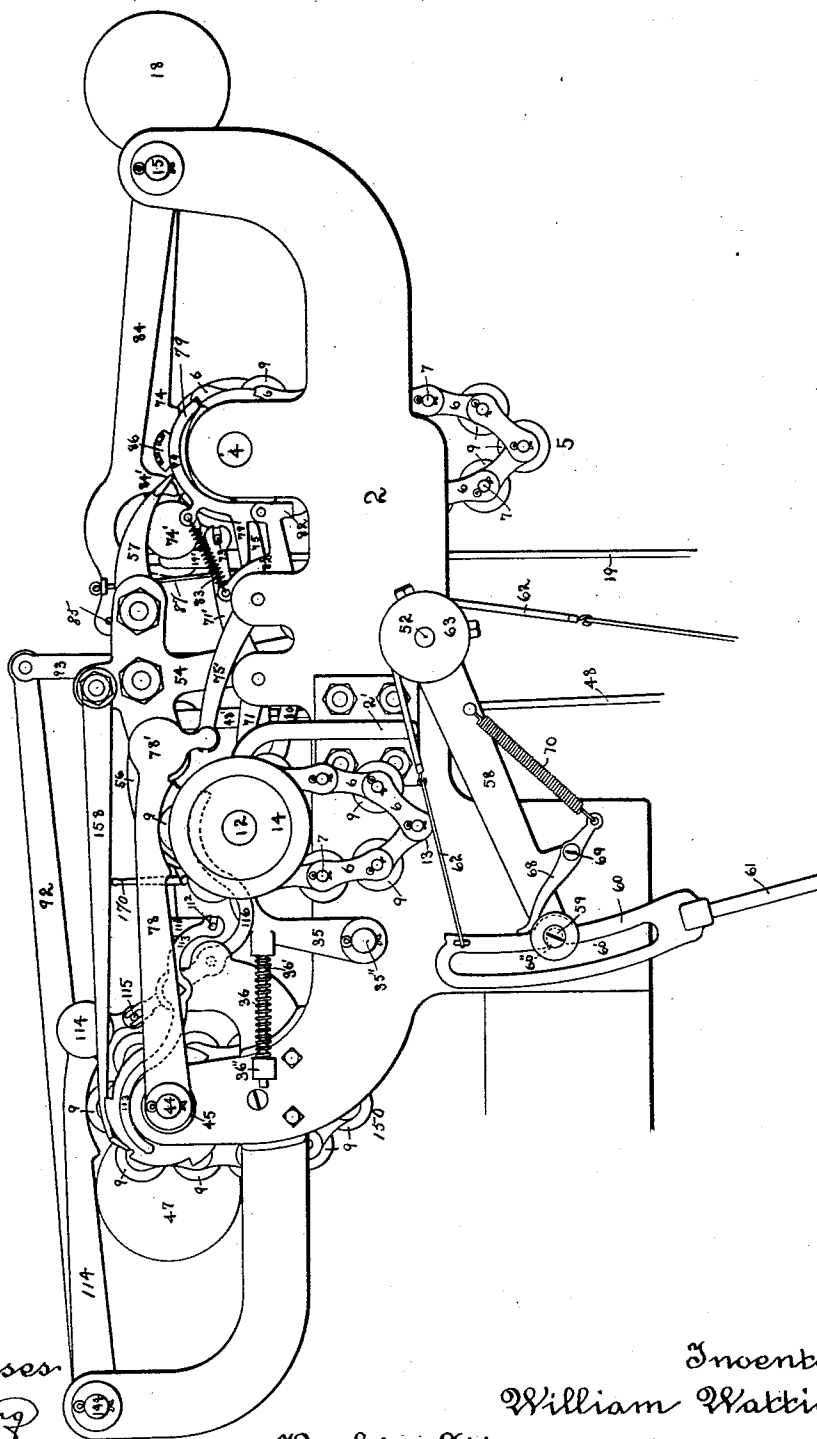
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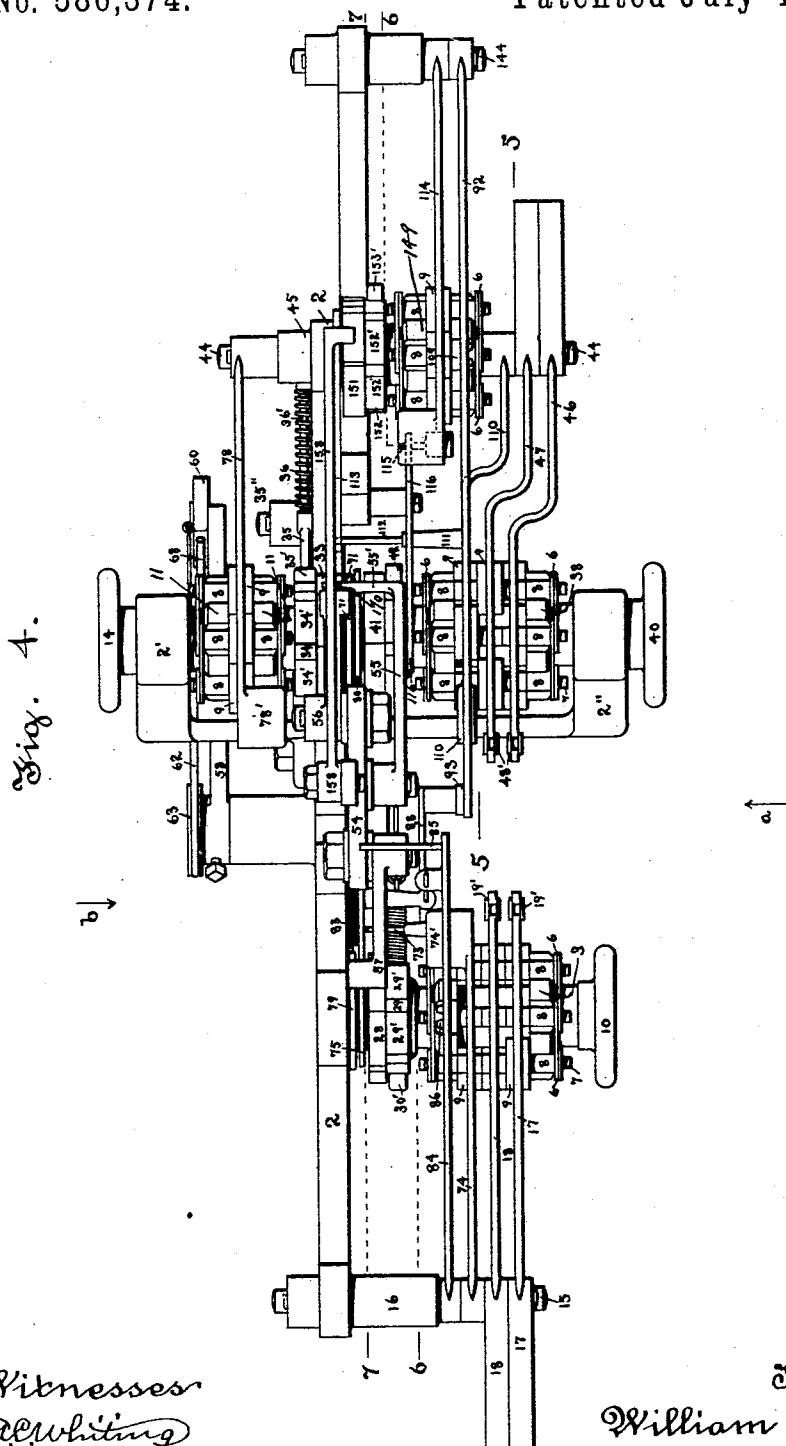
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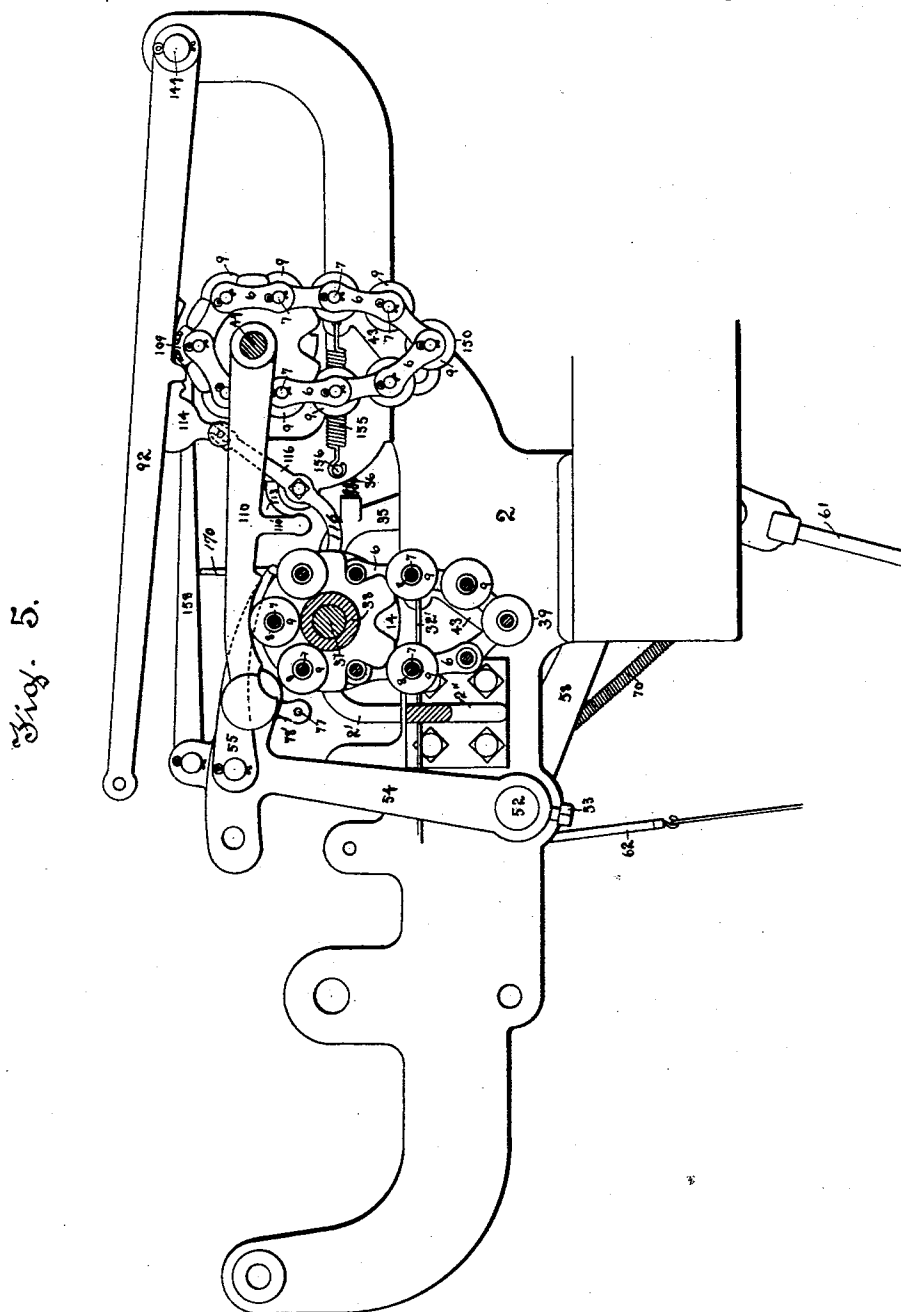
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81
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7 Sheets—Sheet 5.

No. 586,374.

Patented July 13, 1897.



Witnesses.
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In witness
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(No Model.)

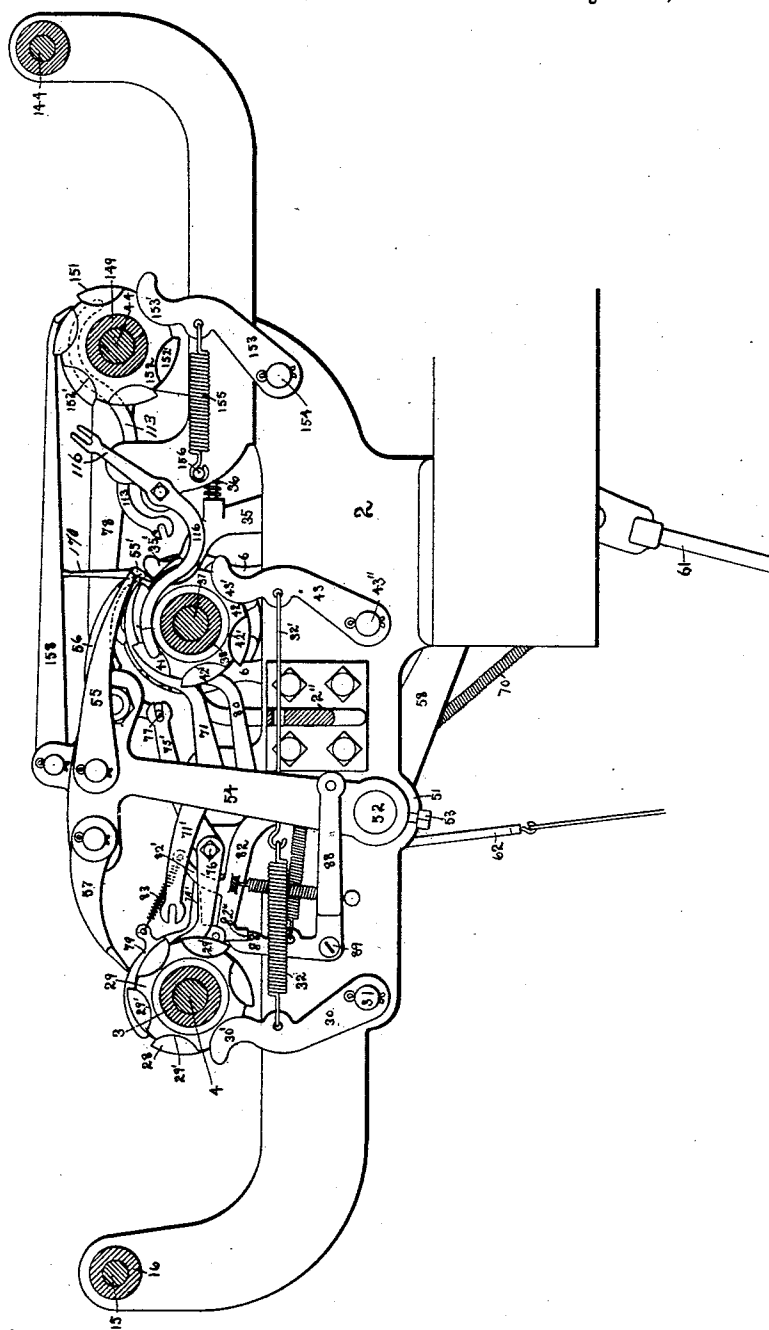
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W. WATTIE.
MULTIPLIER MECHANISM FOR LOOMS.

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Fig. 6.



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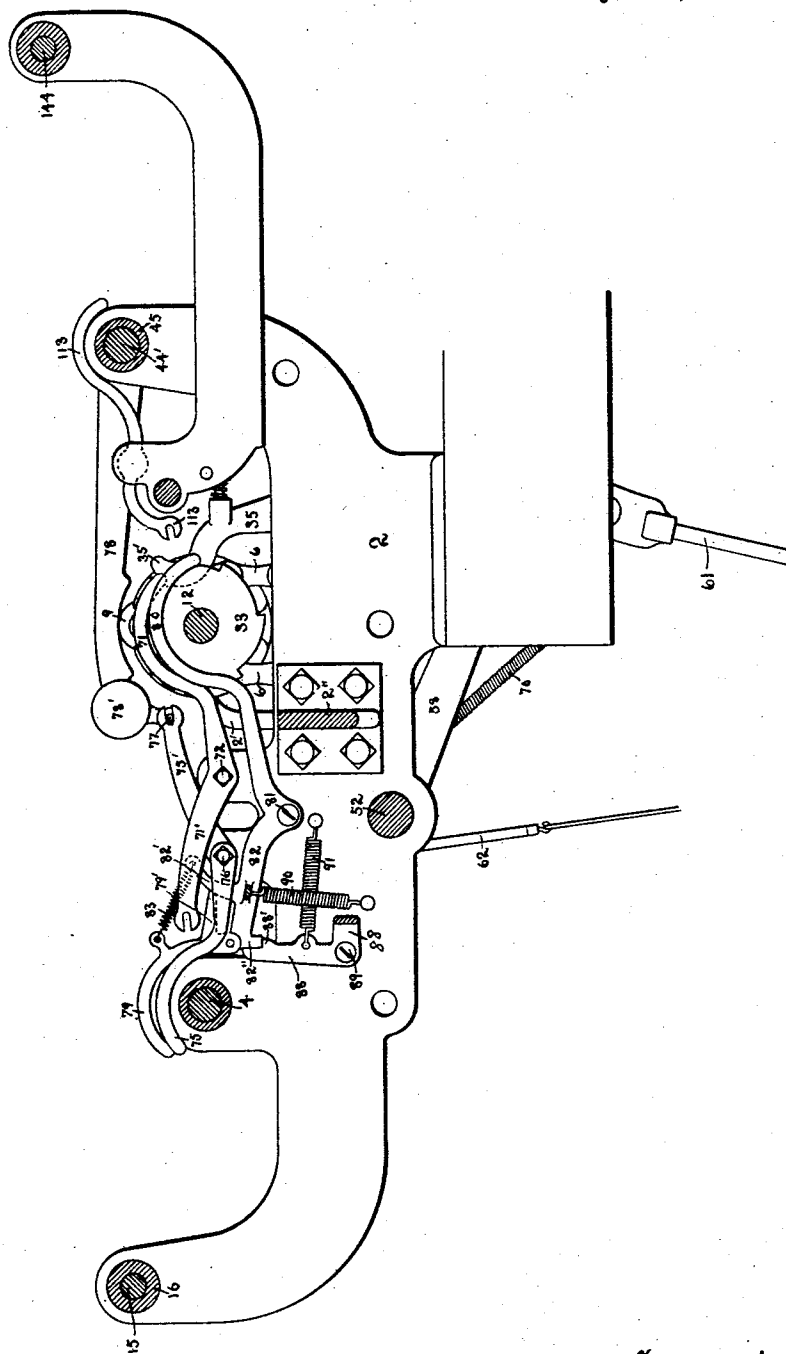
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W. WATTIE.
MULTIPLIER MECHANISM FOR LOOMS.

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Patented July 13, 1897.

Fig. 7.



Witnesses
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William Wattie
By his Attorney
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UNITED STATES PATENT OFFICE.

WILLIAM WATTIE, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE CROMPTON & KNOWLES LOOM WORKS, OF SAME PLACE.

MULTIPLIER MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 586,374, dated July 13, 1897.

Application filed March 16, 1897. Serial No. 627,840. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WATTIE, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Multiplier Mechanism for Looms, of which the following is a specification.

My invention relates to looms for weaving textile fabrics and to that class of looms having an auxiliary or multiplier pattern chain or surface in addition to the main pattern chain or surface, by means of which certain bars of the main pattern-chain of the drop-box-indicating mechanism may be repeated without constructing successive similar bars in said main chain, as is well understood; and my invention relates more particularly to certain improvements on the mechanisms shown and described in my pending application for United States Letters Patent, Serial No. 593,756, filed June 1, 1896. In said application is shown and described a third or supplemental pattern-chain mechanism to be used in connection with the ordinary main and multiplier pattern-chain mechanisms and by means of which the number of bars of chain in the main pattern-chain is much reduced. Said third pattern-chain is used, for example, in the case of blankets, to weave in a striped body between the headings. In said application the starting of the main pattern-chain is controlled through flexible connections to an indicator-disk on the take-up roll. By reason of the slow movement of the indicator-disk and the flexibility and length of the connections from said indicator-disk on the take-up roll it may happen that the main pattern-chain is not started just at the time it ought to be, and an extra pick or two is put in the fabric by the third pattern-chain mechanism before the main pattern-chain is started, thus making an imperfection in the fabric.

The object of my present invention is to do away with indicator-disk on the take-up roll and the connections therefrom to the chain mechanisms above referred to, and to provide a fourth pattern-chain mechanism which operates in connection with the main pattern-chain mechanism to start said mechanism in-

stantly when desired—that is, to change on the pick. The fourth pattern-chain is also used in connection with the third pattern-chain as a multiplier chain in the same way as the ordinary multiplier chain is used in connection with the main pattern-chain. For example, if the third pattern-chain is weaving stripes by means of the fourth pattern-chain the stripes can be divided and additional stripes put in without increasing the length of the third chain.

My invention consists in certain novel features of construction and operation of the several pattern-chain mechanisms and intermediate connections, and more particularly in combining with the main pattern-chain mechanism the multiplier pattern-chain mechanism a third pattern-chain mechanism and the shuttle-box-shifting mechanism a fourth pattern-chain mechanism, as will be hereinafter fully described.

I have shown in the drawings my improvements applied to a four-by-one drop-box loom and combined with main and multiplier pattern-chain mechanisms and operating parts of substantially the same construction and operation as is shown and described in United States Letters Patent No. 544,356 of August 13, 1895, and also in my pending application for United States Letters Patent, Serial No. 593,756, to which reference is hereby made.

Referring to the drawings, Figure 1 shows a loom side, on the upper part of which is supported the box-pattern-indicating mechanism embodying my improvements and upon the lower part the box-shifting mechanism. Fig. 2 is a front view of the box-indicating mechanism shown in Fig. 1, looking in the direction of arrow *a*, Fig. 4. Fig. 3 is a rear view of the box-pattern-indicating mechanism, looking in the direction of arrow *b*, Fig. 4. Fig. 4 is a plan view looking in the direction of arrow *c*, Fig. 2. Fig. 5 is a vertical cross-section on line 5 5, Fig. 4, looking in the direction of arrow *a*, same figure. The parts shown at the left in Fig. 4 and some of the other parts are not shown in this figure. Fig. 6 is a vertical cross-section on line 6 6, Fig. 4, looking in the direction of arrow *a*, same figure; and Fig. 7 is a vertical section on line 7 7, Fig. 4, looking in the direction

of arrow *a*, same figure. Figs. 2 to 7, inclusive, are shown on an enlarged scale.

In the accompanying drawings on the top of the loom side or end is supported the loom-arch stand 1, on the upper part of which is secured the stand or frame 2, on which are supported the several parts of my drop-box-pattern-indicating mechanism.

The drop-box-pattern-indicating mechanism is in this instance, as above stated, for a four-by-one box-loom, and is of substantially the same construction and operation as the drop-box-pattern-indicating mechanism shown in said Patent No. 544,356 and in my said pending application, Serial No. 593,756, with my present improvements combined therewith. In said pattern-indicating mechanism 3 is the main pattern-chain cylinder, loosely mounted on a stud 4, secured in the frame 2. Said cylinder or barrel 3 is of the ordinary construction, having grooved or notched heads or ends and carrying the main pattern-chain 5, made up of links 6, which connect the bars 7, upon which are mounted tubes 8 and rolls 9 in the ordinary way. The cylinder 3 is provided with a hand-wheel 10, by means of which said cylinder is turned in either direction, as desired.

The auxiliary or multiplier pattern-chain cylinder 11 is loosely mounted on a stud 12, supported in the frame 2 and in the bracket 2', and in this instance upon the opposite side of the stand 2 from the main pattern-chain cylinder. (See Fig. 4.) The cylinder 11 carries the auxiliary or multiplier pattern-chain 13, made up of links 6, bars 7, tubes 8, and rolls 9, similar to the main pattern-chain 5. The cylinder 11 is provided with a hand-wheel 14 to turn said cylinder in either direction, as desired.

On a stud 15, secured in a boss 16 on one end of the stand 2, are loosely mounted the outer weighted ends of two shuttle-box-indicator levers 17 and 18, which extend over and are operated by the main pattern-chain 5. The inner ends of the levers 17 and 18 are in this instance provided with open-end slots to receive the loops or heads 19' on the upper ends of the connector-rods 19, (see Figs. 1 and 2,) which lead to the two connectors 48, to which they are adjustably attached by a collar 49 and set-screw 50. (See Fig. 1.) The connector-rods 19 by reason of the open-end slots in the ends of the levers 17 and 18 can move up without raising said levers.

The connectors 48, to be hereinafter described, are attached at their lower ends to the vibrator-levers 20 of the box-shifting mechanism shown in Fig. 1 and which may be of the ordinary construction and operation, and consists of the upper and lower cylinder-gears 21 and 22, vibrator-gear 23, carried on the vibrator-lever 20, pivoted at its outer end at 24, and the vibrator-connector 25, pivoted at one end on the vibrator-gear 23 and at its other end to the compound lever 26, which operates the shuttle-box-lifter

rod, all in the usual way and shown and described more particularly in United States Patent No. 551,104 of December 10, 1895.

A ratchet-wheel 28 is mounted on the stud 4 and is secured to the main pattern-chain cylinder 3. (See Fig. 4.) A stop-wheel 29 is also mounted on the stud 4 and secured to the ratchet-wheel 28 to turn with said ratchet-wheel. Said stop-wheel is provided with concave portions 29' in its periphery, into which is adapted to extend the convex portion 30' on the lock-lever 30, pivoted at 31 on the frame 2 (see Fig. 6) and connected by a spring 32 and link 32' to a similar lock-lever, to be hereinafter described.

On the stud 12 of the multiplier pattern-chain cylinder 11 is mounted a ratchet 33, (see Figs. 4 and 7,) which is secured to the multiplier pattern-chain cylinder 11. A stop-wheel 34 (see Fig. 4) is also mounted on said stud 12 and secured to the ratchet-wheel to turn with said ratchet-wheel, and is provided with concave portions 34' in its periphery, into which extends a convex portion 35' on the lock-lever 35, pivoted at 35'' on the frame 2. (See Figs. 3 and 7.) A spring 36, encircling a pin 36', sliding at one end in an eye 36'' and secured at its other end to the lock-lever 35, (see Fig. 3,) acts to hold said lever 35 in engagement with the stop-wheel 34.

I will now describe my third pattern-chain mechanism, combined with the main pattern-chain and the multiplier pattern-chain mechanisms above described and the shuttle-drop-box-shifting mechanism and in this instance located at the front of the stand or frame 2 and in front of and in line with the multiplier pattern-chain 13. On a stud 37, supported in the frame 2 and the bracket 2'', is loosely mounted a pattern-chain cylinder 38, carrying the supplemental pattern-chain 39, made up of links 6, bars 7, tubes 8, and rolls 9 in the ordinary way. The pattern-chain cylinder 38 is provided with a hand-wheel 40 to turn said cylinder in either direction, as desired.

On the stud 37 of the third pattern-chain cylinder 38 is mounted a ratchet-wheel 41, which is secured to said third pattern-chain cylinder 38. A stop-wheel 42 is also mounted on said stud 37 and is secured to the ratchet-wheel 41 to turn with said ratchet-wheel, and is provided with concave portions 42' in its periphery, in which is adapted to extend a convex portion 43' on the lock-lever 43, pivoted at 43'' on the frame 2 (see Fig. 6) and connected by a link 32' and a spring 32 to the lock-lever 30. The spring 32 acts to draw the lock-levers 30 and 43 toward each other, to hold them in engagement with the stop-wheels 29 and 42, as shown in Fig. 6.

On a stud 44, secured in a boss 45 on the frame 2, are loosely mounted the outer weighted ends of two shuttle-box-indicator levers 46 and 47, which extend over and are operated by the third pattern-chain 39. The inner ends of the levers 46 and 47 are in this in-

stance provided with open end slots to receive the loops or heads 48' on the upper end of the connector-rods 48, and allow said rods 48 to move up without raising said levers.

5 The lower ends of said rods 48 are attached to the vibrator-levers 20 of the box-shifting mechanism above described. (See Fig. 1.)

It will be seen that the movement of the indicator-levers 17 and 18 on the main pattern-chain 5, through the connector-rods 19, 10 attached to the connector-rods 48, will communicate motion to the vibrator-levers 20 of the box-shifting mechanism, and the indicator-levers 46 and 47 on the third pattern-chain 39, through connector-rods 48, attached 15 to the vibrator-levers 20, will also communicate motion to said vibrator-levers 20 to operate the box-shifting mechanism.

I will now describe my fourth pattern-chain 20 mechanism. On the stud 44 is loosely mounted a pattern-chain cylinder 149, carrying the fourth pattern-chain 150, made up of links 6, bars 7, tubes 8, and rolls 9. On the stud 44 of the pattern-chain cylinder 149 is mounted 25 a ratchet-wheel 151, which is secured to the pattern-chain cylinder 149. A stop-wheel 152 is also mounted on said stud 44 and is secured to the ratchet-wheel 151 to turn with said ratchet-wheel, and is provided with concave portions 152' in its periphery, into which 30 is adapted to extend a convex portion 153' on the lock-lever 153, pivoted at 154 on the frame 2. (See Fig. 6.) A spring 155 is connected at one end to said lock-lever 153 and at its 35 other end to a pin 156 on the frame 2 and acts to hold the lock-lever in engagement with the stop-wheel 152, as shown in Fig. 6.

I will now describe the mechanism for operating the main pattern-chain 5, multiplier 40 pattern-chain 13, and third pattern-chain 39, and fourth pattern-chain 150. Said mechanism corresponds to the mechanism shown and described in said Patent No. 544,356 and in my said pending application, Serial No. 45 593,756, but is adapted to operate four chains instead of two.

In the lower central part of the frame 2 in a boss 51 is mounted a shaft 52, (see Figs. 4 and 6,) adapted to have a rocking motion. On 50 the front end of the shaft 52 is secured by a set-screw 53 the lower end of the rocking pawl-carrying arm 54. Upon the upper end of said pawl-carrying arm 54 are pivoted four 55 pawls 55, 56, 57, and 158. The pawl 55 acts as a pull-pawl and is provided with a hook 55' at its free end, which extends over and engages the teeth on the ratchet-wheel 41 to move said ratchet-wheel, and with it the pattern-chain cylinder 38 and the third pattern-chain 39. The pawl 56 is pivoted on the op- 60 posite side of the pawl-carrying arm 54 from the pawl 55 and acts as a push-pawl, and its free end engages the teeth on the ratchet-wheel 33 to move said ratchet-wheel and with 65 it the pattern-chain cylinder 11 and multiplier pattern-chain 13.

The pawl 57 is pivoted on the front of the

pawl-carrying arm 54 and extends in an opposite direction to the pawls 55 and 56. Said pawl 57 acts as a push-pawl, and the free end 70 thereof engages with the ratchet-teeth on the ratchet-wheel 28 to move said ratchet-wheel and the pattern-chain cylinder 3 and main pattern-chain 5. The pawl 158 is pivoted on 75 the upper end of the pawl-carrying arm 54 and extends over the pawl 56 (see Figs. 4 and 6) and acts as a push-pawl, and engages the teeth on the ratchet-wheel 151 to move said ratchet-wheel and with it the pattern-chain 80 cylinder 149 and the fourth pattern-chain 150. Upon the opposite end of the shaft 52 from the pawl-carrying arm 54 is secured the inner end of the arm 58, (see Fig. 3,) which is connected through a giveaway or lock connection 85 with the driven part of the loom. Said lock connection and mechanism connected with the stop-motion shaft to automatically operate said lock connection and disconnect the 90 arm 65 to stop the movement of said arm and the pawl-carrying arm 54, so that the movement of the four pattern-chains will cease in case the filling gives out and the filling stop-motion shaft acts to stop the loom, is of the same construction and operation as shown 95 and described in said Patent No. 544,356, to which reference is hereby made for a detail description of the construction and operation of said mechanism. I will briefly describe said mechanism herein.

The outer end of the arm 58 is provided 100 with a screw or pin 59, which is adapted to engage a notch 60', leading out from a vertical slot 60' in the head 60 on the upper end of the connector-rod 61. The lower end of said connector-rod 61 is connected with a cam 105 on the bottom shaft or with some other driven part of the loom, (not shown,) from which a continuous up-and-down motion is communicated to said rod 61 and, through the arm 58, to the rock-shaft 52 and the pawl-carrying 110 arm 54.

From the head 60 of the connector-rod 61 a connection 62 leads over a pulley 63, loose on the shaft 52, (see Fig. 3,) and over two pulleys 64 and 65, mounted on the loom side, 115 (see broken lines, Fig. 1,) to an arm 66, fast on the stop-motion shaft 67, so that when the loom is stopped by the stop-motion shaft in the ordinary way, in case the filling gives out, the connection 62 will be pulled to draw the 120 head 60 of the connector-rod 61 to the right in Fig. 3 and move the screw or pin 59 out of the notch 60' into the slot 60' to allow the head 60 and connector-rod 61 to move up and down without moving the arm 58, so that the 125 pattern-indicating mechanism will be instantly stopped, though the loom may continue to run.

A pawl 68, pivoted at 69 on the arm 58 and bearing at one end against the inner edge of 130 the head 60 and attached at its other end to one end of a spring 70, which is secured at its other end to the arm 58, acts to hold the screw 59 in the notch 60' in the head 60 to

form a lock connection between the connector-rod 61 and the arm 58.

I will now describe the mechanism for controlling the engagement of the pawls 55, 56, 57, and 158 with their respective ratchet-wheels, so that only one pattern-chain will be operated at a time—that is, the main pattern-chain, the multiplier pattern-chain, the third pattern-chain, and the fourth pattern-chain will be operated at the proper time.

The stopping and starting of the pattern-chains at the proper time is controlled by indicator-levers extending over and operated by the pattern-chains and connecting mechanisms.

As before stated, the main pattern-chain 5 is used to weave in the headings or borders and the multiplier pattern-chain 13 is used in connection with the main pattern-chain 5 to repeat certain bars of the main pattern-chain, the main pattern-chain being at rest while the multiplier pattern-chain is working and the multiplier pattern-chain being at rest while the main pattern-chain is working.

The third pattern-chain 39 is used for weaving the striped body of the fabric between the headings, and the fourth pattern-chain 150 is used in connection with the third pattern-chain 39 to repeat certain bars of said third pattern-chain, said third pattern-chain being at rest while the fourth pattern-chain is working and the fourth pattern-chain being at rest while the third pattern-chain is working. It will be understood that of the four pattern-chains only one is working at the same time.

In order to control the movement of the ratchet-wheel 33 of the multiplier pattern-chain mechanism, I provide a shield or guard 71, which extends under the pawl 56, (see Fig. 4,) to raise said pawl and prevent its engagement with said ratchet-wheel 33. The shield or guard 71 is pivoted at 72 on the stand 2 (see Fig. 7) and has an extension or arm 71' on the opposite side of its pivot-support, the end of which is provided with an open-end slot into which extends a pin 73, extending out from the weighted end 74' of the indicator-lever 74, extending over the main pattern-chain 5, loosely mounted at its outer end on the stud 15. (See Fig. 4.) It will thus be seen that the row of indicators on the main pattern-chain 5 under the indicator-lever 74, through said lever 74, pin 73, and the arm 71' and shield 71, controls the action of the pawl 56 of the multiplier pattern-chain mechanism.

A shield or guard 75 extends under the pawl 57, which moves the ratchet-wheel 28 of the main pattern-chain mechanism. The shield 75 is pivoted at 76 on the stand 2 (see Fig. 7) and has an arm or extension 75' on the opposite side of its pivot-support, the end of which is provided with an open-end slot into which extends a pin 77, extending out from the weighted end 78' of the indicator-lever 78, extending over the multiplier pattern-chain 13

and loosely mounted at its outer end on the stud 44. (See Figs. 4 and 7.)

It will thus be seen that the row of indicators on the multiplier pattern-chain 13 under the indicator-lever 78, through said lever 78, pin 77, and the arm 75' and shield 75, controls the action of the pawl 57 of the main pattern-chain mechanism, in connection with a shield or guard 79, to be hereinafter described, connected with the third pattern-chain mechanism.

I will now describe the construction and operation of the shield or guard which extends under the pawl 55, which operates the ratchet-wheel 41 of the third pattern-chain 39.

The shield or guard 80 is pivoted at 81 on the stand 2. (See Fig. 7.) Said shield or guard extends under the projecting end 55' of the operating-pawl 55 of the third pattern-chain 39. (See Fig. 4.) Upon the opposite side of the pivot 81 of the shield 80 is an extension or arm 82, upon the outer upper end of which is pivoted the lower end of the shield or guard 79, which extends under the pawl 57 of the main pattern-chain mechanism and operates in connection with the shield 75, as above stated.

The shield 79 has a pivotal motion in a vertical plane on the supporting-arm 82 and is provided with a rear extension 79', which engages an upward extension 82' on the arm 82. A spring 83, attached to the shield 79 and to the upward extension 82', (see Fig. 3,) holds the shield 79 in its raised position with the rear extension 79' engaging with the upward extension 82' on the arm 82.

Extending over the main pattern-chain 5 is an indicator-lever 84, the outer end of which is mounted loosely on the stud 15 and the inner end provided with a pin 85, which extends over the top of the pawl-carrying arm 54 (see Fig. 4) to limit the downward motion of said lever at its free end. The indicator-lever 84 has a downward extension 84' thereon, (see Fig. 3,) which is adapted to be engaged by an indicator 86 on the main pattern-chain.

The indicators which act on the indicator-lever 84 form a separate row of tubes and rolls between the heads or ends of the pattern-cylinder, or, as in this instance, the indicators may be substituted for one of the tubes which extend into the notches or grooves in the ends of the cylinder or barrel. (See Fig. 4.)

A link 87 connects the outer end of the indicator-lever 84 with the arm 82, forming a part of the shield 80. (See Fig. 2.)

An angle-lever 88 (see Figs. 6 and 7) is pivoted at 89 on the frame 2 and is provided with a notched portion 88' in the upper end of its vertical arm, into which a downward extension 82'' on the arm 82 is adapted to extend. A spring 90, attached to the arm 82 and to the stand 2, and a spring 91, attached to the angle-lever 88 and to the stand 2, act

to hold the arm 82 and the angle-lever 88 in engagement, as shown in Figs. 6 and 7.

Upon the stud 144 is loosely mounted the outer end of the indicator-lever 92, (see Figs. 2 and 4,) which extends over and is acted on by indicators on the fourth pattern-chain 10. On the inner end of the indicator-lever 92 is hung the upper end of a connector 93, which has a vertical slot 93' in the lower end thereof, through which extends loosely a screw 112, secured in the end of the lower arm of the angle-lever 88. (See Fig. 2.)

In the revolution of the fourth pattern-chain 150 when the pattern-indicator 109 comes under the lever 92 said lever will be raised and with it the connector or arm 93, (see Figs. 2 and 6,) causing the angle-lever 88, through the engagement of the pin 112 thereon with said arm 93, to move on its pivotal support and be disengaged from the arm 82 of the shield 80 and allow the spring 90 to act to draw down the arm 82 and with it the shield 79, so that the pawl 57 can engage with the ratchet-wheel 28 of the main pattern-chain mechanism and put said mechanism into operation. At the same time the shield 80 is raised to hold the pawl 55 out of engagement with the ratchet-wheel 41 of the third pattern-chain mechanism to stop said mechanism. As soon as the pattern-indicator 109 passes from under the lever 92 said lever drops down at its free end and with it the connector 93, the slot 93' in said connector 93 allowing the connector to drop without moving the angle-lever 88.

The revolution of the main pattern-chain 5 brings at the proper time the pattern-indicator 86 on said chain under the indicator-lever 84, and raises said lever 84, and through the link 87 raises the arm 82 and allows the spring 91 to act to draw over the angle-lever 88 and bring the end thereof under the arm 82 and hold it in its raised position, as shown in Fig. 7. The raising of the arm 82 raises the shield 79 under the pawl 57 of the main pattern-chain mechanism and lowers the shield 80 under the pawl 55 of the third pattern-chain mechanism, as shown in Fig. 7.

The shield 79, extending under the pawl 57 of the main pattern-chain mechanism, is pivoted to the arm 82 to have a movement in a vertical plane independent of said arm, so that the arm 82 may be raised while the pawl 57 is in engagement with the teeth of the ratchet-wheel 28, and after the pawl 57 has completed its stroke the spring 83 will then act to carry the pawl from engagement with the ratchet-wheel by causing the shield 79 to lift the said pawl.

I will now describe the connections intermediate the third and fourth pattern mechanisms, by means of which they coact, and the starting of one stops the other, and vice versa.

On the stud 44 is loosely mounted the end of an indicator-lever 110, (see Fig. 4,) the inner end of which extends over the third pat-

tern-chain 39. (See Fig. 5.) Extending down from the indicator-lever 110 is an extension 110', which has at its lower end a boss 111, extending out at right angles therefrom. (See Fig. 4.) In said boss is secured a pin 112, which extends into the open end slot in one end of the shield or guard 113, centrally pivoted on the frame 2. (See Figs. 3 and 6.) The opposite end of the shield or guard 113 extends under the pawl 158, which engages the ratchet-wheel 151 to operate the fourth pattern-chain 150.

It will be seen that in the revolution of the third pattern-chain 39, when a roll 9 comes under the indicator-lever 110, said lever will be raised and move the shield 113 on its pivotal support and cause one end of said shield to be raised and the other end under the pawl 158 to be lowered to allow said pawl 158 to drop down and engage the ratchet-wheel 151 to put in operation the fourth pattern-chain 150, as shown in Fig. 3.

On the stud 144 is loosely mounted the outer end of an indicator-lever 114, (see Fig. 4,) the inner end of which extends over the fourth pattern-chain 150. Extending out from the inner end of the indicator-lever 114 is a pin 115, which extends into the open end slot in one end of the shield or guard 116, centrally pivoted on the frame 2. (See Fig. 6.) The opposite end of the shield or guard 116 extends under the pawl 55, which engages the ratchet-wheel 41 to operate the third pattern-chain 39.

It will be seen that in the revolution of the fourth pattern-chain 150, when a roll comes under the indicator-lever 114, said lever will be raised and move the shield 116 on its pivotal support and cause one end of the shield to be raised and the other end under the pawl 55 to be lowered to allow said pawl 55 to drop down and engage the ratchet-wheel 41 to put into operation the third pattern-chain 39.

The third and fourth pattern-chains cooperate to weave the fabric according to the pattern, the fourth pattern-chain acting as a multiplier for the third pattern-chain in the same manner that the first and second pattern-chains cooperate to weave the fabric, the second pattern-chain acting as a multiplier for the first pattern-chain.

From the above description, in connection with the drawings, the operation of my improvements in drop-box-indicating mechanism in which four pattern-chains are used will be readily understood by those skilled in the art and, briefly, is as follows:

Suppose the loom is running, with the third pattern-chain 39 in operation, to weave the striped body of a blanket between the headings or borders, in case a blanket is being woven, the other three pattern-chains will be at rest. When a roll 9 on the third pattern-chain 39 comes under the indicator-lever 110, (see Fig. 4,) said indicator-lever will be raised, and through pin 112 engaging the inner end of the shield 113 (see Fig. 6) the outer

end of said shield will be dropped to allow the pawl 158 to engage and operate the ratchet-wheel 151 of the fourth pattern-chain 150. The revolution of the fourth pattern-chain 150 will bring a tube 8 on said pattern-chain under the indicator-lever 114 and will cause said lever 114 to drop, and through the pin 115 engaging the outer end of the shield 116 will raise the inner end of said shield 116 (see Fig. 6) and raise the pawl 55 out of engagement with the ratchet-wheel 41 of the third pattern-chain mechanism, so that the third pattern-chain 39 will stop. The fourth pattern-chain 150 will continue to run and repeat the bars of the third pattern-chain 39 until a roll 9 comes under the indicator-lever 114. The lever will then be raised, and through pin 115 the outer end of the shield 116 will be raised and the inner end will be dropped, allowing the pawl 55 to engage the ratchet-wheel 41 and operate the third pattern-chain 39. (See Fig. 6.) The revolution of the third pattern-chain 39 will bring a tube 8 under the indicator-lever 110 and, through pin 112 engaging the inner end of the shield 113, will raise the outer end of said shield and raise the pawl 158 out of engagement with the ratchet-wheel 151 of the fourth pattern-chain mechanism, and the fourth pattern-chain 150 will stop. This operation will be repeated, according to the arrangement of the third and fourth pattern-chains, the fourth pattern-chain acting as a multiplier for the third pattern-chain and the two chains weaving the striped body of the fabric between the headings or borders. In the revolution of the fourth chain 150 when the indicator 109 thereon engages the indicator-lever 92, as shown in Fig. 5, then said lever 92 will be raised and, through connector 93, (see Fig. 2,) will rock the angle-lever 88 and disconnect the upright arm thereof from the extension 82' on the arm 82 (see Fig. 7) and allow the outer end of said arm 82 to drop down, actuated by the spring 90, and with it the shield 79, so that the pawl 57 can engage the ratchet-wheel 28 and operate the main pattern-chain 5. The lowering of the shield 79 and arm 82 raises the shield 80, which raises the pawl 55 from engagement with the teeth of the ratchet-wheel 41 of the third pattern-chain mechanism and stops the third pattern-chain 38, and a post or stud 170, fast at its lower end on the outer end of the extension 55' of the pawl 55 and extending under and engaging with its upper end the pawl 158, acts to hold the pawl 158 out of engagement with the ratchet-wheel 151 of the fourth pattern-chain mechanism, so that the movement of the pawl-carrying arm 54 to the right, Fig. 6, will not operate the fourth pattern-chain 150. The main pattern-chain 5 will continue to operate until a roll 9 comes under the lever 84, which will raise said lever and, through pin 73 thereon engaging the arm 71' of the shield 71, (see Fig. 7,) lower said shield 71 and allow the pawl 56 to drop and engage the ratchet-wheel 33 to operate the second or

multiplier pattern-chain 39. The revolution of the chain 39 will bring a tube 8 under the lever 78 (see Fig. 7) and, through the pin 77 on said lever engaging the arm 75' of the shield 75, will raise said shield 75 and disengage the pawl 57 from the ratchet-wheel 28, so that the main pattern-chain 5 will stop. When in the revolution of the second pattern-chain 39 a roll 9 comes under the lever 78, (see Fig. 7,) the shield 75 is lowered, allowing the pawl 57 to operate the main pattern-chain 5, and this operation is repeated as desired, the second pattern-chain 39 acting as a multiplier for the main pattern-chain 5 in weaving the headings or borders of the goods.

When in the revolution of the main pattern-chain 5 the indicator 86 thereon comes under the lever 84, it will raise said lever and through link 87 will raise the arm 82 of the shield 79 to allow the spring 91 to act and draw the vertical arm of the angle-lever 88 under the arm 82. The raising of the arm 82 will raise the shield 79 to disengage the pawl 57 from the ratchet-wheel 28 and stop the main pattern-chain 5 and at the same time lower the shield 80 to allow the pawl 55 to engage the ratchet-wheel 41 and operate the third pattern-chain 39. The lowering of the shield 80 and the pawl 55 will, through pin 170, lower the pawl 158, so that it will engage the ratchet-wheel 151 and move the fourth pattern-chain 150 once on the movement of the pawl-carrying arm 54 to the right, Fig. 6. The movement of the pawl-carrying arm 54 to the left, Fig. 6, will move the third pattern-chain 39 and bring a tube under the indicator-lever 110 to raise the shield 113, and thus hold the pawl 158 out of engagement with the ratchet-wheel 151 and prevent the turning of the fourth pattern-chain 150 on the return movement of the pawl-carrying arm 54, Fig. 6, to the right. The third pattern-chain 39 and the fourth pattern-chain 150 will then operate, as above described, to weave the striped body of the goods. It will be seen that the four pattern-chains all cooperate, and the stopping of one starts another, &c. It will also be seen that when the indicator 109 on the fourth pattern-chain 150 in the revolution of said chain comes under the lever 92 the shield 79, through connector 93 and angle-lever 88, is instantly dropped to allow the pawl 57 of the main pattern-chain mechanism to put into operation the main pattern-chain 5, and this change is made instantly or on the pick without any possibility of an extra pick or two being put into the fabric before the main pattern-chain 5 starts.

It will be understood that the details of construction of my improvements may be varied, if desired, and they may be used to weave different kinds of textile fabrics.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a loom of the class described, the combination with a main pattern-chain mechan-

ism, a second or multiplier pattern-chain mechanism, intermediate connecting mechanism, and mechanism for operating said two pattern-chain mechanisms, of a third pattern-chain mechanism, and a fourth pattern-chain mechanism, and intermediate connecting mechanism, and mechanism for operating said third and fourth pattern-chain mechanisms, and mechanism intermediate and connecting the fourth pattern-chain mechanism with the main pattern-chain mechanism, to put into action the main pattern-chain mechanism from the fourth pattern-chain mechanism, substantially as shown and described.

2. In a loom of the class described, the combination with a main pattern-chain mechanism, a multiplier pattern-chain mechanism, and a shuttle-drop-box-shifting mechanism, and connections between the main pattern-

chain mechanism and the box-shifting mechanism to operate said box-shifting mechanism from the main pattern-chain, of a third pattern-chain mechanism, a fourth pattern-chain mechanism, and connections between said third pattern-chain mechanism and the shuttle-drop-box-shifting mechanism, to operate said box-shifting mechanism from the third pattern-chain, and connections between the fourth pattern-chain mechanism and the main pattern-chain mechanism, to start the main pattern-chain mechanism from the fourth pattern-chain mechanism, substantially as shown and described.

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Witnesses:

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M. J. GALVIN.