March 15, 1960 G. W. DUNHAM 2,928,428

LOOMS

Filed May 29, 1956 8 Sheets-Sheet 1

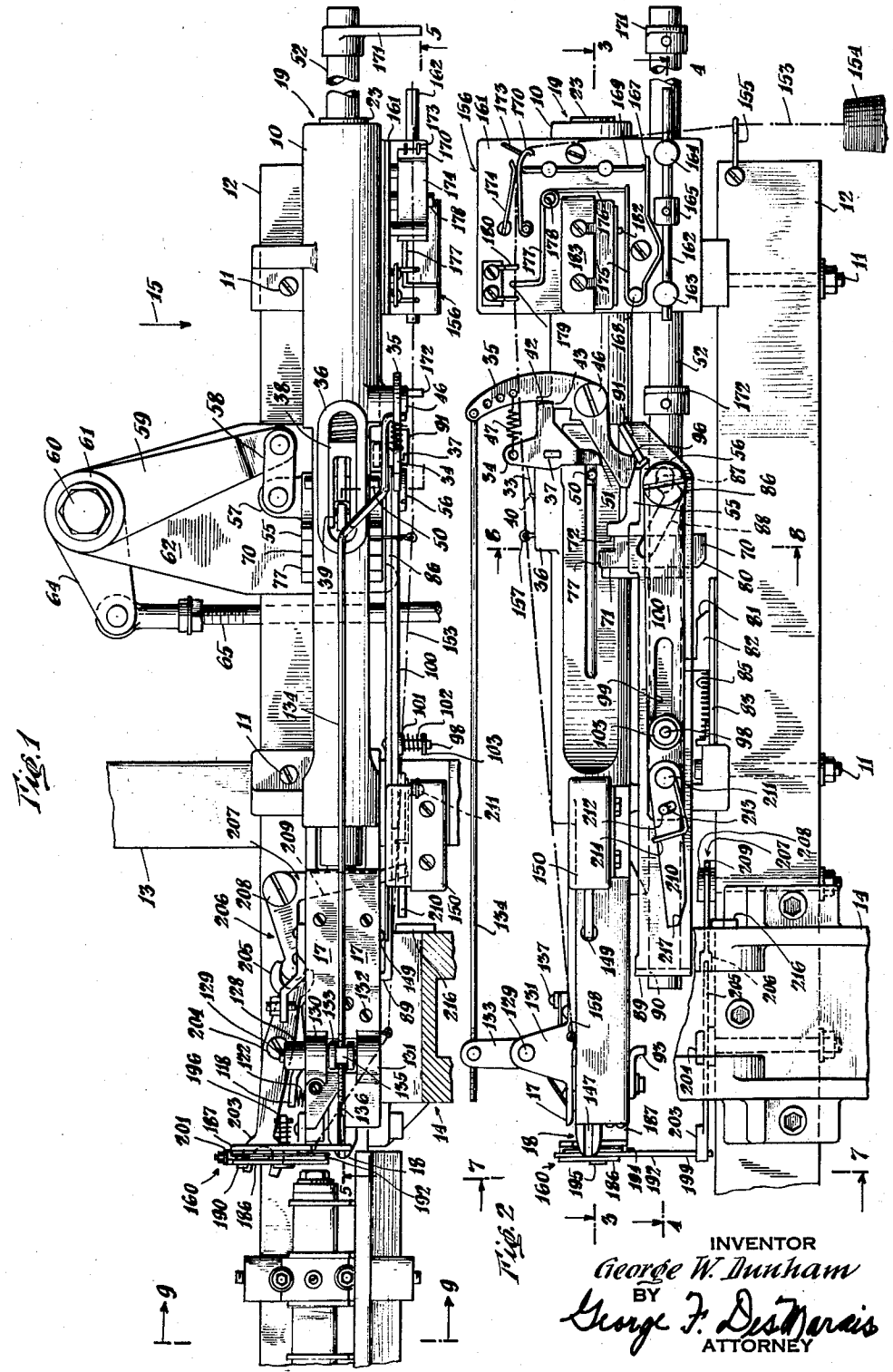


Fig. 1

Fig. 2

INVENTOR
George W. Dunham
BY
George F. DesMarais
ATTORNEY

March 15, 1960 G. W. DUNHAM 2,928,428

LOOMS

Filed May 29, 1956 8 Sheets-Sheet 2

Fig. 3

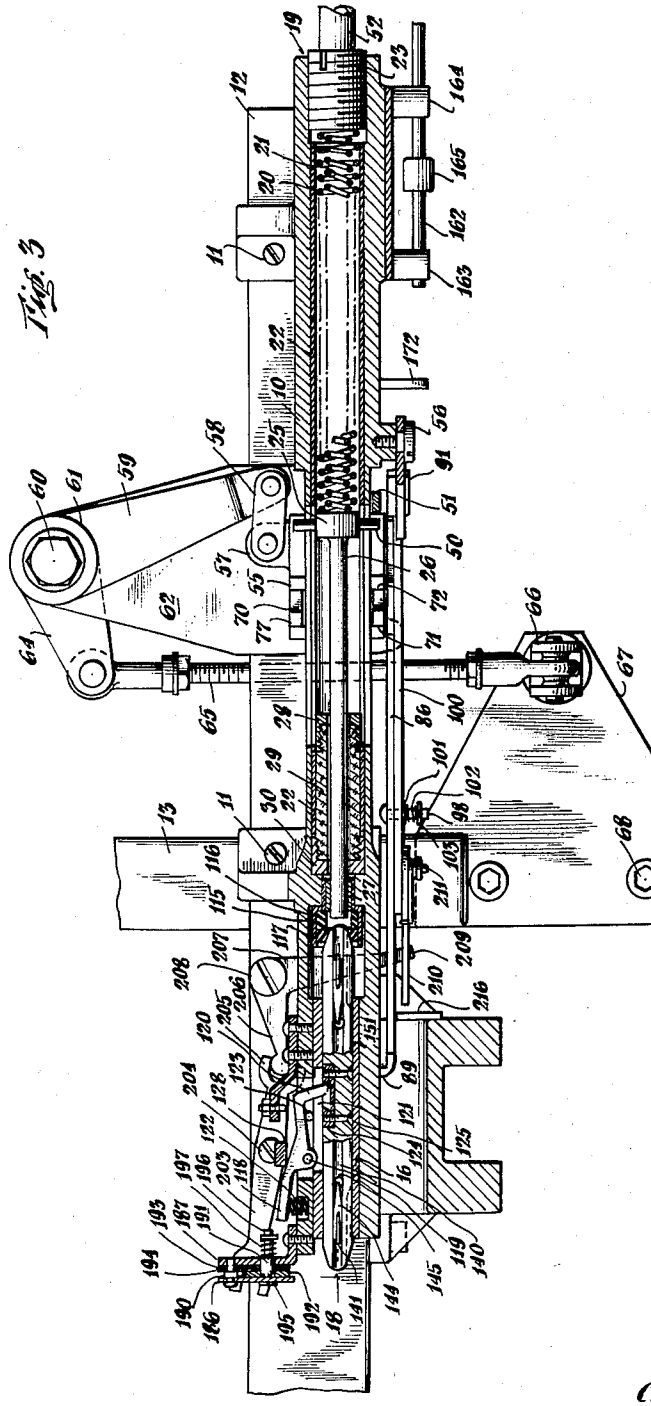
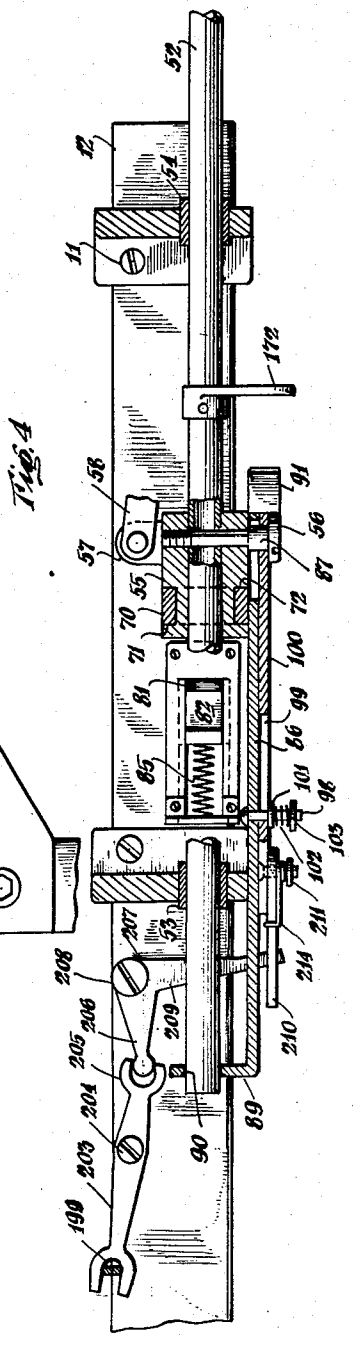


Fig. 4



INVENTOR
George W. Dunham
BY
George F. DeMorais
ATTORNEY

March 15, 1960 G. W. DUNHAM 2,928,428

LOOMS

Filed May 29, 1956 8 Sheets-Sheet 3

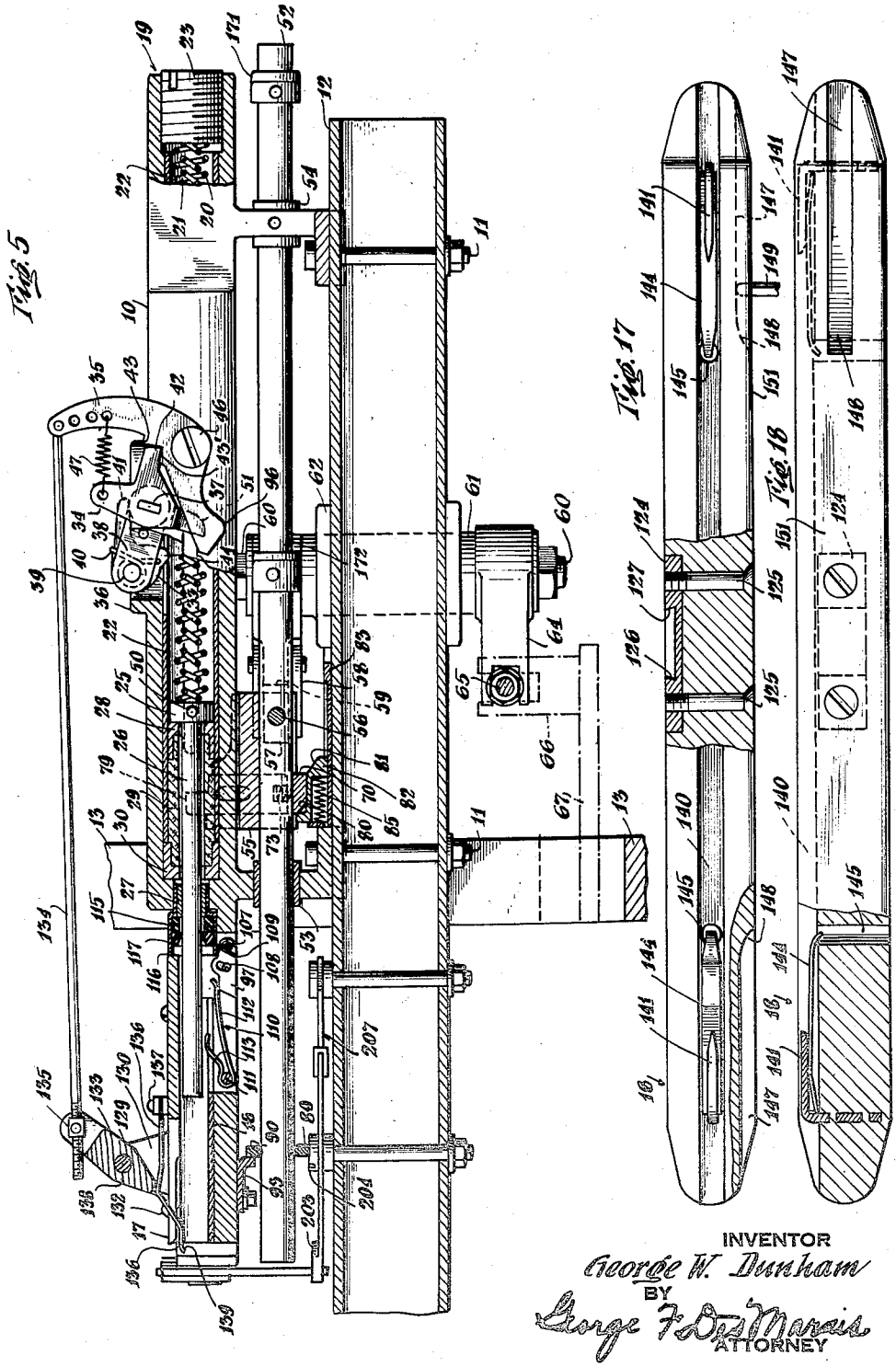


Fig. 5

Fig. 17

Fig. 18

INVENTOR
George W. Dunham
BY
George F. DesMarais
ATTORNEY

March 15, 1960 G. W. DUNHAM 2,928,428

LOOMS

Filed May 29, 1956 8 Sheets-Sheet 4

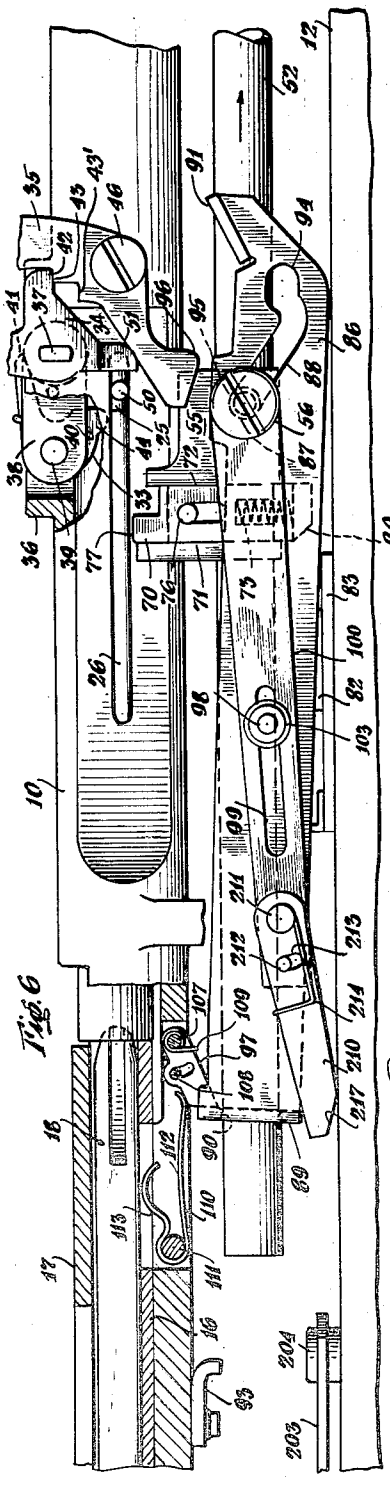


Fig. 6

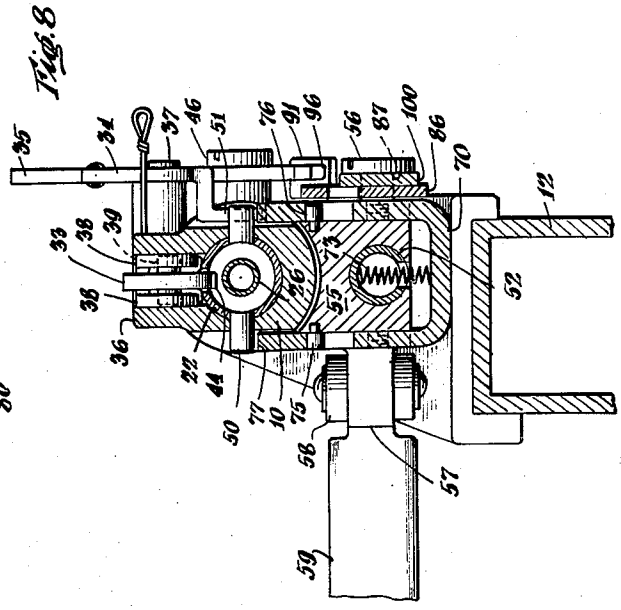


Fig. 8

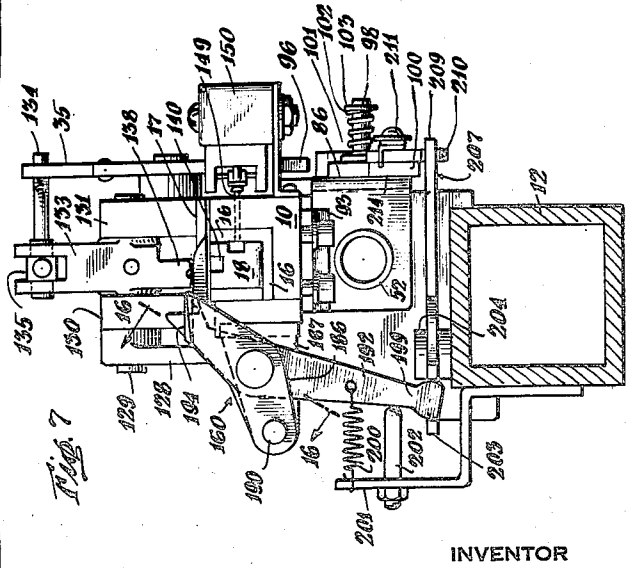


Fig. 7

INVENTOR
George W. Dunham
BY
George F. DisMarais
ATTORNEY

March 15, 1960 G. W. DUNHAM 2,928,428

LOOMS

Filed May 29, 1956 8 Sheets-Sheet 5

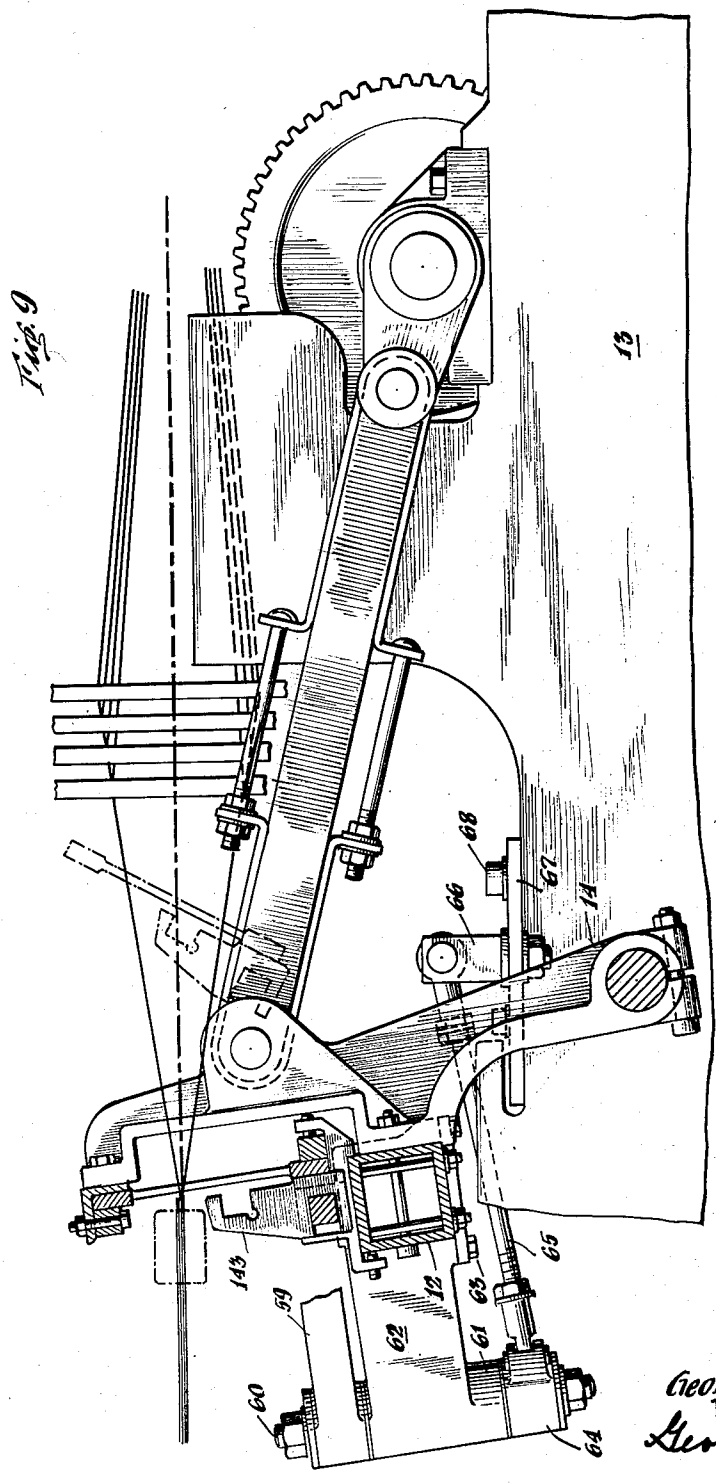


Fig. 9

INVENTOR
George W. Dunham
BY
George F. DesMarais
ATTORNEY

March 15, 1960 G. W. DUNHAM 2,928,428

LOOMS

Filed May 29, 1956 8 Sheets-Sheet 6

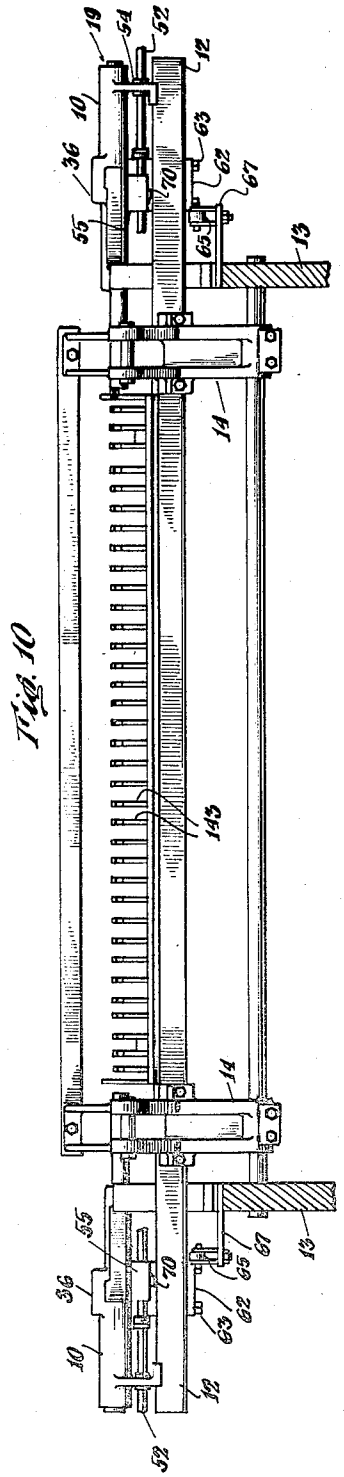


Fig. 10

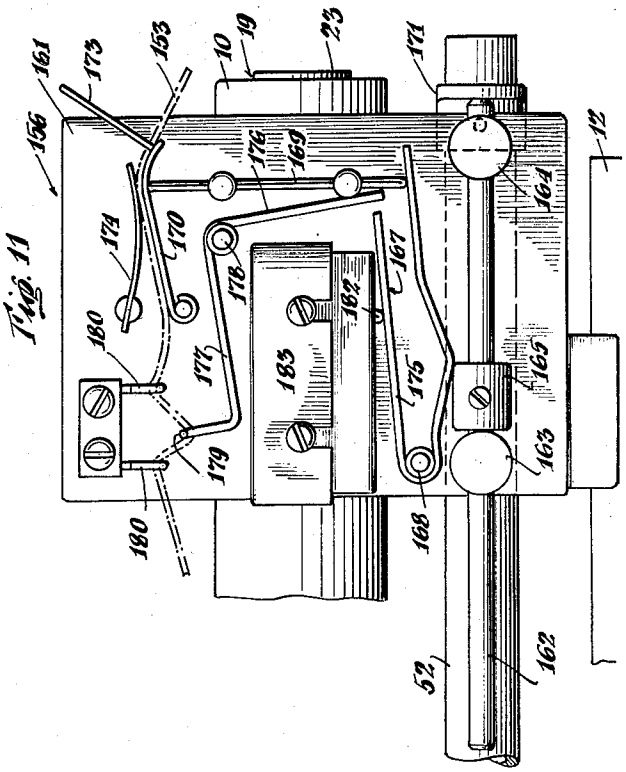


Fig. 11

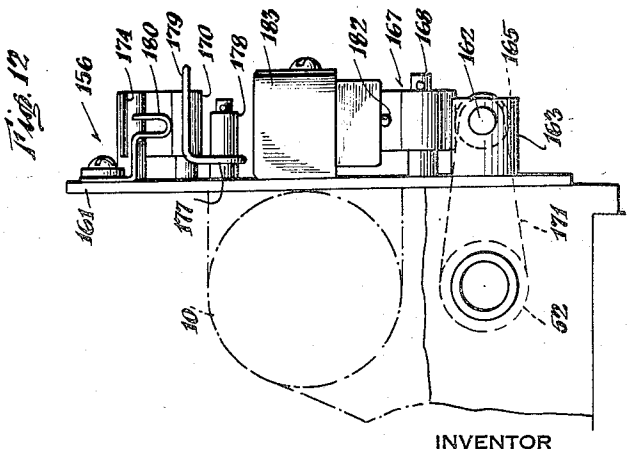


Fig. 12

INVENTOR

George W. Dunham

BY

George F. DuMarais

ATTORNEY

March 15, 1960 G. W. DUNHAM 2,928,428

LOOMS

Filed May 29, 1956 8 Sheets-Sheet 7

Fig. 13

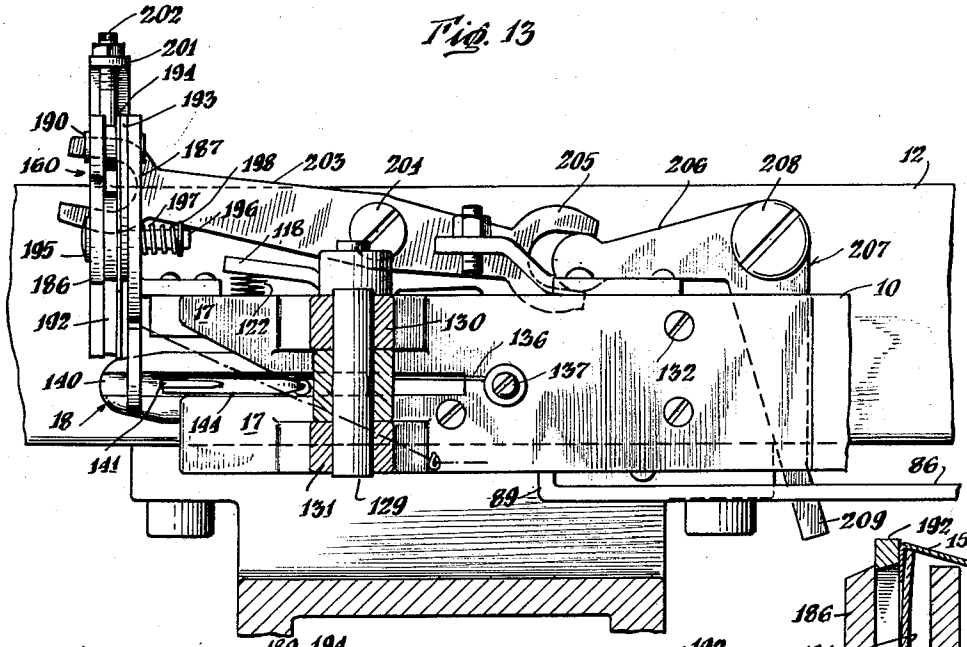
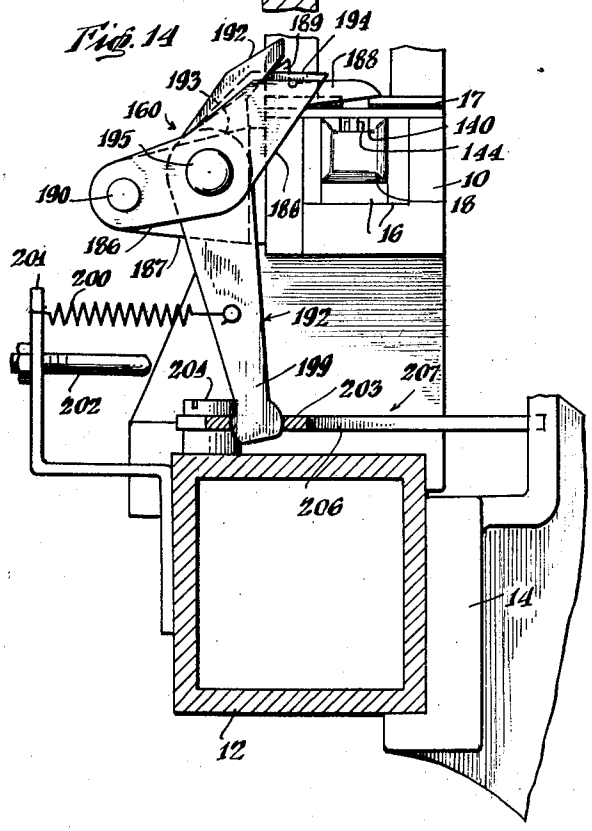


Fig. 14



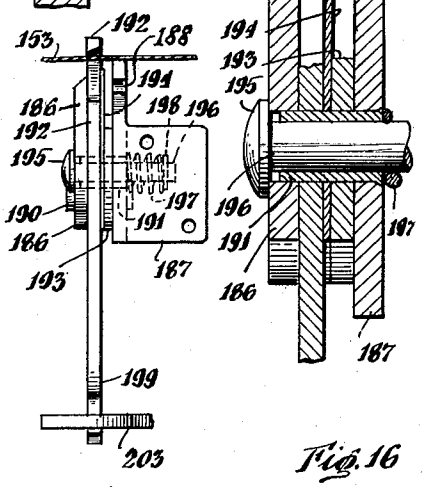


Fig. 15

Fig. 16

INVENTOR
George W. Dunham
BY
George F. DesMarais
ATTORNEY

March 15, 1960 G. W. DUNHAM 2,928,428

LOOMS

Filed May 29, 1956 8 Sheets-Sheet 8

Fig. 20

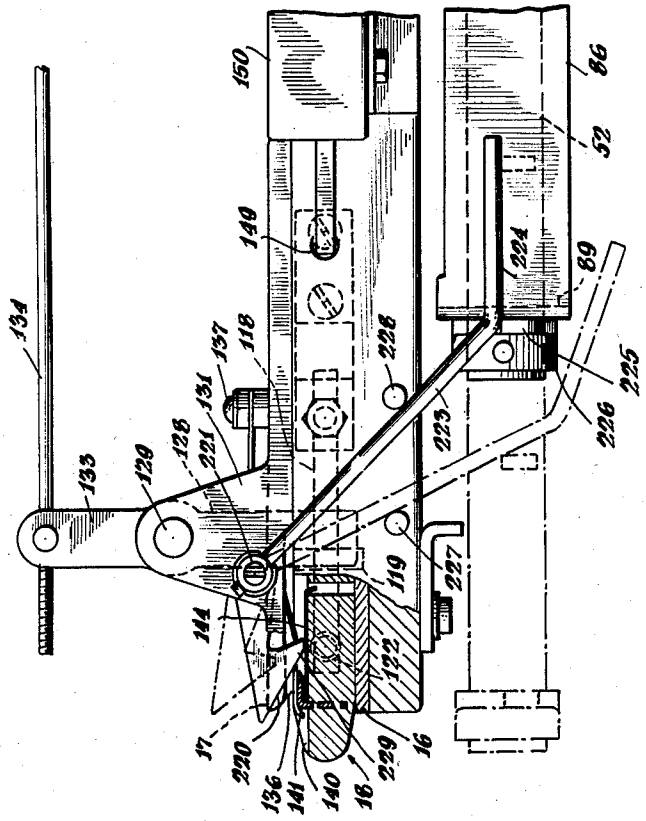
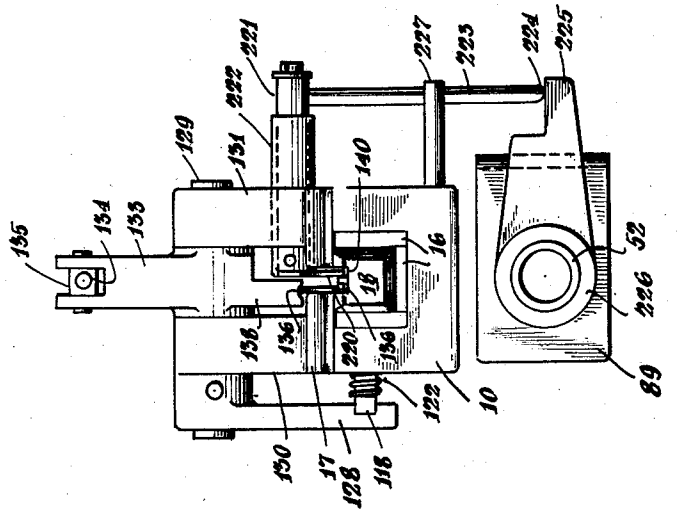


Fig. 19



INVENTOR
George W. Dunham
BY
George F. DesMarais
ATTORNEY

United States Patent Office 2,928,428
Patented Mar. 15, 1960

2,928,428

LOOMS

George W. Dunham, Wilton, Conn.

Application May 29, 1956, Serial No. 588,152

40 Claims. (Cl. 139—126)

This invention relates to looms and particularly to looms of the type by which filling threads are woven into a fabric from separate supply sources located at opposite sides of the loom. In such looms a weft carrier or pilot picks up a leading end of a filling thread at one side of the loom and carries it across the loom where the inserted thread is released and the leading end of another thread is picked up and carried across the loom in the reverse direction. An object of the invention is to provide mechanisms operable at high speed for the placement of threads in this manner.

The invention provides positively acting and precisely timed mechanisms for the automatic projecting of a pilot to and fro lengthwise of a lay in successive cycles of movement of the lay, the picking up of a weft thread by the pilot, the release of an inserted thread from the pilot, the shearing of the trailing end of an inserted thread from a source of supply for each projection of the pilot, and controls for automatically effecting these operations.

Another object of the invention is to provide mechanisms capable of carrying out the foregoing functions which are wholly mounted on a lay or laybeam and controlled to operate in timed relation to the movement of the laybeam and under power derived from the crankshaft as the crankshaft reciprocates the lay. The pilot is received in and projected from projectors mounted on the opposite ends of the lay. These projectors are similarly constructed and operated, and they alternately project a pilot in succeeding cycles of the crankshaft as the lay moves backwardly. The pilot is received in and projected from a box which forms part of or is associated with each projector.

Each projector is activated or cocked to propel a pilot, and all operations incident to the propulsion of a pilot and the placing and cutting of filling threads are controlled from and in timed relation to the movement of a single element in the form of a slide rod which is associated with each projector and is reciprocated by the movement of the lay. The slide rods are carried by the lay, one adjacent to and parallel to each of the projectors. The slide rods are actuated in unison and move inwardly or toward each other during each backward movement of the lay, and outwardly or away from each other during each forward movement of the lay by a pivotal connection between each slide rod and a stationary frame of the loom. All of the motion-producing and controlling mechanisms associated with the projectors are mountable on a laybeam and thus provide an assemblage adapted for the replacement of laybeams and pilot-projecting mechanisms of existing looms for the purpose of attaining a rate of production higher than that obtainable by the replaced mechanism.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawing which shows by way of illustration a preferred embodiment and the principle thereof and what I now consider to be the best

mode in which I have contemplated applying that principle.

In the drawing:

Fig. 1 is a top view of the left hand projector with parts shown in position as the lay is moving towards the back of the loom and before the propelling plunger is tripped to project a pilot;

Fig. 2 is an elevational view of the back of the left hand projector shown in Fig. 1;

Fig. 3 is a horizontal section on line 3—3 of Fig. 2;

Fig. 4 is a horizontal section on line 4—4 of Fig. 2;

Fig. 5 is a view of the left hand projector as seen from the back, partly in section, with the plunger released and the lay in back position;

Fig. 6 is an enlarged elevational view of the back of a portion of the left hand projector partly broken away and showing the position of the parts during the forward movement of the lay which immediately precedes the backward movement of the lay during which the pilot is projected;

Fig. 7 is an elevational view of the inboard end of the left hand projector shown in Fig. 2;

Fig. 8 is a vertical section on line 8—8 of Fig. 2;

Fig. 9 is an elevational view looking toward the left loom side from the right side of the loom;

Fig. 10 is an elevational view looking toward the lay from the back of the loom;

Fig. 11 illustrates the action of the warp tensioning mechanism upon breakage of a filling thread;

Fig. 12 is an end view of the warp tensioning mechanism as seen from the left of Fig. 11;

Fig. 13 is an enlarged horizontal view of the shears operating mechanism as seen from above;

Fig. 14 is an end view of the shears operating mechanism showing the shears open;

Fig. 15 is a vertical view of the shears as seen from the right side of Fig. 14;

Fig. 16 is an enlarged sectional view of the shears illustrating the holding of a thread after cutting;

Fig. 17 is a top view of a pilot, partly broken away;

Fig. 18 is a side view of the pilot with one end broken away to show the thread-engaging gripper;

Fig. 19 is an elevational view of the inboard end of a left hand projector which is provided with a thread-releasing device;

Fig. 20 is an elevational view of the back of the projector shown in Fig. 19.

In the following description and in the claims, various details will be identified by specific names for convenience, but they are intended to be as generic in their application as the art will permit.

In the drawing accompanying and forming part of this specification, certain specific disclosure of the invention is made for purposes of explanation, but it will be understood that the details may be modified in various respects without departure from the broad aspect of the invention.

The projector and the operating mechanisms associated therewith at opposite ends of the lay are mirror likenesses of one another and they function alike in successive cycles of the loom but with like functions of the respective projectors and operating mechanisms occurring at intervals of 360° of rotation of the crankshaft of the loom. Two complete cycles of the crankshaft, or four strokes of the lay are required for each projector and its associated operating mechanisms to perform a single complete series of actions. Since the same actions occur in the respective projectors at opposite ends of the lay at intervals of 360°, all actions of one projector during one cycle are duplicated by the other projector during an alternate cycle.

As there is one reciprocation consisting of two strokes of the lay in each cycle, and two cycles are required to

complete the action of a projector, the actions will be described as occurring during the backward and forward movements of the lay in either an odd- or an even-numbered cycle, as the case may be, in which a particular action takes place. For example, during an odd-numbered backward movement of the lay the pilot is projected from one projector and on the even-numbered backward movement of the lay the pilot is projected from the other projector and all other operations of the respective projectors follow in order.

The construction and actions of both projectors can be understood from a detailed description of either one. The projector at the left end of the lay is illustrated in detail in the drawing. Referring first to Figs. 1, 2, 3, 7 and 8, a projector body **10** is bolted by bolts **11** to the outboard end of the lay **12** which extends beyond the left hand loom side **13**. The left hand sword of the loom is shown at **14**. In Fig. 1, the lay is in approximately mid-position and is moving backwards, which is towards the lower edge of the sheet, as indicated by the arrow **15**. The inboard end of the projector is channelled and is provided with bottom and side liners **16** and a top gib **17**, Fig. 1, which together form a box for receiving a pilot **18**, shown fully home in projecting position in Fig. 3. The body of the projector is bored from its outboard end **19**. A pair of projecting springs **20** and **21** are disposed within a sleeve **22** which lines the bore. The outboard end of the bore is closed by a threaded member **23** screwed into place within the bore. The member **23** serves to buttress the outer ends of the springs **20** and **21**. The inner ends of the springs bear upon the head **25** of a plunger **26** which projects the pilot **18** each time the energy stored in the springs **20** and **21** is released. As shown in Figs. 1, 2, 3 and 6, the plunger is in cocked position and the springs are compressed.

The plunger is guided by the sleeve **22** and a smaller sleeve **27** mounted in the projector body **10**. When in cocked position, the plunger is located principally in the sleeve **22**. When the plunger is released to the action of the springs **20** and **21**, the plunger projects the pilot across the loom. The inward movement of the plunger is arrested when it comes in contact with a bumper cap **28** which is supported on one end of a bumper **29** to the other end of which is fastened a retainer cap **30**. The bumper comprises a hollow cylinder of a composition of impact deadening material which minimizes the rebound of the plunger and hysteresis of the springs, thus prolonging their useful life. The plunger **26** is shown at the end of the projecting stroke in Fig. 5.

As best seen in Figs. 2, 5, 6 and 8, the plunger **26** is held in its cocked position by a plurality of cooperating latches, including a plunger catch **33**, a cocking latch **34** and a trigger latch or trigger **35**. The plunger catch **33** is supported pivotally on a pivotal double arm bracket **38**. The bracket and the plunger catch are mounted for movement within an opening surrounded by an upstanding rim **36** which serves as a bearing for a rockshaft **37** to one end of which the cocking latch **34** is secured. The rockshaft also has fastened thereto one end of the double arm bracket **38** between the arms of which the plunger catch **33** is pivotally mounted by a pin **39** carried by the free ends of the arms of the bracket. The catch **33** is pivotally mounted on the pin **39** and is biased by a spring **40** to engage its arm **41** with the round hub of the bracket **38** surrounding the center of pivot of the bracket, as shown in Fig. 6.

When the plunger is in cocked position, the bracket **38** is held in a substantially horizontal position by the engagement of the arm **42** of the cocking latch **34** on the shoulder **43** of the trigger latch **35**, as shown in Fig. 6. In this condition of the mechanism, the finger **44** of the catch **33** engages the inward side of the head **25** of the plunger and holds the plunger against the action of the springs **20** and **21**.

The trigger latch **35** is pivotally supported on the projector body by the stem of a screw **46**. Spring **47** (Fig. 2), connecting between the cocking latch **34** and the trigger latch **35** is tensioned to rock the rockshaft **37** clockwise and the trigger latch counterclockwise. When the cocking latch **34** is released from shoulder **43** by a tripping movement of the trigger **35**, the finger **42** slips from the shoulder **43** of the trigger and the cocking latch and rockshaft **37** are rocked clockwise, as seen in Fig. 5. The engagement of the finger **42** with the shoulder **43'** of a notch in the trigger **35** arrests the clockwise rotation of the rockshaft **37**. The rocking of the rockshaft **37** raises the bracket **38** and the catch **33** is raised sufficiently for the finger **44** to clear the head of the plunger and release the plunger to the action of the projecting springs. The releasing of the plungers of a left hand projector and of a right hand projector occur as the lay moves backwardly, the left hand plunger releasing during an odd-numbered cycle of the loom, and the right hand plunger releasing during an even-numbered cycle of the loom.

The trigger and the plunger releasing latches of the respective left and right hand projectors are restored to cocked position during the forward movements of the lay in alternate cycles. As a plunger nears its cocked position a pin **50** in plunger head **25** engages a depending finger **51** on the latch **34** and rotates the latch and the bracket **38** counterclockwise until the finger **42** can engage on the shoulder **43** of the trigger latch **35**. The trigger latch is rotated in the same direction under the action of the spring **47**. Meanwhile the catch **33** resiliently yields as the catch and the bracket are lowered and the plunger head **25** passes under the finger **44** and then, with the catch fully lowered the finger **44** engages the inner side of the plunger head and holds the plunger in cocked position.

The plunger releasing and cocking actions are brought about by the movements of a slide rod **52** which is mounted to slide in bearings **53**, **54**, in the standards by which the projector body **10** is supported on the lay. The slide rod carries a block **55** which is fastened to it by a screw **56**. An ear **57** extends from one side of the block and is pivotally connected to a pair of links **58**, Figs. 1 and 3. The other ends of the links **58** are pivotally connected to an arm **59** which is fastened to the upper end of a shaft **60** journalled in a base **61** supported on the lay by a frame **62**, Fig. 9. The frame **62** is fastened to the lay by bolts **63** and extends toward the front of the loom. The lower end of the shaft **60** has fixed thereto a lever arm **64** whose free end is pivotally connected by a link **65** to a post **66** which is attached to and stands upwardly from a stationary bracket **67**. The bracket **67** is solidly attached to the loomside **13** by bolts **68**. The arrangement is such that when the lay moves backwardly, the slide rod **52** moves toward the inboard end of the lay, as in Figs. 2 and 4, and as the lay moves forwardly the slide rod moves toward the outboard end of the lay, as in Fig. 6.

The plunger is released and the pilot is projected at approximately midway of the backward movement of the lay and the plunger is retracted and cocked during the forward movement of the lay with the slide rod moving outwardly. The retracting of the plunger is accomplished by a U-shaped cocking fork **70** which is carried by the block **55**, as best seen in Figs. 5, 6 and 8.

The cocking fork **70** is guided for vertical movement in grooves **71** and **72** in the side walls of the block. The cocking fork is normally urged downwardly by a spring **73** (Figs. 6 and 8), its lower position being determined by the stops **75** and **76** which extend into slots in the side arms of the work. In its lowermost position, the fingers **77** of the fork are below the level of the ends of the pin **50** which extends laterally from the plunger head **25**, and the fingers remain in this position except when the slide rod **52** approaches the end of its inward movement and when, having been elevated (Fig.

5), they engage the pin 50 during the outward movement of the slide rod for restoring the plunger to cocked position.

As the lay moves backwardly, the slide rod 52 moves inwardly and carries the cocking fork along with it but in depressed position, Fig. 2. At it approaches the end of the inward stroke the bevelled surface 80 on the lower surface of the fork comes into contact with the bevelled surface 81 on a slide elevator 82. The slide elevator 82 is supported in a guide 83 for movement lengthwise of the slide rod 52. The ends of the guide determine the limits of movement of the elevator in both directions. The elevator is urged outwardly by a spring 85, as shown in Fig. 2. As the inwardly moving fork contacts the elevator 82 it carries the elevator along with it against the action of the spring 85 until it reaches the limit of its inward movement in guide 83, causing the fork to be cammed upward over the bevelled surface 81 and thereby rise onto the upper horizontal surface of the elevator, as shown in Fig. 5. This is accomplished by proportioning the forces of the springs 73, 85, and also the slope of the bevelled surface 81 over which the fork slides. The elevator follows the fork as it begins its outward movement and until the upper ends 77 of the fork contact the ends of the pin 50 on the plunger head 25. The reaction of the projecting springs 20, 21 is sufficient to hold the fork up and in engagement with the pin 50 and the continued outward movement of the fork restores the plunger to cocked position. On approaching the cocked position the plunger head 25 brushes past the finger 44 of the catch 33 and the pin 50 engages the arm 51 of the latch 34 and rocks the latch and the shaft 37 counterclockwise. At the end of the cocking stroke the plunger is restrained and held in cocked position by the finger 44 and the latches 33, 34 and 35, as described hereinabove, and the fork is thereupon depressed by the spring 73, so as to clear the pin 50.

During the cycle of the loom in which the functioning of the left hand projector and the movements of its associated slide rod 52 were described, in the first stroke of the lay the lay moved from full front to full back with the slide rod moving inwardly and in the second stroke of the lay the lay moved from full back to full front with the slide rod moving outwardly. For convenience this cycle is termed an odd-numbered cycle. During this cycle the tripping mechanism was actuated and the pilot was projected from the left side and received in the right hand projector, the plunger was retracted, and the cocking catch and trigger latch mechanism was reset.

In the next or even-numbered cycle the slide rod 52 again completes an inward and an outward movement and on the inward movement the cocking fork 70 is raised by the elevator 82, as above explained, but it drops to its lowermost position during the outward movement of the slide rod because the plunger 26 was retracted during the previous odd-numbered cycle and is therefore not in position to be engaged by the fingers 77 of the fork. The fork remains lowered when the plunger is again released to propel a pilot during the first part of the backward movement of the lay in the next odd-numbered cycle of the loom.

The tripping mechanism by which the trigger 35 is actuated to release the plunger 26 during an odd-numbered cycle of the loom as the lay moves backwardly will now be described. As the lay moves backwardly and the slide rod 52 moves inwardly (Fig. 2), the trigger 35 is actuated to release the plunger whenever a pilot is contained in the projector. This is because the tripping mechanism is set for operation only when a pilot has been received from the projector at the other end of the lay.

The tripping mechanism includes a tripping slide 86 which slides over the back surface of the block 55. The outboard end of the slide 86 is supported and guided by the head of the screw 56 and a roller 87 on the screw which is in sliding engagement with a sloping slot 88 in

the tripping slide. The inboard end of the tripping slide has a flange 89 extending at right angles thereto and having an opening 90 through which the slide rod 52 passes. The slide 86 is slidable on the slide rod 52 with the rod serving as a sliding pivot for the flange 89 and with the roller 87 and the slot 88 guiding the outboard end of the slide upwardly and downwardly.

A trigger-actuating cam 91 extends laterally from the outboard end of the slide 86. Whenever the cam 91 is in raised position to actuate the trigger 35, as viewed in Fig. 2, the guide 87 is in engagement with the outer end 94 of the slot 88, and, as the slide 86 is carried along inwardly with the slide rod 52, the trigger is actuated by the cam and thereafter the flange 89 engages a stop 93 which holds the slide from further inward movement. The stop 93 is fastened to the underside of the projector box. As the slide rod 52 continues to move inwardly, the guide 87 travels along the slot 88 to the inner end 95 of the slot, thereby pivoting the outboard end of the slide 86 and the cam 91 downwardly.

The cam will remain lowered and will clear the arm 96 of the trigger during the next outward and inward movements of the slide rod and slide. During said next inward movement the pilot has been released from the other end of the lay and received in the projector at the left hand end of the lay so that the cam 91 may be reset to trigger-actuating position on the following forward movement of the lay as the slide rod is moving outwardly. With the pilot in the box of the projector and the pivoted stop 97 depressed by the pilot, the stop is in position to engage the flange 89 on the slide 86 and stop the slide as the slide rod 52 moves outwardly, as shown in Fig. 6. As the slide rod continues outwardly the guide 87 is carried along the slot 88 to its outer end 94 and raises the cam 91 into trigger-tripping position preparatory to the tripping action which will take place during the following backward stroke of the lay (Fig. 2).

The tripping slide 86 is intermittently carried along with the slide rod 52 as above described by a link 100, which is pivotally attached to the block 55 by the screw 56', and by frictional engagement between the link and the slide. As best seen in Fig. 4, the slide 86 carries a post 98 which extends laterally from the slide and through a slot 99 in the link 100. A washer 101 of frictional material is continually pressed into contact with the link 100 and the link is pressed into contact with the slide by a spring 102 between the washer and a collar 103 fixed to the end of the post. The spring is sufficiently strong to prevent relative longitudinal movement between the link 100 and the slide 86 except when the slide is engaged by the fixed stop 93 or the pivoted stop 97.

When the slide engages the stop 93, the slide is stopped but the link continues to move inwardly with the block 55 and the slide rod 52, thus lowering the outer end of the slide as the guide 87 moves along the cam slot 88 toward its end 95. This action lowers the post 98 and the inner end of the link 100. Whenever the slide engages the pivoted stop 97 during an outward movement, the slide is stopped and the inner end of the link 100 rises as the link continues to move outwardly with the block 55 and the slide rod 52, and the post 98 rises as the guide 87 moves toward the outer end 94 of the cam slot 88 in the slide 86. As the slide 86 moves the cam 91 upwardly or downwardly, the post 98 pivots the link 100 in the same direction about the center of the screw 56. The lowered position of the link 100 during an inward motion of the slide rods controls the actuation of the shears as will appear more fully hereinafter.

The stop 97 is pivotally mounted on the projector body by a pin 107 and is limited in its movements by a stationary pin 108 engaged in a slot in the stop. A spring 109 pivots the stop upwardly and raises a feeler spring 110 (Fig. 5) whenever the feeler spring is not pressed downwardly by a pilot 18 in projecting position in the projector body. The feeler spring is pivotally mounted

on a pin 111. It has an arm 112 resting on the stop 97 and another arm 113 extending into the bore of the projecting box in the path of a pilot entering the box. An entering pilot rocks the feeler spring (Fig. 6) and depresses the stop 97 against the action of the spring 109. In depressed position the stop 97 will arrest the outward movement of the tripping slide 86, but is ineffectual to stop inward movements of the slide. The contacting of the arm 113 of the feeler spring by the pilot as it approaches its home position in the projector cushions the ensuing shock on the stop and its supporting members.

A bumper cup 115 is seated in a shouldered recess in the projector box (Fig. 5). The cup contains a hollow cylindrical bumper cushion 116 and a ring of wear-resisting material 117 which has an inner periphery conforming to the shape of the nose of the pilot 18. The pilot is in home position when it is in contact with the ring 117. To avoid excessive rebound of the pilot upon striking the ring 117, a spring-pressed latch 118 is provided, Fig. 3. The latch is mounted on a pivot pin 119 and its finger 120 extends through a slot 121 in the projector box. The spring 122 normally holds the latch against a stop pin 123. Each pilot has a metal plate 124 which is fastened in one side by screws 125, as best seen in Figs. 3 and 17. The plate is recessed to provide shoulders 126 and 127 for engagement by the latch 118 at either end of the lay.

The latch 118 is released from pilot-holding position by a pivoted arm 128 (Figs. 3, 19, and 20), which rocks the latch out of engagement with the pilot before the pilot is projected. The arm 128 is mounted on a rockshaft 129 which is journalled in a pair of standards 130, 131, extending upwardly from the gib 17. The gib is fastened to the projector body by the screws 132.

The rock shaft 129 is actuated by a lever 133 which is fastened to the rock shaft and is connected to the trigger 35 by an adjustable link 134, Fig. 5. The inner end of the link is threaded into a swivel 135 which is journalled in the upper end of the lever 133.

The lever 133 also serves as a depressor for a cantilever spring 136 which is anchored to the gib 17 by a screw 137 and extends toward the inboard end of the projector. The spring 136 is constantly in contact with the end of a depending arm 138 of the lever 133 and it is so shaped as to remain in a raised position when the trigger is set in position for releasing the plunger and to be depressed while the trigger is being released. As the trigger is tripped to release the plunger and the link 134 moves outwardly, the depending arm 138 moves inwardly and depresses the spring 136, Fig. 5. In doing this the free end 139 of the spring depresses a filling thread into a slot 140 in the top surface of the pilot forwardly of the trailing hook of one of two metal hooks 141 which are provided in the pilot for engaging and carrying a thread across the loom.

Referring to Figs. 17 and 18, the pilot may be made of any suitable material such as a light metal, or may be moulded from a synthetic organic plastic in which the thread-engaging hooks 141 adjacent the ends are anchored in place. Each hook has a right angle portion extending into the body of the pilot for permanently attaching the hook to the pilot. The hooks extend parallel to and within the longitudinal groove 140 in the top surface of the pilot. The pilot preferably has a rectangular cross-section with rounded edges, although it may be otherwise shaped to conform with the openings in the guides 143 which provide a raceway between the projectors. A spring member 144 is disposed beneath each hook 141 whereby a yieldable thread-gripping device is provided. The spring member is supported by engagement of its ends with the bottom of the groove 140 and with its top surface pressing against the under side of the hook 141 so that a filling thread extending across the groove may be picked up by engagement between the hook and the spring as the pilot is projected. The spring 144 is so shaped below the loop end of the hook as to provide a free space which eliminates the collection of lint under the hook. The other end of the spring is bent downwardly into an opening 145 through which a tool may be inserted to raise the end of the spring from the bottom of the groove whenever it is desirable to replace a spring.

The side of the pilot opposite from the recessed locking plate 124, whose function has previously been described, has two longitudinally disposed slots 147 which terminate in cam surfaces 148 adjacent each end of the pilot. The slot and cam at one end functions with one projector and the slot and cam at the other end functions with the projector at the other end of the lay. A cam surface actuates an axially movable pin 149 which operates a safety switch 150 when the pin is displaced by the cam and is held in displaced position by the side surface 151 of the pilot. This occurs when the pilot is fully home in one or the other of the two projector boxes. Unless the safety switch is operated at the proper time the loom is stopped.

After a thread has been carried across the loom and before the pilot is projected in the reverse direction, the spring 144 is depressed to release the gripped thread and the thread is cleared from the pilot.

As illustrated in Figs. 1 and 2, the lay is moving backwardly in the first half of an odd-numbered cycle, and the pilot is about to be projected from the left hand projector. The filling thread 153 is shown as coming from a supply cone 154 which may be mounted on the floor or on a special stand provided convenient to the end of the lay. The thread 153 passes through a guide 155 on the lay and is threaded through the weft tensioning mechanism generally indicated at 156, guides 157 and 158 from which the thread extends, through a shallow space below the gib 17, diagonally across the longitudinal groove 140 in the pilot to the shearing mechanism generally indicated at 160 (Fig. 1), by which the previously cut end is being held, as will be hereinafter described. As has been explained, the length of thread extending over the groove 140 is depressed by the depressor spring member 136 to be engaged by the trailing hook of the pilot as the pilot leaves the projector box.

The pilot is propelled from the box as the cam 91 on the inwardly moving slide 86 trips the trigger-latch 35. The weft tensioning mechanism 156 includes a plate 161 bolted to the backside of the projector body 10. A rod 162 is slidably mounted in bosses 163, 164. The rod has fixed thereto a control cam 165 which is adapted to engage the lower arm of a switch spring 167, pivotally supported by a stud 168, to raise the lower arm, a vertically slidable rod 169 and a pivoted leaf member 170 when the cam 165 is brought into engagement with the lower arm of the switch spring 167 upon actuation of the rod 162 by the finger 171 on the slide rod 52 during the inward movement of the slide rod as the lay moves backwardly. A finger 172 is provided on the slide rod to disengage the control cam 165 from the switch spring as the lay approaches the end of its forward stroke.

The thread 153 is centered on the leaf member 170 by an eye 173 on the leaf member and it is drawn freely over the leaf member while the pilot is in flight and until the pilot nears the other end of the lay when the leaf member 170 is raised by the control cam 165 and the travelling thread is pressed against a flexible blade 174. This action develops a drag or braking effect on the travelling thread which holds the thread taut between the spread warps. The switch spring 167 is normally prevented from pivoting as the control cam 165 flexes its lower arm by the engagement of the upper arm 175 by the lower end of a depending arm 176 of a rockable angle member 177 mounted on a stud 178. This member 177 has a laterally extending finger 179 which normally rests upon the thread, Fig. 2, as the thread extends between two fixed wire loops 180. If the thread breaks the horizontal arm of the angle member 177 drops, as shown in Fig. 11, and the depending arm 176 is removed from above the upper arm 175

of the switch spring **167** and so permits the switch spring to be pivoted by the control cam **165**. Therefore when the thread breaks the switch spring actuates a pin **182** of a safety switch **183** and the loom is stopped.

The shearing mechanism is illustrated in Figs. 1, 2, 7, 13, 14, 15 and 16. The trailing end of an inserted filling thread is sheared at the left hand projector as the lay moves backwardly during an even-numbered cycle while the pilot is in the right hand projector. Soon after the lay starts moving backwardly, the jaws of the shears open and the continued backward motion of the lay causes the trailing end of the inserted filling thread to be received in the open jaws, and seized and cut as the shears close as the lay continues backwardly. The closing action of the shears causes the severed end, which is subsequently to become a leading end of another weft, to be held until it is picked up by the projection of the pilot from the left hand projector.

The shears include a non-rotatable blade **186** which is carried by a bracket **187** fast to the front of the projector box, as shown in Figs. 1, 3, 7 and 14. The bracket has a nose **188** which extends over and across the chamber of the projector box for guiding the filling thread to the open jaws of the shears, and a vertically extending abutment **189** which limits the movement of the thread into the open jaws.

The blade **186** is supported from the bracket **187** by a stud **190** and a sleeve **191**, both of which are firmly secured in the bracket. A movable shear blade **192** is pivotally mounted on the sleeve **191**. A spacer **193** and a spring member **194** are supported between the bracket **187** and the movable blade by the stud and the sleeve. The blade **186**, movable blade **192**, spring member **194** and washer **193** are pressed axially together and against the bracket **187** by the engagement of the head **195** of a shaft **196** with the blade **186** and a spring **197** which is compressed between the bracket and a pin **198** through the shaft.

The thread end which is cut by the shearing action of the movable blade **192** and the blade **186** is held between the movable blade and the spring member **194** to later constitute the leading end of a new filling thread.

The movable shear blade **192** has a depending arm **199** which is normally drawn forwardly to close the shears (Fig. 7) by a spring **200** connecting between the arm **199** and a bracket **201**. In closed position the arm is held against a stop **202**. The lower end of the arm **199** is engaged by an arm **203** pivotally mounted on the laybeam on a pivot **204** (Figs. 4 and 13). The other arm **205** of the lever has a fork connection with an arm **206** of the bell crank lever **207** which is also pivotally mounted on the laybeam by a pin **208**. The arm **209** of the bell crank lever extends towards the back of the laybeam and is disposed to be engaged by a finger **210**, which is pivotally mounted on the link **100**, when the link **100** and the finger **210** are in a lowered position. As shown in Fig. 2, the finger **210** is mounted on a pivot pin **211** and it is normally supported by a pin **212** extending from the link **100** into a slot **213** in the finger. A spring **214** biases the finger against the pin **212** and permits the finger to pivot upwardly on the pin **211** to allow closing of the shears, as will presently appear.

As previously explained, when the trigger latch **35** is to be actuated to release the plunger to project a pilot, as shown in Fig. 2, the slide **86** and the link **100** are in raised positions and the finger **210** passes above the arm **209** of the bell crank lever. When the inward movement of the slide **86** is interrupted by the stop **93**, the slide **86** is pivoted downwardly and this action lowers the post **98** and the link **100** which is fulcrumed on the screw **56**. As the slide rod **52** reverses and moves outwardly, the link **100** remains in its down position, but the finger **210** rides over the arm **209** of the bell crank lever **207** due to the yielding of the spring **214**. During the inward stroke of the slide rod **52** in the next cycle, the even-numbered cycle, the link **100** is still down and the end of the finger **210** is disposed in the plane of the arm **209** and actuates the bell crank lever to cause the shears to open. The finger **210** is released from engagement with the arm **209** by a camming member **216** which is supported by and extends from the back side of the lay in a position to engage the cam surface **217** adjacent the end of the finger **210**. The engagement of the cam surface with the cam finger occurs after the filling thread has been brought into the open jaws of the shears. When the finger **210** is cammed upwardly against the action of the spring **214**, the spring **200** actuates the movable blade to close the shears and cut the thread.

At the beginning of the closing movement of the movable blade **192**, the thread is depressed by the moving blade and is seized between the blunt side of the moving blade and the spring plate **194** before the thread is cut. The trailing end of the inserted thread is freed by the cutting action, but the leading end of the later to be inserted thread is held fast between the movable blade **192** and the spring plate **194**, as illustrated in Fig. 16. The held end of the thread extends between the shears and the eye **158** (Fig. 1) in a position beneath the spring member **139** (Fig. 5) in which it can be picked up by the trailing thread-gripping means on a pilot, as explained hereinbefore.

At the full front position of the lay, i.e. 0° of the crank shaft, the shed of warp threads is fully open and remains open as the crank rotates through 180°. The shed starts to close at 180° and is fully closed at 270°. The warps then reverse and the shed opens during the remainder of the cycle as the lay returns to full front position at 360° (0°). Consequently, a filling thread inserted in one direction is bound in the cloth by the warp threads before a filling thread is carried in the opposite direction by a pilot projected from the other side of the loom. At 0° (360°) there is a pilot present in either the left hand or the right hand projector. As the lay moves backwardly the leading end of the last-inserted filling thread is pulled free from the thread-gripping means of the pilot and is subsequently blown into the fully open shed.

Mechanism may be employed to mechanically actuate the thread-gripping means **141**, **144**, of a pilot to free a thread from its gripping action. Such a mechanism is illustrated in Figs. 19 and 20. This mechanism includes a thread-gripper releasing actuator in the form of a depressor arm **220** carried by a rock shaft **221** which is journalled in a sleeve **222** supported by the standard **131**. The arm **220** is mounted to rock in the vertical plane of the longitudinal groove **140** of a pilot contained in the projector box. The arm **138** which is carried by the lever **133** is so shaped as to clear the arm **220** as the former is moved to actuate the cantilever spring **136** to depress the leading end of a weft thread into position for engagement by a thread gripper on the pilot in the manner hereinbefore described in reference to the depending arm **138** (Figs. 5 and 7).

The end of the rockshaft **221** which extends outside of the projector box has attached thereto a downwardly extending arm **223** which terminates in an end portion **224** adapted to be engaged by a finger **225** extending horizontally from a collar **226** fixed to the slide rod **52**. Stop pins **227** and **228** extend from the back face of the projector box and determine the limits of swing of the arm **223**. The finger **225** is so located on the slide rod **52** as to engage and raise the arm **223** to lower the depressor arm **220** as the slide rod **52** moves outwardly toward the end of the forward stroke of the lay. As the lay continues to move forwardly, the finger **225** slides along the underside of the horizontal portion **224** of the arm **223** and thereby holds the depressor arm **220** in its lowermost position. The depressor arm is held in its lowermost position as the motion of the lay reverses and until the lay has completed part of its backward stroke,

as illustrated in Fig. 20. During this interval of time the nose 229 of the depressor arm 220 has held the spring 144 depressed away from the hook 141, whereby the filling thread is freed from the pilot. The depressor arm 220 is permitted to rise when the finger 225 moves from under the arm 223 (224).

The depressor arms 220 of the projectors at the ends of the lay are depressed to gripper-releasing positions each time the lay is in full front position, so that an arm is effective to free a thread from the pilot at whichever of the projectors the pilot is present.

The operation of the machine will be apparent to those skilled in the art in view of the foregoing disclosure. The principle of the invention and the apparatus which is now considered to represent the best embodiments thereof have been described in accordance with the provisions of the patent statutes, but it is intended that the apparatus disclosed is only illustrative and that the invention can be carried out by other means. While the apparatus is designed to use the various features and elements in the combinations and relationships described, some of these may be altered and others omitted without interfering with the more general results outlined, and the invention, within the scope of the appended claims.

What is claimed is:

1. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot-projecting device mounted on said laybeam, said device including a spring-actuated member for projecting a pilot from said device, means for retracting said member, means for holding said member in retracted position, means for tripping said holding means to release said member to project a pilot, and means for actuating said retracting means and said tripping means in timed relationship to the movements of the laybeam, said actuating means including a member slidably mounted on said laybeam adjacent to said projecting device and articulated members having connection with said slidable member and connected to a stationary element of said loom whereby said slidable member is translated in opposite directions in different strokes of the laybeam and said actuating means actuate said retracting means as the laybeam moves forwardly and said tripping means as the laybeam moves backwardly.

2. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for retracting said plunger, means for holding said plunger in retracted position, means for tripping said holding means to release said plunger, means for actuating said retracting means and said tripping means, said actuating means including a movable member mounted on said laybeam, and articulated means connected with said movable member and connected to a stationary element of said loom for actuating said member in opposite directions in different strokes of said laybeam.

3. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for retracting said plunger, means for holding said plunger in retracted position, said holding means including a trigger member, means for tripping said trigger member to release said plunger, said tripping means comprising a cam member for actuating said trigger, means for reciprocating said cam member as the laybeam moves forwardly and backwardly, and means to move said cam member into and out of position for actuating said trigger during different strokes of the laybeam.

4. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for retracting said plunger, means including a trigger member for holding said plunger in retracted position, means for tripping said trigger member to release said plunger, means for actuating said tripping means, a movable member mounted on said laybeam, means connected with said member and connected to a stationary element of said loom for actuating said member in opposite directions in different strokes of said laybeam, a cam member carried by said movable member, means for positioning said cam member in relation to said movable member to actuate said trigger member as the laybeam strokes in one direction, and means for positioning said cam member to avoid actuating said trigger member as said cam member travels past said trigger during another stroke of the laybeam.

5. The combination set forth in claim 4 wherein said means for positioning said cam member to actuate said trigger member includes a stop member engageable with said cam member and positionable by a pilot present in said projecting device to engage said cam member.

6. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for retracting said plunger, means for holding said plunger in retracted position, means for tripping said holding means to release said plunger, a movable member carried by and movable with respect to said laybeam, said tripping means including a slide member carried by and movable with respect to said movable member, a cam on said slide member, means for displacing said slide and cam with respect to said movable member to set said cam to trip said tripping means when said movable member travels in one direction, means for moving said slide and cam out of position for tripping said tripping means, means controlled by a pilot in said projecting device for moving said slide and cam into position for tripping said tripping device, and means for actuating said movable member in timed relation to the movement of the laybeam.

7. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means including a fork member for retracting said plunger, means for engaging said fork member with said plunger for retracting the plunger, means for holding said plunger in retracted position, means for tripping said holding means to release said plunger, a slide rod slidably mounted on said laybeam, a cam member for actuating said tripping means, said cam member and said fork member being carried by said slide rod, means for setting said cam member to trip said tripping means when said slide rod moves in one direction, means for moving said cam member out of position for actuating said tripping means, and means for actuating said slide rod in timed relation to the movement of the laybeam.

8. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for retracting said plunger, means for holding said plunger in retracted position, means for tripping said holding means, a latch engageable with a pilot located

in said base member, means for displacing said latch from pilot-engaging position, means for actuating said tripping means to release said plunger, said last-named means comprising a movable member slidably mounted on said laybeam, means connected with said movable member and connected to a stationary element of said loom for actuating said movable member as said laybeam swings forwardly and backwardly, and means controlled by said movable member for actuating said latch-displacing means and said tripping means.

9. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for receiving and projecting a pilot, a plunger for projecting a pilot, a spring for energizing said plunger to propel a pilot from said device, means for retracting said plunger, means for holding said plunger in retracted position, a latch engageable with said pilot in said pilot-receiving and projecting device, means for retracting said latch from engagement with said pilot, means for tripping said holding means to release said plunger, a movable member mounted on said laybeam, means for reciprocating said member in timed relation to the movement of said laybeam, and means controlled by said member for operating said latch-releasing means and said tripping means in timed relation to each other.

10. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plungers movable in said base member for projecting a pilot from said base member, means for retracting said plunger, means for holding said plunger in retracted position, a depressor for moving a thread into the path of gripping means carried by a pilot, means connected with said holding means for actuating said depressor, means for tripping said holding means and for actuating said depressor to release said plunger and to engage a filling thread on a propelled pilot.

11. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for retracting said plunger, means including a trigger member for holding said plunger in retracted position, a resilient member mounted on said base member and disposed opposite from a pilot in said base member and operable to press a thread against said pilot, means having connection with said trigger member for moving said resilient member toward said pilot, and means for actuating said trigger.

12. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot projecting device mounted on said laybeam, a box associated with said device for receiving a pilot having releasable thread-gripping means, means for actuating said thread-gripping means to release a thread therefrom, and means for controlling the operation of said actuating means and of said pilot projecting device in timed relation to each other, said controlling means including a rod slidably mounted on said laybeam, and articulated means connected with said rod and to a stationary element of said loom for actuating said rod in timed relation to the movement of said laybeam.

13. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot projecting device mounted on said laybeam, a box associated with said device for receiving a pilot, a pilot carrying releasable thread-gripping means having a hooking element and a resilient element for engaging a thread therebetween, means for actuating said resilient element to release a thread from said thread-gripping means, means for operating said pilot projecting device to project a pilot therefrom, means for controlling the operation of said actuating means and of said operating means, said controlling means including a slide rod slidably mounted on said laybeam, and articulated means connected with said slide rod and to a stationary element of said loom for actuating said slide rod in timed relation to the movement of said laybeam.

14. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, slidable means movable in one direction for cocking said plunger, means for holding said plunger in cocked position, said holding means including a pivoted latch, an arm mounted for rotation about the pivot of said latch, a catch for engaging said plunger, said catch being rotatably mounted on said arm, a trigger engaging said latch when said plunger is held in cocked position by said catch, means operated by said slidable means for tripping said trigger to release said latch when said slidable means moves in the opposite direction, and means carried by said latch and engageable by said plunger to restore said latch in holding engagement with said trigger.

15. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for retracting said plunger to cocked position, means for holding said plunger in cocked position, said holding means including a pivoted latch, a pivoted catch for engaging said plunger, the pivot of said catch being mounted for rotation with said latch, a pivoted trigger for supporting said latch when said plunger is held in cocked position by said catch, a spring urging said latch into engagement with said trigger, means carried by said latch and engageable by said plunger to move said latch to holding position in engagement with said trigger, and means for actuating said trigger to allow said latch and catch to pivot and withdraw said catch from engagement with said plunger.

16. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for cocking said plunger, means for holding said plunger in cocked position, said holding means including a pivoted latch, a pivoted catch for engaging said plunger, the pivot of said catch being mounted for rotation with said latch, a trigger for supporting said latch when said plunger is held in cocked position by said catch, a spring urging said latch into engagement with said trigger, means for actuating said trigger to allow said latch and catch to be pivoted by said spring to withdraw said catch from engagement with said plunger, said last-named means including a member actuated in timed relation to the movement of said laybeam.

17. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device mounted on said laybeam for projecting a pilot lengthwise of said laybeam, means for actuating said device to project a pilot in timed relation to the movement of the laybeam, means mounted on said laybeam for tensioning a filling thread being carried by a pilot projected from said projecting device, and means for actuating said thread-tensioning device to apply tension to said thread in timed relation to said first-named actuating means.

18. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam,

a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for retracting said plunger, means for holding said plunger in retracted position, means for tripping said holding means to release said plunger, means for actuating said retracting means and said tripping means in timed relation to the movement of the laybeam, said actuating means including a member mounted on said laybeam and connected to a stationary element of said loom, and means controlled by said last-named member for tensioning a filling thread being carried by a pilot projected from said projecting device.

19. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a base member mounted on said laybeam, a spring-actuated plunger movable in said base member for projecting a pilot from said base member, means for retracting said plunger, means for holding said plunger in retracted position, means for tripping said holding means to release said plunger, means for actuating said retracting means and said tripping means in timed relation to the movement of the laybeam, said last-named means including a slidable member mounted on said laybeam and means connecting said slidable member to a stationary element of said loom for reciprocating said slidable member with each reciprocation of said laybeam, means for tensioning a filling thread carried by a pilot projected from said projecting device, and means controlled by said slidable member for activating said thread-tensioning device to tension said thread.

20. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device on said laybeam for receiving and projecting a pilot, means for projecting a pilot therefrom, means for operating said pilot-projecting means, thread-tensioning means for engaging a thread extending from a source of supply to a pilot in said device, means controlled by said operating means to cause said thread-tensioning means to apply frictional restrtaint to a thread trailing a pilot projected from said receiving and projecting device.

21. The combination set forth in claim 20 wherein said thread-tensioning means comprises a pair of elements between which said thread is threaded, and means for pressing said elements toward one another for effecting restraint on the travel of the thread therebetween.

22. The combination set forth in claim 20 wherein said thread-tensioning means comprises a pair of elements engaging opposite sides of said thread, a movable member contacting one of said elements, and actuatable resilient means engaging said movable member for yieldably urging said elements into frictional engagement with said thread.

23. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device mounted on said laybeam for projecting a pilot, means for tensioning a filling thread being carried by a pilot projected from said device, said thread-tensioning device comprising a pair of elements for engaging opposite sides of said thread, means for moving one of said elements toward the other, said last-named means including a movable member, a pivoted double-arm spring member having one arm supporting said movable member and another arm engageable by a movable element held by said thread in the path of movement of said last-named arm, a slidable member, and a control cam on said slidable member, a slide rod mounted on said laybeam, means for reciprocating said slide rod in timed relation to the reciprocation of said laybeam, means operated by said slide rod for actuating said pilot-projecting device, and means carried on said slide rod for operating said slidable member and control cam to cause said spring member to transmit yieldable pressure on said thread during the flight of a pilot from said device.

24. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device mounted on said laybeam for projecting a pilot, means for guiding a thread attached to a pilot projected from said device, a pivoted double arm spring member, an actuatable member engaging an arm of said double arm spring member and normally supporting said double arm spring member against rotation, a displaceable thread-engaging member held in normal operating position by said thread to prevent movement of the other arm of said double arm spring member, switch means adapted to be actuated to stop movement of said laybeam when actuated by the said other arm of said double arm spring member, and means for actuating said actuatable member to exert force on said first-named arm to flex said first-named arm and urge said double arm spring member to pivot each time a pilot is projected whereby if said thread breaks and said displaceable thread-engaging member becomes displaced from normal position said other arm of said double arm spring member is moved to actuate said switch means.

25. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device mounted on said laybeam for projecting a pilot, means for guiding a thread attached to a pilot projected from said device, a pivoted member having two flexible arms, a movable member engaging one arm of said pivoted member and normally supported said pivoted member, a switch for stopping the movement of said laybeam, said switch being operable by the second arm of said pivoted member, a displaceable thread-engaging member normally held by said thread in position for obstructing movement of said second arm and the operation of said switch, means operated by said movable member to actuate said first-named arm to pivot said pivoted member whereby if a thread breaks and said thread-engaging member is freed to move out of obstructing position of said second-named arm said pivoted member is pivoted and said switch is operated by said second-named arm.

26. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, means for guiding a thread attached to a pilot projected from said device, switch means operable for stopping the movement of said laybeam upon breakage of a thread, a pivoted double arm spring member having one arm engageable with said switch means for operating said switch means and a second arm adapted to be moved during the flight of a pilot, a displaceable member normally supported by said thread and held by the thread in position to obstruct movement of said first-named arm and thereby prevent said first-named arm from operating said switch means but displaceable from normal position upon breakage of a thread to permit said first-named arm to operate said switch means, means operable by said second arm for applying tension to said thread, and means operable in timed relation to the movement of the laybeam to engage said second arm to flex said second arm and exert a pivoting force on said double arm spring member during the flight of a pilot from said device.

27. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, shearing means comprising relatively movable blades for cutting a filling thread which has been inserted by a pilot projected from said device, means mounted on said laybeam for operating said shearing means, and means operable in timed relation to the movement of the laybeam for controlling the action of said operating means to effect cutting and opening movements of one of said blades relatively to the other.

28. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, shearing means for cutting a filling thread which has been inserted by a pilot projected from said device, said shear-

ing means being mounted on said laybeam and having a movable blade and a fixed blade, a spring plate adjacent said movable blade whereby on the cutting motion of said movable blade the thread is pinched between the movable blade and the spring plate and thereby held before the thread is cut upon further cutting movement of the movable blade, means for operating said movable blade, and means operable in timed relation to the movement of the laybeam for controlling the action of said shearing means.

29. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot box on said laybeam, a plunger for striking a pilot in said box, means for impelling said plunger toward said box, means for controlling the operation of said plunger-impelling means to impel said plunger toward said box, said controlling means including a movable member carried by said laybeam, means for retracting said plunger after a pilot has been projected thereby, means actuated by said movable member for actuating said plunger-retracting means, and means operated in timed relationship to the movement of said laybeam for actuating said movable member to effect plunger-impelling and plunger-retracting actions during different strokes of the laybeam.

30. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot-projecting device on said laybeam, said device including a pilot box and a striker element for projecting a pilot from the box, means for holding said striker element in a retracted position, means for impelling said striker element to strike a pilot in said box, means for restoring said striker element to retracted position after a pilot has been projected, and means for controlling the impelling action of said impelling means and the retracting action of said retracting means in different strokes of the laybeam, said controlling means comprising a movable member mounted on said laybeam and means for reciprocating said member in timed relation to the movements of said laybeam.

31. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot-projecting device mounted on said laybeam, said device including a pilot box and an element movable between a retracted position and said box for projecting a pilot from said box, means for impelling said element from retracted position into striking engagement with a pilot contained in said box, means for retracting said element after projection of a pilot, and means for controlling the impelling operation of said impelling means and the retracting operation of said retracting means in timed relationship to the movements of the laybeam, said controlling means including a movable member mounted on said laybeam and articulated members having connection with said movable member and with a stationary element of said loom whereby said member is moved in opposite directions in different strokes of the laybeam.

32. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot-projecting device mounted on said laybeam, said device including a pilot box and a striker element movable between a retracted position and said box for projecting a pilot from said box, means for impelling said striker element into striking engagement with a pilot contained in said box, a slidable member mounted on said laybeam, means carried by said slidable member for controlling the impelling action of said impelling means as said slidable member moves in one direction, means carried by said slidable member for retracting said striker element as said slidable member moves in the opposite direction, said retracting means including a second member movable crosswise of said slidable member, means for moving said second member to a position enabling engagement of said striker element to return said striker element to retracted position, and means for reciprocating said slidable member in timed relation to the movements of said laybeam.

33. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot-projecting device mounted on said laybeam, said device including a pilot box and a striker element movable between a retracted position and said box for projecting a pilot from said box, means for impelling said element into striking engagement with a pilot contained in said box, a slidable member mounted on said laybeam, means carried by said slidable member for restoring said striker element to retracted position, said restoring means including a second member carried by said slidable member and movable into and out of the line of travel of said striker element, means for reciprocating said slidable member in timed relationship to the movement of said laybeam, a cam slide having a surface for engaging and elevating said second member into the line of travel of said striker element as said slidable member moves in one direction, said cam slide holding said second member elevated for at least a portion of the movement of said slidable member in the opposite direction whereupon, if said striker element has been impelled, it is picked up by said second element and restored to retracted position by the continuing movement of said slidable member in said opposite direction, and means for holding said striker element in retracted position.

34. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot box on said laybeam, a plunger for striking a pilot in said box, means for locking a pilot in said box, means for impelling said plunger toward said box, means for controlling the operation of said plunger-impelling means, said controlling means including a member slidably mounted on said laybeam, means actuated by said controlling means for disengaging said pilot-locking means from engagement with a pilot in said box, and means operated in timed relationship to the movement of said laybeam for reciprocating said movable member.

35. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a pilot-box mounted on said laybeam and a striker element adapted to enter one end of said box for striking a pilot contained in said box, a member disposed at said end of said box for arresting the flight of a pilot entering said box, said member having an opening for the passage of said striker element, a latch engageable with a pilot contained in said box, means for impelling said striker element into striking engagement with a pilot contained in said box, means for withdrawing said latch from engagement with a pilot contained in said box, and means for controlling the actuation of said latch-withdrawing means and the impelling action of said impelling means to effect the withdrawal of said latch in advance of the engagement of a pilot contained in said box by said striker element.

36. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a device for projecting a pilot lengthwise of said laybeam, said device including a pilot-box mounted on said laybeam and a striker element for striking a pilot contained in said box, said box having an opening for the entry of said striker element, means for receiving the impact of a pilot entering said box, a latch engageable with a pilot contained in said box, means for withdrawing said latch from engagement with a pilot contained in said box, spring means for impelling said striker element, means for tensioning said spring means, means for holding said spring means in tensioned condition, means for tripping said holding means to impel said striker element, and means for controlling the actuation of said latch-withdrawing means and the actuation of said tripping means to effect the withdrawal of said latch in advance of the engage-

ment of a pilot contained in said box by said striker element.

37. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot-projecting device on said laybeam, said device including a pilot box and means for projecting a pilot from said box, means for moving a thread into position to be picked up by gripping means on a pilot in said box, means for tripping said device to project a pilot from said box, means for controlling the operation of said thread-positioning means in timed relation to the operation of said tripping means, and means for controlling the tripping action of said tripping means in timed relation to the movement of said laybeam.

38. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot-projecting device on said laybeam, said device including a pilot box and means for projecting a pilot from said box, means for moving a thread into position to be picked up by gripping means on a pilot in said box, means for controlling the action of said thread-moving means to position a thread for pick-up in advance of the pilot-projecting action of said pilot-projecting device, and means for actuating said pilot-projecting device, said actuating means comprising a movable member mounted on said laybeam and articulated members having connection with said movable member and with a stationary element of said loom.

39. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot-projecting device mounted on said laybeam, said device including a pilot box and means for projecting a pilot from said box, means for actuating said pilot-projecting device to project a pilot in timed relation to the movement of said laybeam, said actuating means including a movable member mounted on said laybeam and connected to a stationary element of said loom, means mounted on said laybeam for applying tension to a filling thread being carried by a pilot projected from said projecting device, and means operated by said actuating means for controlling the operation of said tension-applying means in timed relation to the travel of a pilot from said pilot-projecting device.

40. In a loom having mechanism for reciprocating a laybeam, the combination comprising a laybeam, a pilot-projecting device on said laybeam, said device including a pilot box and means for projecting a pilot from said box, thread shearing means, means mounting said shearing means adjacent the mouth of said pilot box, means co-operating with said shearing means for holding an end of a thread cut by said shearing means, and means carried on said laybeam and having connection with a fixed element for effecting actuations of said shearing means and said pilot-projecting device in timed relation to each other and to the movement of said laybeam.

References Cited in the file of this patent

UNITED STATES PATENTS

983,550	Harrington	Feb. 7, 1911
1,729,413	Ashton	Sept. 24, 1929
2,374,952	Pedrazzo et al.	May 1, 1945
2,589,429	Pfarrwaller	Mar. 18, 1952
2,693,829	Turner	Nov. 9, 1954
2,731,986	Frentzel	Jan. 24, 1956
2,785,701	Dunham	Mar. 19, 1957