D. M. HOLLINS.

AUTOMATIC WEFT REPLENISHING LOOM.

APPLICATION FILED APR. 1, 1912.

1,038,888.

Patented Sept. 17, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

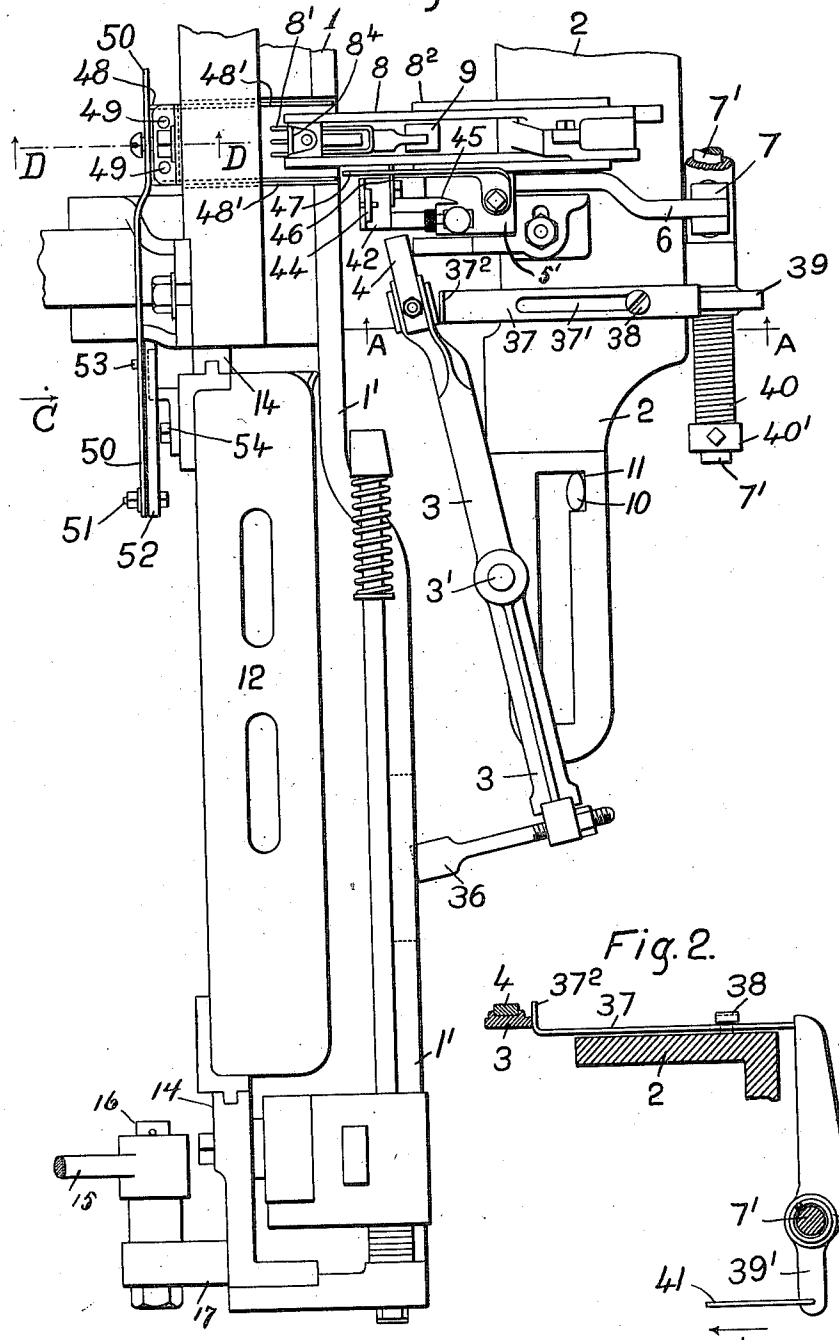

Fig. 2.

Witnesses.

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3 SHEETS—SHEET 2.

Fig. 3.

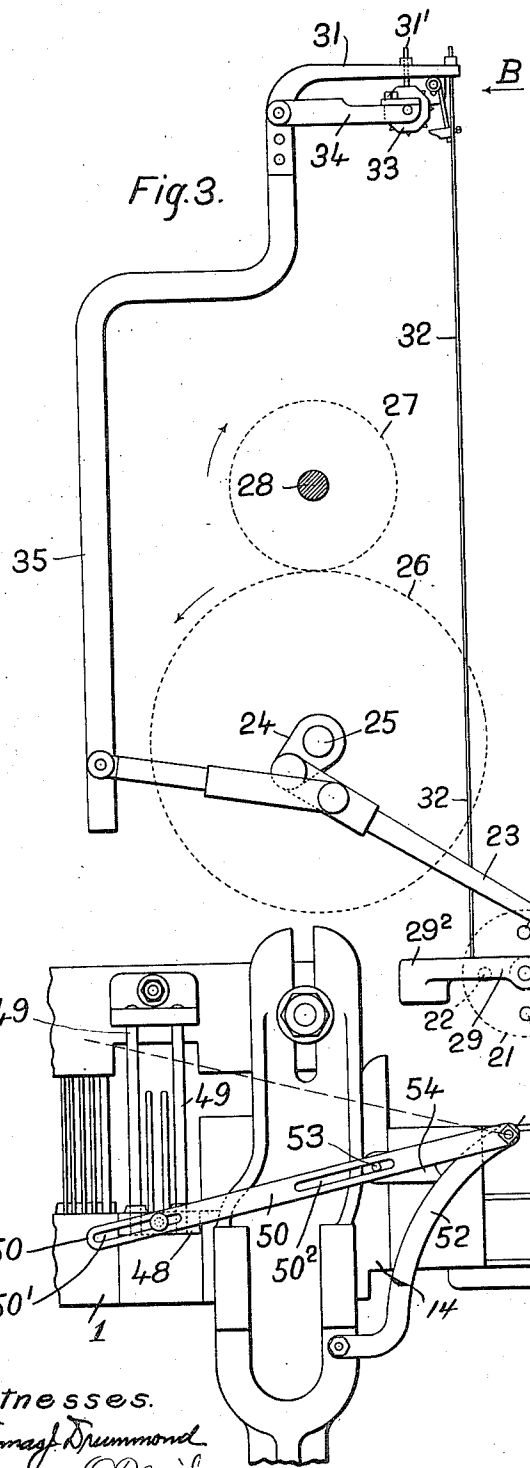

Fig. 4.

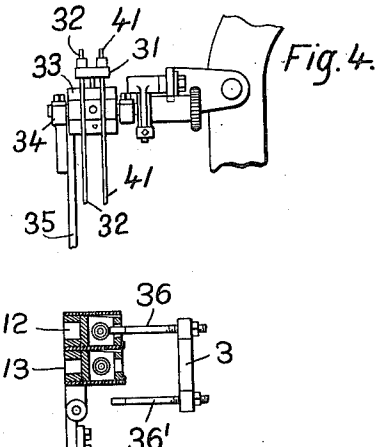

Fig. 5.

Witnesses.

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3 SHEETS—SHEET 3.

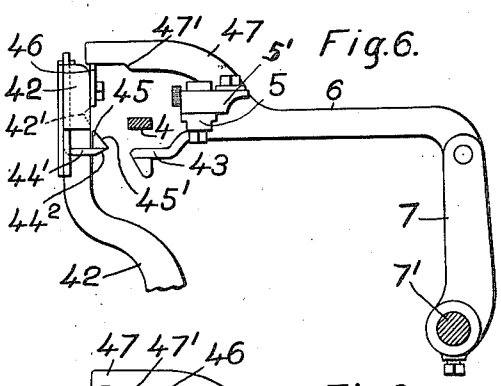

Fig. 6.

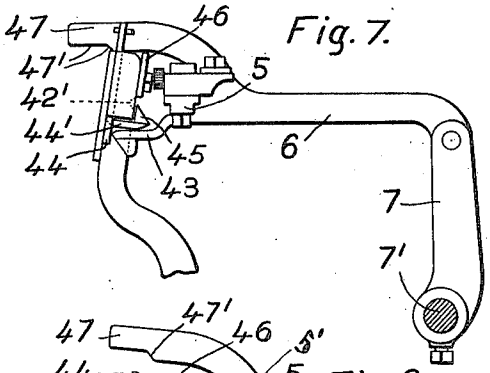

Fig. 7.

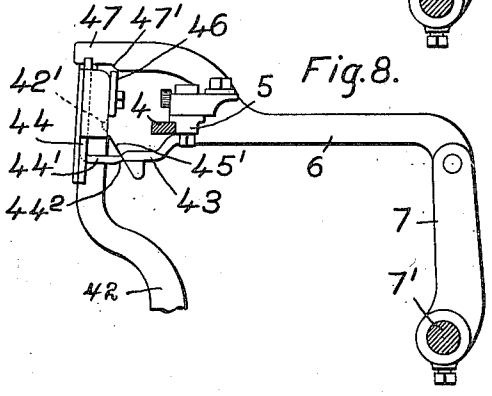

Fig. 8.

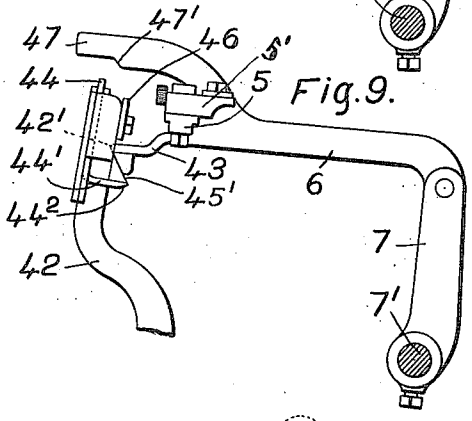

Fig. 9.

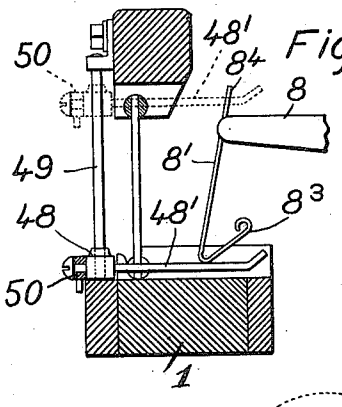

Fig. 10.

Fig. 11.

Witnesses.

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UNITED STATES PATENT OFFICE.

DENIS MACHELL HOLLINS, OF BLACKBURN, ENGLAND, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

AUTOMATIC WEFT-REPLENISHING LOOM.

1,038,888. Specification of Letters Patent. Patented Sept. 17, 1912.

Application filed April 1, 1912. Serial No. 687,612.

To all whom it may concern:

Be it known that I, DENIS MACHELL HOLLINS, a subject of King George V of Great Britain, residing at Blackburn, in the county of Lancaster, England, have invented certain new and useful Improvements in Automatic Weft-Replenishing Looms, of which the following is a specification.

This invention in automatic weft replenishing looms has for its primary object the prevention of shading or like effects sometimes produced in fabric woven with the filling in one shuttle, and, on the exhaustion of that filling, with a fresh supply of filling supplied to the same shuttle, as is customary at present.

The shading or like effects may be produced by slight variation in the color or counts of one supply of filling from the supply immediately preceding it, or from the next following supply, or one supply of filling may vary somewhat in character from another supply. To avoid the formation of this shading or other effects due to variations in the color or character or counts of the filling, I propose to blend the filling from two shuttles, that is to say, one of the two shuttles makes two picks or a multiple thereof and then the other shuttle makes two picks or a multiple thereof and so on.

My invention consists in applying to an ordinary weft replenishing loom having a magazine for containing spare weft carriers mounted over a stationary shuttle box at one end of the lay and means for transferring one of said square weft carriers into a shuttle in said stationary box, in combination with movable shuttle boxes at the opposite end of the lay adapted to contain two shuttles each brought into action alternately, or, as hereinafter described, a plurality of shuttles each brought into action successively, a filling feeler or detector having engaging members or surfaces thereon set apart one above the other one of said surfaces or members being adapted to feel at the filling in the inactive shuttle or the shuttle next to become active, and the other passing clear of the shuttle boxes, whereby filling exhaustion is detected only in the case of a shuttle which for the time being is inactive and will, through the usual transmitting lever, position the usual latch in readiness for the actuation of the weft replenishing motion when the inactive shuttle with the exhausted bobbin therein has been lowered to the level of the lay and picked across the loom, the feeler device being moved to inoperative position when the boxes are changing; means being also provided for holding the weft extending from the fabric to the inactive shuttle or shuttles clear of the weft fork.

The movable shuttle boxes and the mechanism by means of which they are enabled to coöperate with the ordinary mechanisms of the loom can, in addition to being employed to fulfil the primary object of the invention, be also employed to weave goods in which the number of picks of each weft may vary.

The improvements may be applied to any type of automatic weft replenishing loom, but I shall herein show and describe an embodiment of my improvements as applied to the well known Northrop loom in which a rotary battery or magazine for spare weft carriers is mounted over a stationary shuttle box at one end of the lay and which is provided with mechanism adapted to automatically transfer a bobbin or weft carrier from the magazine to a shuttle in said stationary box on indication of substantial or total exhaustion of the filling in that shuttle.

As the general construction, arrangement, and operation of the Northrop filling carrier magazine and transferring mechanism are well known to those skilled in the art of weaving, I have not deemed it necessary to give herein any illustration or description of same, but shall confine myself to showing and describing only those parts of the loom which have been modified in construction and arrangement and the added parts necessary to enable my invention to be applied, the particular embodiment illustrated providing for two movable shuttle boxes.

In the accompanying drawings:—Figure 1 is a plan view of one end, in this instance the left hand end, of the lay and breast beam of a loom of the Northrop type, showing the movable shuttle boxes, and such other parts

as are necessary to illustrate my improvements; Fig. 2 is a section on the line A—A, Fig. 1, looking in the direction of the arrows; Fig. 3 is a diagrammatic end view of the loom, showing the means for raising and lowering the shuttle boxes, means for controlling the movements of the boxes and the operation of the feeler and the novel form of feeler I provide to enable indications of the state of the filling on the bobbins in the respective boxes to be obtained; Fig. 4 is a front view of the upper part of the means for controlling the movements of the boxes and the operation of the feeler, that is to say, looking in the direction of the arrow B, Fig. 3; Fig. 5 is a rear view of part of the lay and of the movable shuttle boxes, looking in the direction of the arrow C, Fig. 1; Fig. 6 is a detail showing in side elevation the latch and coöperating parts by means of which the filling replenishing indications of the feeler are caused to operate the usual rock shaft to bring about actuation of the weft carrier transferring mechanism; Figs. 7, 8 and 9 are corresponding views to Fig. 6, but show the different positions; Fig. 10 is a section on the line D—D, Fig. 1, looking in the direction of the arrows, and Fig. 11 is a detail hereinafter referred to.

Referring to the drawings, 1 represents the lay, 2 the breast beam, and 3 the usual feeler lever or transmitter pivotally mounted at 3′ on the breast beam and having at one end thereof a dog 4 adapted on filling replenishment being called for to coöperate with a notched block 5 Figs. 6 to 9, carried by a lateral ear 5′ on a latch 6 to cause said latch to be moved endwise by an actuator and through an upturned arm 7 fast on a rock shaft 7′ to rock said shaft and cause the filling transferring mechanism, not shown, at the other end of the loom to be operated to transfer a new weft carrer into the shuttle in the stationary shuttle box at the said other end of the loom.

8′ is the weft fork, 8 is the weft fork slide and 9 the usual cam actuated weft hammer, operating to move the slide 8 endwise in its guide 8^2 when absence of weft causes the tail of the weft fork to remain in the path of a hook carried by the weft hammer, in the usual manner, the endwise movement of the weft fork slide operating through a pivoted lever, not shown, to release the shipper handle 10 from its holding notch 11 to bring about stoppage of the loom in the ordinary way.

The above parts are or may be all of the usual and well known construction employed in the Northrop type of weft replenishing loom, and in themselves, do not form any part of the present invention.

For the purposes of the invention, I provide at the end of the lay opposite to that at which the filling carrier magazine and transferring mechanism are located a pair of shuttle boxes 12 and 13 movable vertically in guides 14, 14, in an extension 1′ on the end of the lay 1, (see Fig. 1) the outer end of which is preferably connected by a link or connector 15 pivotally mounted on a stud 16 carried by a bracket 17 secured to the back of said extension, said connector 15 being connected in usual manner with the crank shaft 28 of the loom, to support the outer end of the extension 1′ and cause it to reciprocate truly with the lay 1.

Any suitable means may be employed to raise and lower the movable shuttle boxes 12 and 13, one convenient arrangement for the purpose being illustrated at Fig. 3. The lower end of the shuttle box rod 18 carrying the boxes 12 and 13 has a block 18′ mounted on a pin 19 eccentrically disposed on the face of a pinion 20. The pinion 20 meshes with a wheel 21 from the face of which project a series of pins 22, 22 adapted to be engaged by a hook 23 operated by a crank arm 24 from the low shaft 25 of the loom, which said shaft is driven in the usual manner by gears 26 and 27 from the crank shaft 28. At each revolution of the shaft 25, the hook engages one of the pins 22 and causes the wheel 21 to make a quarter turn. The pinion 20 and the wheels 21, 26 and 27 are so proportioned, that a half turn is given to the pinion 20 every two revolutions of the crank shaft, thus causing the shuttle box rod 18 to be raised or lowered every two picks.

To enable the hook 23 to be moved out of operative position with respect to the pins 22, so that the shuttle box rod will not be operated and either of the shuttle boxes be allowed to remain at rest opposite the race way for any consecutive number of picks, I provide a weighted pivoted lever 29 having an arm 29′ adapted to engage the outer end of the hook and raise it out of the path of the pins 22 so that instead of engaging a pin and giving a quarter turn to the gear 21 at each revolution of the crank arm 24, the said hook will slide idly to and fro along the arm 29′. The lever is held in this position, which is that shown in Fig. 3, by means of its weighted end 29^2.

To raise the weighted end 29^2 of the lever 29, when the positions of the shuttle boxes are to be changed, I employ a pivoted arm 31 connected by cord or the like 32 to the said weighted end 29^2 of the lever 29 and having a pin or projection 31′ adapted to engage a pattern barrel or surface 33. When a hole is presented by the pattern surface into which the pin 31′ can enter, the lever 29 occupies the position shown in Fig. 3. On presentation of a blank surface under the pin 31′, the arm 31 is raised and, through

the connection 32 the weighted end 29^2 of the lever 29 is raised, and the end 29′ thereof is lowered, dropping the hook into operative position, so that as the crank arm 24 rotates the said hook engages a pin 22 and through the gear 21 and pinion 20, operates the shuttle box rod 18 to change the positions of the boxes. The pattern surface 33 is shown in the drawing as a barrel having holes therein, but the said barrel may carry a pattern surface of any usual construction and of any length. The barrel is in this instance carried by a pivoted lever 34 operated by a lever 35 in the usual and well known manner. Any other suitable means may be employed in place of those shown for controlling the vertical movements of the shuttle boxes. If the loom is required to make two picks only of each weft successively, the pattern barrel and connections and weighted lever may be disconnected and the feeler device moved out of operative position for each change of the boxes by the means hereafter described with reference to Fig. 11.

The feeler or detector proper carried by the lever or transmitter 3 comprises, according to my invention, two fingers or engaging surfaces or members 36, 36′ in place of a single engaging surface common to this type of loom, the two said fingers or engaging surfaces being set at a suitable distance apart vertically to span a distance of one shuttle box, as shown at Fig. 3, so that if the boxes are in their highest position, as shown in such figure, the upper feeler member 36 will pass into the upper shuttle box 12 and through an opening in the wall of the shuttle in the usual manner to feel on the weft mass on the bobbin, while the lower feeler member 36′ will pass under the boxes and clear thereof. If the boxes occupy their lowest position, then the lower feeler member 36′ will pass into the shuttle in the lower box and the upper member 36 will pass above the boxes and clear thereof as will be understood.

The feeler lever or transmitter 3 has as usual, a coiled spring not shown, on its pivot, which tends to hold the said lever in such a position that as the lay beats up, one of the feeler members carried thereby will enter the shuttle in the shuttle box which for the time being is inactive, that is to say, above or below the level of the race way. If a sufficient mass of filling be present on the bobbin in the inactive shuttle then the lever 3 will be swung on its pivot against the action of the spring by contact of the feeler member with the yarn, and the dog 4 will be moved clear of the notched block 5 on the latch 6 in the usual manner, while if the filling on the bobbin in the inactive shuttle is substantially exhausted, then the dog 4 will not be moved sufficiently to clear the notched block 5 and the latch will be operated, as hereinafter described, to cause a fresh bobbin to be placed in the shuttle when it reaches the stationary shuttle box at the other end of the lay.

To hold the feeler lever in an inoperative position, clear of the shuttle boxes, which is necessary when the boxes are changing, and also for any given number of picks, I provide suitable means comprising in this instance a member 37 having a slot 37′ therein in which registers a screw or pin 38 on the breast beam. The inner end of the member 37 is upturned as at 37^2 see Fig. 2, and engages the end of the lever 3 near the dog 4. Loosely pivoted on the rock shaft 7′ is a lever 39 Figs. 1 and 2, whose upper end is adapted to engage the outer end of the member 37. The lever 39 is normally caused by a coiled spring 40 having one end fast thereto and its other end fast to a collar 40′ secured on the rock shaft, to press on the outer end of the member 37 and to cause it to slide inward so that its upturned end 37^2 engages the lever 3 and holds it in the position shown in Fig. 1 with the dog 4 clear of the latch and the feeler members 36 and 36′ clear of the shuttle boxes. The lever 39 has a depending arm or finger 39′ which is connected by a flexible connection 41 to the arm 31 of the box pattern mechanism, so that when the pattern surface indicates for a change of boxes and the arm 31 is held raised, then the connection 41 will rock the lever 39 and carry its upper end away from the outer end of the member 37, permitting the feeler lever 3 to be swung by its spring into operative position so that one of the feeler members carried thereby will enter the inactive shuttle and feel on the yarn mass therein.

As the feeler is controlled from the box pattern mechanism, and is allowed to swing into operative position only when the said pattern mechanism indicates for a change of boxes, it follows that the feeler is only permitted to feel at the yarn in a shuttle one pick before that shuttle becomes active, and is then moved by the pattern mechanism to inoperative position until the next indication for a change of boxes, when it feels at the weft in the other shuttle the pick before that shuttle becomes active.

When substantial exhaustion of filling in the inactive shuttle is detected, the dog 4 is not moved clear of the notched block on the latch in the usual way, to position same in readiness for the actuation of the filling replenishing mechanism, but such actuation has to be delayed until the boxes have changed and the shuttle containing the substantially exhausted bobbin has been picked from its movable box to the stationary shuttle box at the magazine end of the loom

where it receives a new bobbin. I will now describe the means by which this delay is effected, the action being clearly illustrated by Figs. 6 to 9 of the drawings. To move the latch, at the proper time, to actuate the rock shaft to effect weft replenishment, I employ a cam actuated lever 42, which may conveniently form a part of or be attached to the usual cam lever, not shown, by which the weft hammer 9 is actuated. The actuator 42 may, however, be operated by a separate cam if preferred. The actuator has a notch 42′ in its front face adapted to engage a bunter 43 on the latch 6 when the said bunter is positioned opposite thereto, and to move the latch endwise in the usual manner to actuate the rock shaft 7′. The actuator also has a vertically sliding member 44 having near its lower end a forwardly extending portion 44′ carrying a block 45 having an inclined or cam surface 45′. A finger 46 attached to the actuator 42 is adapted to ride under and support a rearwardly extending finger 47 on the latch, the said finger 47 having on its under side a cam surface or incline 47′ adapted to be engaged by the finger 46 as the actuator is moved forward by its cam, such engagement of the finger 46 with the cam surface 47′ being adapted to raise the latch to permit the dog 4 to engage the notched block 5 when weft replenishment is called for. So long as a sufficient supply of filling is indicated by the feeler, and the dog does not engage the notched block to hold the latch raised, the bunter 43 on the forward movement of the actuator, engages an inclined surface 44^2 on the underside of the forwardly extending portion 44′ of the sliding member 44 and raises said sliding member, so that the bunter passes below same, as shown at Fig. 7. When owing to substantial exhaustion of filling in the shuttle which is about to become active, the dog 4 is not moved clear of the notched block 5, but engages same and holds the latch raised, the actuator, by its cam, having a partial forward movement given to it, as shown at Fig. 8, which causes the bunter 43 to be engaged by the inclined surface 45′ before the dog 4 has been moved away from the notched block as the feeler lever is swung on its pivot to carry the feeler members clear of the movable boxes ready for the same changing. The lay goes back, and the boxes change, and the shuttle containing the substantially exhausted bobbin is picked across to the stationary shuttle box at the magazine end of the loom. While the actuator has been moving forward the bunter 43 has slid up the inclined surface 45′ by which it is guided into the notch 42′ and the parts remain in this position until the next beat up when the actuator completes its forward movement and the latch is moved endwise as shown in Fig. 9 to actuate the rock shaft and operate the filling replenishing mechanism.

The weft fork 8′ is shown as being placed at the end of the lay adjacent the movable shuttle boxes and is preferably timed to feel at the weft extending from the selvage of the fabric to the active shuttle when the latter has entered its respective movable box, this arrangement enabling me to operate the actuator 42 by the same cam as operates the weft hammer, the shaping of the cam to give the partial forward movement to the actuator as described, causing the weft hammer to move sufficiently to engage if necessary with the weft fork. In addition, however, to the thread extending from the fabric to the active shuttle, there is also the thread extending from the fabric to the inactive shuttle, and I therefore provide means to move the inactive thread clear of the weft fork so that the latter has only the active thread to feel at. At the back of the lay, and behind the usual weft fork grate I provide a block 48 slidable vertically on wires 49, 49. The block 48 has forwardly extending wires 48′, 48′, which are adapted to pass up either side of the weft fork. A pin on the back of the block 48 registers in a slot 50′ in a lever 50 pivoted at 51 to a bracket 52 secured to the back of the lay. A pin 53 carried by a bracket 54 attached to the back of the movable shuttle boxes registers in a slot 50^2 in the lever 50 and as the boxes rise or fall causes, through the lever 50, an up and down movement, in excess of the lift of the boxes, to be given to the block 48, and thus to the wires 48′, 48′.

If the upper box is at the level of the race way, then the block 48 occupies the position shown at Fig. 5 and in full line in Fig. 10, and the wires 48′, 48′, hold the thread, extending from the shuttle in the lower box to the selvage, below and clear of the weft fork. When the boxes change and the lower box comes up to the level of the race way, then the block 48 is raised to the position shown in dotted lines in Fig. 10 and the wires 48′, 48′, carry the thread extending from the shuttle in the upper box which has now become inactive, up clear of the weft fork. To prevent the inactive weft from fouling the weft fork owing to the boxes moving and the inactive thread thus being slackened before the lay has moved sufficiently far back for the weft fork to be cleared, I provide the lower ends of the prongs of the weft fork with forwardly and upwardly inclined portions 8^3 Fig. 10 so that if the lower inactive weft rises it is engaged by and slides along said inclined portions which prevent it from getting up behind the prongs of the fork. At the top of

the fork I provide an upstanding portion 8^4 to prevent the upper inactive weft from lashing out over the top of the weft fork.

The weft fork may, if desired, be arranged to operate on the alternate pick when the active shuttle is at the magazine end of the loom, the actuator in this case being operated by a separate cam and the device just described for moving the inactive thread clear of the weft fork be dispensed with.

When running the loom with two shuttles each making two picks alternately, the box pattern mechanism for controlling the operation of the hook 23 can be dispensed with, the said hook then operating to change the boxes every two picks. The feeler in this case will operate just as when running the loom in the ordinary way with a single shuttle but some means are required to hold the feeler members clear of the movable boxes while such boxes are changing. An arrangement to effect this is shown at Fig. 11. A cam 54 fast on the shaft of the pinion 20 engages a bowl 55′ carried by a pivoted lever 55 whose forward end is pivotally connected to the lower end of a vertically movable rod 56. The rod 56 has at its upper end a bowl 57 adapted when the said rod is moved up to engage the feeler lever 3, and swing it on its pivot to carry the feeler members clear of the moving boxes. A spring 55^2 acts to hold the bowl 55′ against the cam 54. Any other suitable means connected with the movable shuttle boxes or with any other suitable moving part acting in unison with the shuttle box motion could be employed for the purpose. The weft fork instead of being placed at the movable box end of the lay may be placed at the magazine end, or a center weft fork may be employed. When used in conjunction with the feeler or detector mechanism the weft fork motion acts solely to stop the loom when the weft breaks.

It will be obvious that in addition to my improvements being employed with shuttles containing similar weft, they can equally well be employed with shuttles containing fillings of different colors, characters or counts.

The details of construction and arrangement of my improvements may be varied without departing from the spirit and scope of my invention. By disconnecting my improvements the loom may be used as an ordinary automatic loom.

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

1. In an automatic weft replenishing loom, the combination with vertically movable shuttle boxes at one end of the lay to hold a plurality of shuttles, and means to change said boxes automatically, of a feeler device mounted adjacent said shuttle boxes and having two weft engaging members located one above the other and spaced apart to span one of said boxes, whereby when either engaging member enters the inactive shuttle in one box the other engaging member will pass clear of the box for the active shuttle, and means to coöperate with the feeler device and maintain both engaging members clear of the shuttle boxes when a change in the vertical position thereof is effected.

2. In a loom, the combination with a filling carrier magazine located above a stationary shuttle box at one end of the lay, and means for transferring a bobbin from said magazine to a shuttle in said stationary box, of two movable shuttle boxes at the opposite end of the lay, means for changing the boxes every two picks, means for feeling at the weft in the inactive shuttle to detect substantial exhaustion thereof, and means acting on substantial exhaustion of weft in a shuttle to operate the transferring mechanism to cause a new bobbin to be transferred to that shuttle when the boxes have been changed and the shuttle has been picked across to the stationary box at the magazine end of the loom.

3. In a loom, the combination with a filling carrier magazine located above a stationary shuttle box at one end of the lay, and means for transferring a bobbin from said magazine to a shuttle in said stationary box, of two movable shuttle boxes at the opposite end of the lay, pattern controlled means for changing the positions of the boxes, means for feeling or detecting weft absence in the shuttle next to become active, means for holding the feeler or detector in inoperative position until one pick before a change of boxes, and means acting on detection of substantial exhaustion of weft in a shuttle to operate the transferring mechanism to cause a new bobbin to be transferred to that shuttle when the boxes have been changed and the shuttle has been picked across to the stationary box at the magazine end of the loom.

4. In an automatic weft replenishing loom, the combination with vertically movable shuttle boxes at one end of the lay to hold a plurality of shuttles, and means to change said boxes automatically, of a feeler device mounted adjacent said shuttle boxes and having two weft engaging members located one above the other and spaced apart to span one of said boxes, whereby when either engaging member enters the inactive shuttle in one box the other engaging member will pass clear of the box for the active shuttle, said engaging members moving in fixed and substantially horizontal paths into and out of feeling position, means to cooperate with the feeler device and maintain both the engaging members retracted from

feeling position when the shuttle boxes are changed, and pattern mechanism to govern such means and cause it to release the feeler device and permit one of the engaging members thereof to feel the weft in an inactive shuttle one pick before said shuttle becomes active.

In testimony whereof I affix my signature in the presence of two witnesses.

DENIS MACHELL HOLLINS.

Witnesses:
JOHN WILLIAM THOMAS,
ERNOLD SIMPSON MOSELEY.