

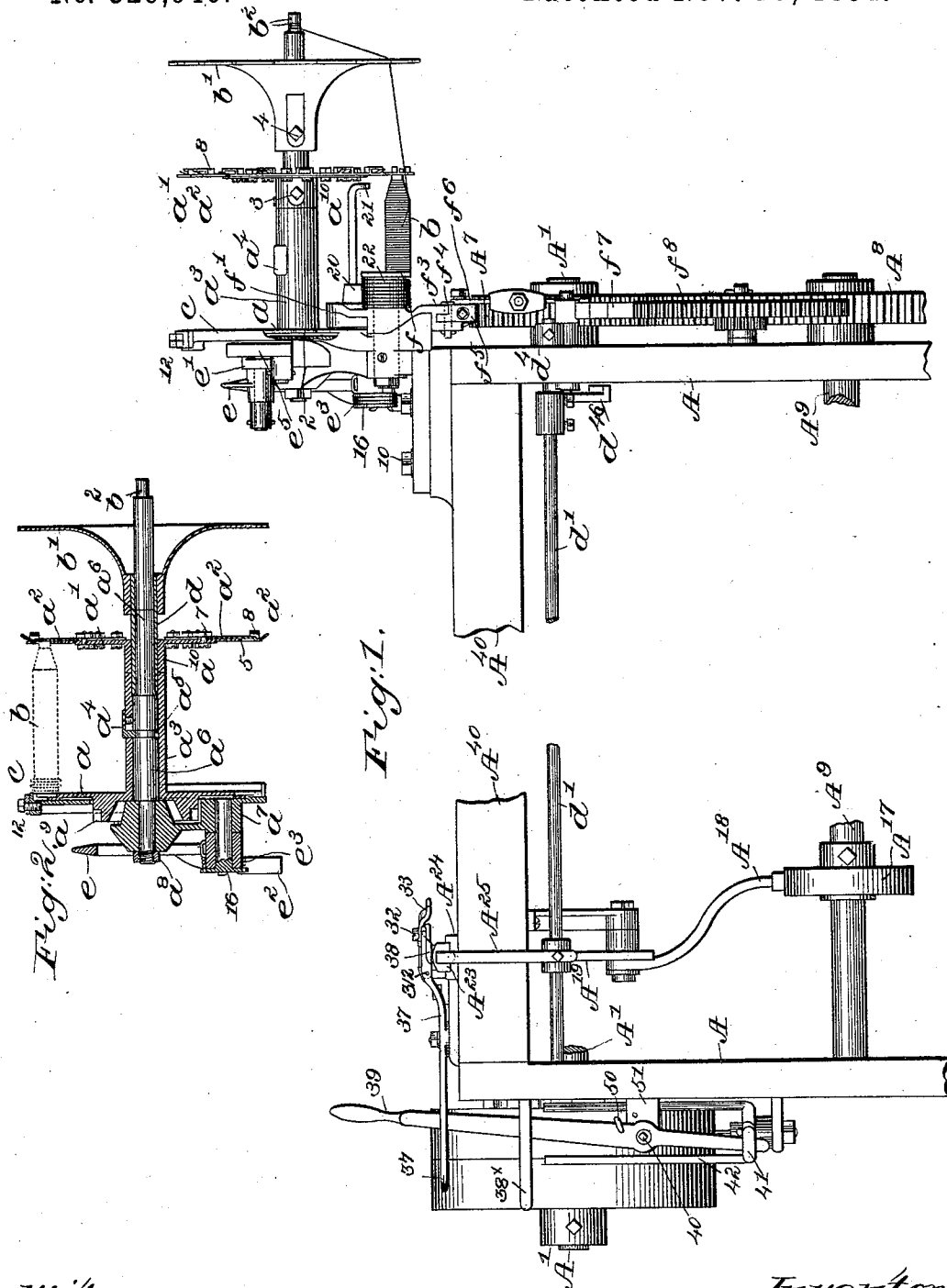
(No Model.)

4 Sheets—Sheet 1.

J. H. NORTHRUP.
LOOM.

No. 529,940.

Patented Nov. 27, 1894.



Witnesses.
Fred. S. Greenleaf.
Edward F. Allen.

Inventor
James H. Northrup.
by Crosby & Gregory Attys.

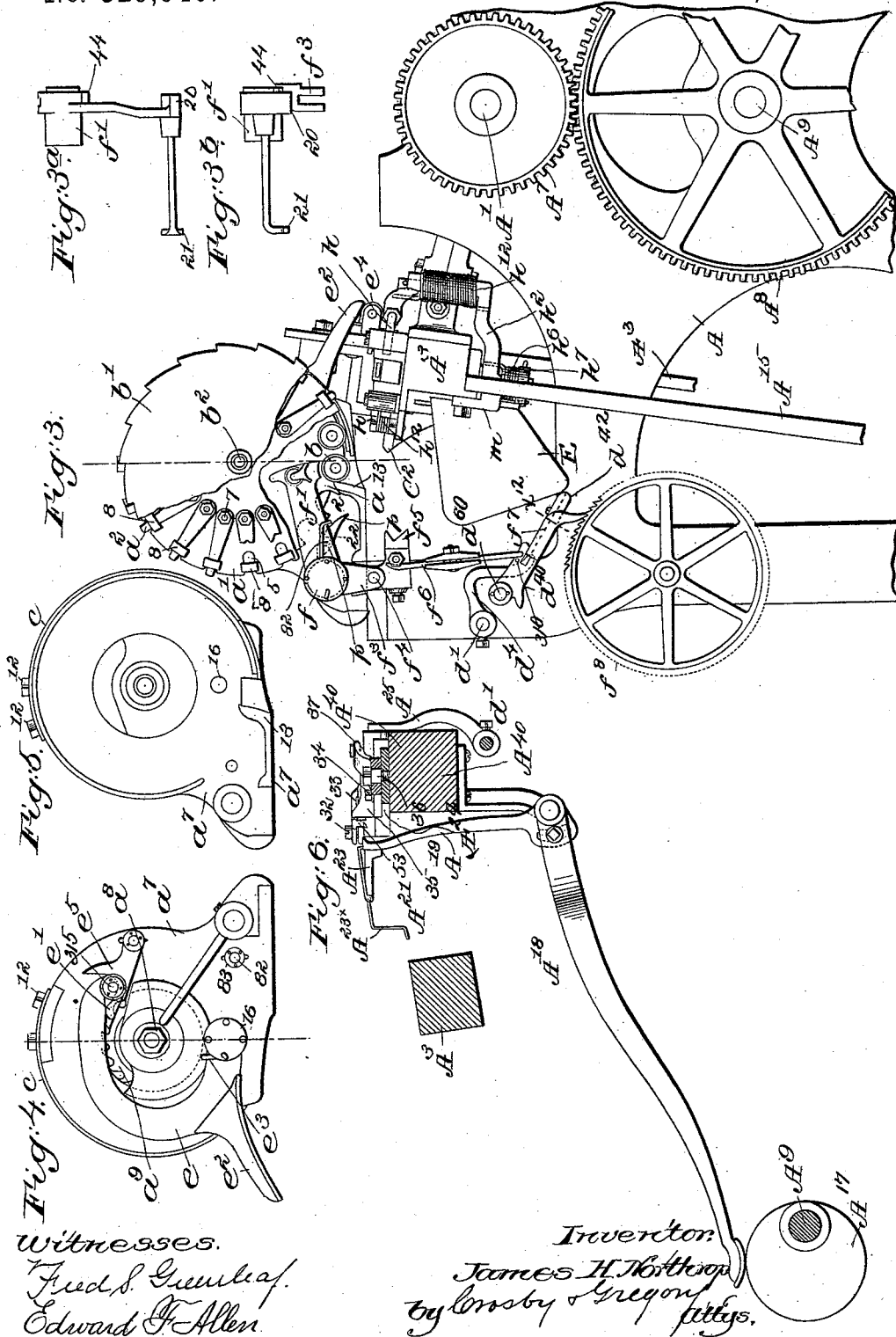
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4 Sheets—Sheet 2.

J. H. NORTHRUP.
LOOM.

No. 529,940.

Patented Nov. 27, 1894.



Witnesses.

Fred S. Gunkel.
Edward F. Allen.

Inventor.

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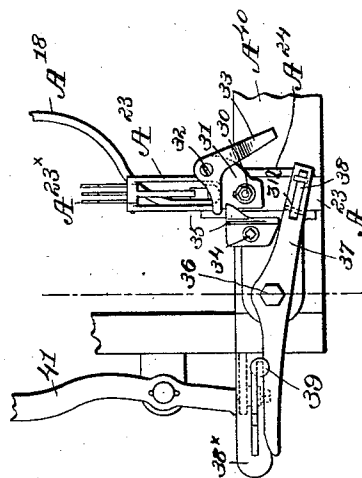
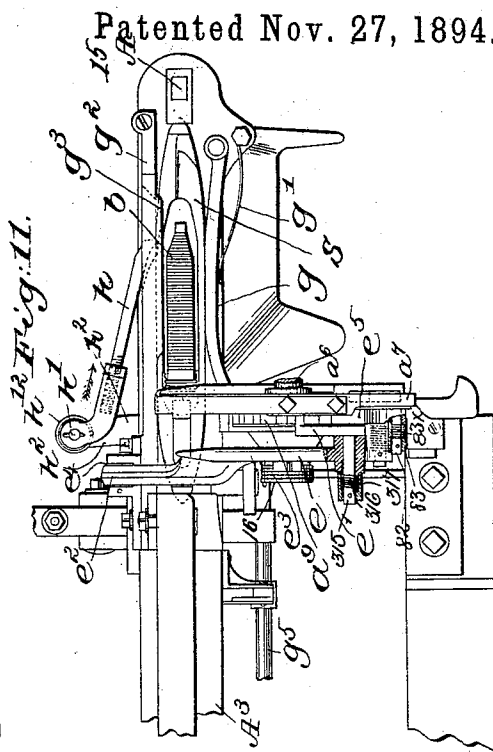
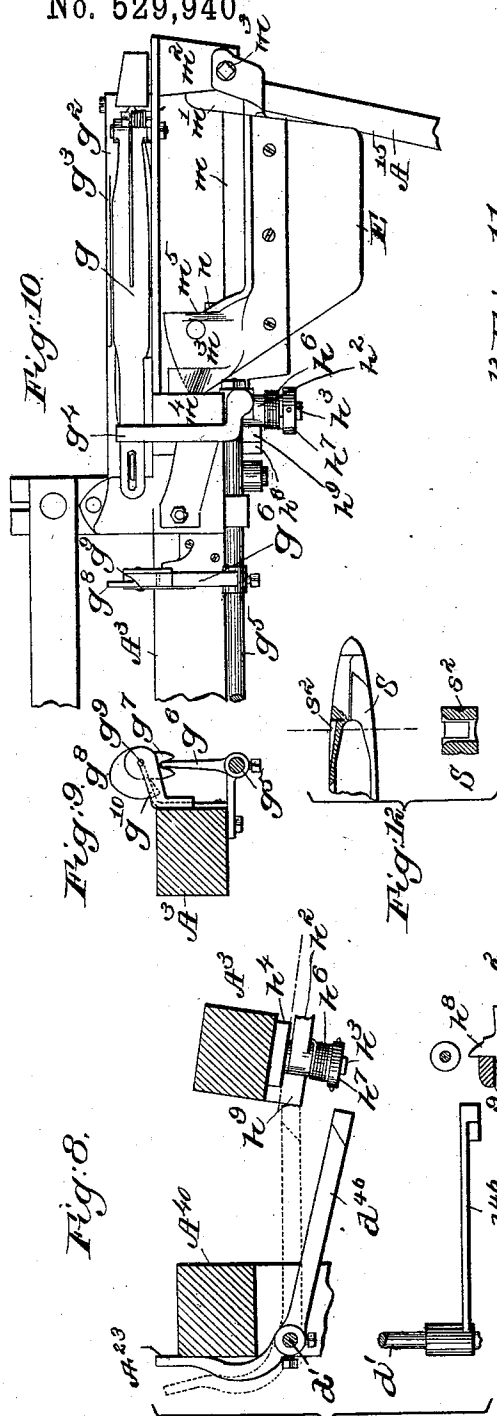
(No Model.)

4 Sheets—Sheet 3.

J. H. NORTROP.
LOOM.

No. 529,940

Patented Nov. 27, 1894.



Witnesses.

Frederick S. Gurnea
Edward F. Allen.

Inventor.

James H. Northrop
by Crosby & Morgan
Attys.

UNITED STATES PATENT OFFICE.

JAMES H. NORTHROP, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO GEORGE DRAPER & SONS, OF SAME PLACE.

LOOM.

SPECIFICATION forming part of Letters Patent No. 529,940, dated November 27, 1894.

Application filed December 12, 1891. Serial No. 414,831. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. NORTHROP, a subject of the Queen of Great Britain, but at present residing at Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object to improve and simplify that class of loom shown in United States Patent No. 454,810, granted to me June 23, 1891.

In the loom described in that patent the bobbins to be supplied automatically to the shuttle in the shuttle-box of the lay were placed in a hopper down which they slid by gravity, the endmost bobbin lying just below the pusher when the latter was in its normal or elevated position.

In looms wherein the bobbin or bobbins in shuttle-cases are placed in a hopper one against another, the bobbins or the bobbin-cases depending for their movement upon gravity and sliding in a case, difficulty is experienced in bringing the bobbin directly into proper position with relation to the pusher used to put the bobbin into the shuttle. I have for the first devised an apparatus for positively bringing each bobbin into position under the pusher, my said apparatus comprehending an intermittingly operating bobbin-feeder devised to receive and support independently the bobbins to be carried by the feeder, the latter being preferably so constructed as to positively hold both ends of the bobbin in the movement of the feeder to put the bobbin under or within the range of movement of the pusher.

With my improved bobbin feeder I have combined a guard or retainer, which prevents the escape of a bobbin except at the proper point. The feeder has co-operating with it a stop, against which rests the head of the bobbin next to be acted upon by the pusher. The disk which serves to hold the tips of the bobbins has a series of spring-like or yielding catches.

In the patent referred to the weft threads were connected with a stud, located outside

the hopper, and as the bobbins descended in the hopper, the weft was unwound therefrom, and means had to be provided by which to take up and care for the slack weft thread, and prevent the same from becoming entangled; but herein, in order to obviate this difficulty, I have combined with the bobbin-feeder a weft-end-support which is moved with the bobbin-feeder, and by which the formation of slack thread is avoided.

In the patent referred to, the bobbin to be transferred from the hopper into the shuttle-box, was acted upon at its head end by a pusher, and sometimes in the rapid running of the loom difficulty has been experienced because of the failure of the point end of the bobbin to get into the shuttle at the proper time. To overcome this difficulty I have devised a pusher having a finger extended laterally therefrom, so as to occupy a position just over and near the tip end of the bobbin, the said finger having its acting face located in a higher plane than the acting face of that part of the pusher which contacts with the head of the bobbin, so that the pusher in its operation first contacts with the head of the bobbin and pushes it into the open space at the top of the shuttle, and during this operation the finger acts upon and positively dislodges the tip of the bobbin from the device holding it.

The bobbin-feeder is herein represented as composed of two disks having a series of notches or pockets, the disks being attached to a sleeve mounted upon a fixed stud, one disk or the sleeve having a ratchet adapted to be engaged by a pawl pivoted or mounted upon a spring-actuated pawl-carrier deriving its motion, in this present instance of my invention, from a projection carried by the lay. This ratchet has co-operating with it a detent which prevents retrograde motion thereof. I have also combined with the said bobbin-feeder a stop against which is carried the head of the bobbin next to be acted upon by the pusher, and when the bobbin contacts with this stop, the end of the pawl, by its engagement with a tooth of the ratchet wheel, acts to keep up the end of the pawl-carrier nearest the lay, so that the said pawl-carrier cannot be vibrated to move the bobbin-feeder

until the pusher has acted to push the bobbin from the bobbin-feeder. The pusher having acted, the spring which moves the pawl-carrier immediately acts and moves the carrier and the pawl, causing the feeder to be rotated or moved in a circular direction, sufficiently far to bring the next bobbin in the shuttle against the said stop.

In United States Patent No. 454,810 heretofore granted to me, I have shown what I have therein designated as a positioning device, it acting at proper times upon the innermost tip of the shuttle to position the same correctly in the shuttle-box and with relation to the pusher, to receive a bobbin.

In my efforts to leave the raceway of the loom as free as possible, I have devised a positioning device, which, at the proper time is made to engage a notch at the rear side of the shuttle which is about to receive a bobbin, said device acting to push the said shuttle backwardly into its correct position in the shuttle-box provided the said shuttle is not in its proper position to receive the bobbin from the feeder.

The positioning device is herein represented as deriving its initial motion from an arm or projection upon a rock-shaft actuated by the filling fork-slide.

In order to enable the positioning device to reach the shuttle, the rear side of the shuttle-box has been provided with a slot.

To avoid any possibility of the picker-stick striking the bobbin when the loom is running at high speed, I have provided the lay at the under side thereof and near the end of the slot in which the picker-stick works, with an arresting device, which arrests the head of the bobbin after the same has been ejected from the shuttle and passed through the slot in the shuttle-box.

Arresting the head of the bobbin enables the tip thereof to be turned down so that its point may be directed toward the bobbin receptacle, and, to prevent the tip of the bobbin from getting into the path of the picker-stick, I have combined with the arresting device a lump or projection which deflects the bobbin laterally.

The lay, immediately below the arresting device, is provided with a chute which receives upon it the ejected bobbin, on its way into the bobbin receptacle. Herein I have combined with the pusher a locking device for the bobbin-feeder, so that the pusher, as it is moved to take a bobbin from the bobbin-feeder and put it into the shuttle, will enable the locking device, actuated by a suitable spring, to engage the said bobbin-feeder, so that said feeder cannot be moved while the pusher is in operation, or while it is acting to put a bobbin into the shuttle, the upward movement of the pusher into its normal position causing the locking device to release the bobbin-feeder.

In the class of looms made the subject of this invention and claim, the object is to en-

able the same to be run at high speed, and to dispense with as much attendance as possible. In doing this, numerous difficulties arise which do not occur in ordinary looms.

In that class of loom represented in United States Patent No. 454,810, dated June 23, 1891, wherein provision is made for automatically supplying a shuttle with a bobbin to replace a bobbin when the thread with which the bobbin is threaded has been broken or exhausted, and wherein the thread of the newly supplied bobbin is automatically threaded into the delivery eye of the shuttle, it sometimes happens that the thread of the bobbin last inserted in the shuttle, fails to be threaded into the delivery eye thereof at the first shot of the shuttle through the shed, and in such event, the weft fork mechanism acts and causes the full bobbin just put into the shuttle to be ejected before its thread has been at all used, and the loom will continue to run, and will, at every other pick, move the pusher, take a bobbin from the hopper or other source of supply for bobbins and put it into the shuttle, this operation being continued until the thread from the bobbin has been left in the shed in suitable position to tip the filling fork, and if the filling fork is not tipped by the weft the operation will continue until all the bobbins have been taken from the hopper or other source of supply for bobbins, and during such operation no cloth will be woven.

The loom referred to will continue to run even after the bobbins have been taken from the hopper, for the weft fork mechanism instead of acting as in ordinary looms to effect the stopping of the loom when the weft fails in the shed, is made instrumental only to determine the time at which the pusher shall be actuated to put a bobbin into the shuttle.

In ordinary looms for weaving cotton cloth, whenever the weft fails, the weft fork is not tilted, and consequently the tail piece of the weft fork is caught by the usual weft hammer and the weft fork slide is moved outward toward the front of the breast-beam to effect the stopping of the loom through a knock-off lever and usual controlling mechanism, not shown, of which there are many variations in use, all of which operate in substantially the same manner, but as above stated it will be remembered that the weft fork mechanism in said patent performs a very different duty.

For this my present invention I have invented appliances whereby the weft fork not only controls the movements of the pusher, but also effects, by its movements, the stopping of the loom under circumstances to be hereinafter more fully described. To effect this desirable result I have invented a novel weft fork mechanism which has been so devised that it is not made fully effective to stop the loom or operate the knock-off lever thereof until after more than one action of the lay, the first failure of the weft fork to be tilted by the presence of the weft against it, being utilized to effect a primary movement

of the weft fork, sufficient, however, to put into position the parts upon which depend the movement of the pusher. In case, however, the weft should fail at one shed and a bobbin should be inserted into the shuttle, and the weft from said bobbin when the shuttle is thrown across the shed should fail to be left opposite the weft fork, then in such case the weft fork for a second time will not be tilted, and the slide-bar carrying it will be given an additional or secondary movement sufficient to knock off or stop the loom; but in case the weft from the new bobbin last inserted in the shuttle should be presented in position to tilt the weft fork, then the movement of the weft-hammer will restore the weft fork mechanism into its normal condition and enable the loom to be run. To effect this desired result I have provided the weft-fork slide with what I term a "trigger," said trigger being adapted to be set at that outward movement of the weft fork slide which is effected by the absence of weft at the filling fork, and which movement is used to indicate that the pusher must act to put another bobbin into the shuttle, and if the shuttle, it having received another bobbin, fails at the next shot to leave weft in front of the weft fork, then said trigger effects the knocking off of the loom to stop the same, but if the shuttle, it having received a fresh bobbin, leaves a weft to meet the weft-fork, then the said trigger will be restored automatically into its normal position. In the embodiment of my invention as herein illustrated, the weft hammer is employed to restore the weft-fork slide. This trigger, through suitable appliances, such as a knock-off lever between it and the shipper handle, is made at the proper time to effect the release of the shipper handle, and through the usual means, stop the loom.

I have combined with a binder-operating rock-shaft an arm which engages one part of a weft-parter, connected to and moving with the lay, the said arm, actuated by the movement of the rock-shaft, in turn moved by the shuttle-binder in usual manner, serving to close the weft-parter at all times while the shuttle is in the shuttle-box of the lay.

In the accompanying drawings:—Figure 1 is a partial front elevation of a sufficient portion of a loom containing my improvements to enable my invention to be understood, the breast-beam and some of the shafts being broken out centrally to save space upon the drawings, the lay being entirely omitted because it is shown in other figures to be referred to. Fig. 2 is a longitudinal sectional detail of the bobbin-feeder and weft-end support and holder, the figure showing one bobbin in position. Fig. 3 is a partial right-hand side elevation of my improved loom, the weft-end support and holder and the outer disk of the bobbin-feeder being both partially broken out to show the head-holding disk of the

feeder and two bobbins therein, the figure also showing the notches which receive the heads of the bobbins. Figs. 3^a and 3^b are details of the pusher. Fig. 4 is a detail of the stand for the bobbin-feeder said figure showing the ratchet for rotating the same. Fig. 5 is an opposite side view of the said stand. Fig. 6 is a sectional detail showing the breast beam, the weft-fork, its actuating hammer, and the lay. Fig. 7 is a top or plan view of one end of the breast beam, the weft-fork, and some of its co-operating parts. Fig. 8, shows details of the devices employed in actuating the positioning device; Fig. 9, a detail view of the weft-parter. Fig. 10 is a front elevation of that end of the lay and shuttle-box which is hidden by the bobbin-feeder in Fig. 1. Fig. 11 is a top or plan view of that end of the loom at which is situated the shuttle-box which is to be supplied with bobbins automatically, the said figure showing but part of the lay and the breast-beam together with the stand or support for the bobbin-feeder, the bobbin-feeder being however removed, the stud on which it rotates being broken off. Fig. 12 shows a portion of the shuttle to illustrate the notch in its rear side which is engaged by the pusher. Fig. 13 shows a portion of the head-holding disk of the bobbin-feeder, stand, and locking device for the feeder. Fig. 13^a is a detail of the feeder locking device; Fig. 14, details of the trigger and the end of the releasing lever; Fig. 14^a, a view of the trigger and plate, Fig. 14, looking in the direction of the arrow; Fig. 15, a side elevation and section of the end of the releasing device next the trigger. Figs. 16, 17, and 18, are respectively a side elevation, plan view, and section in the line $y-y$ (Fig. 16), of the shuttle-arresting and deflecting plate at the under side of the shuttle-box, and Fig. 19 is a section across the take-up detent f^7 in the line x^{12} , Fig. 3.

The loom frame A has in suitable bearings a crank-shaft A', provided with a toothed gear A⁷, which engages a toothed gear A⁸ on and rotates the under shaft A⁹, having a cam A¹⁷, which acts upon the arm A¹⁸ of the weft-hammer A¹⁹.

The breast-beam, lettered A⁴⁰, has upon it a guide A²⁴ for the weft-fork slide A²³, upon the forward end of which is pivoted the weft-fork A^{23x}, having, as represented in Fig. 6, at its rear end a downturned tail of usual shape.

The outer end of the weft-fork slide acts against an arm A²⁵, fast on a rock-shaft d', extended across from one to the other side of the loom. As the lay comes forward for the reed to act, should the weft be absent in front of the weft-fork A^{23x}, then the said fork will remain down and its tail-piece will be struck by the weft-hammer A¹⁹, which will cause the weft-fork slide A²³ to be moved toward the outer side of the breast-beam, so that it will act on the arm A²⁵, turn the rock-shaft d' and cause it, as will be described,

to put into operation the pusher which is instrumental in transferring a bobbin into the shuttle.

The parts above referred to specifically by letter, are substantially as in the patent referred to, as are also the picker staff A^{15} , and the self-threading shuttle S , with the exception that the shuttle has at its rear side a notch S^2 , to be described.

The bobbin-feeder herein to be described consists essentially of a disk or plate a , having a series of notches or pockets 2 (see Fig. 13) to receive the heads of the bobbins b , one of the said notches being shown in Fig. 3 in full lines and another in dotted lines, and a second disk or plate a' , herein represented as having a series of grooves and provided with a series of springs a^2 , the said disk and its parts serving to hold the tip or small end of the bobbin.

The hub a^3 of the disk a is provided with a suitable dog a^4 , made as an L-shaped finger, extend edthrough a slot in the hub, the said finger entering an annular groove a^5 , made in a stud a^6 , fixed with relation to the stand a^7 by means of a nut a^8 , so that the said hub and disk may be rotated on the said stud intermittingly, the disk or plate a having a series of ratchet teeth a^9 . Shown best in Fig. 4.

The outer end of the stud a^6 is surrounded loosely by a sleeve d which is forced tightly into the open end of the hub a^3 , and upon sleeve d is secured by a screw 3, see Fig. 1, the hub a^{10} of the disk or plate a' which holds the tips of the bobbin, the said sleeve d having also fast upon it by a screw 4 a weft-end-support b' , the latter having in this present embodiment of my invention a weft-end-holder shown as a central stud b^2 , to which will be secured the free ends of the weft-threads coming from the bobbins b , mounted separately or independently in suitable bearings, pockets, or notches in the bobbin-feeder, the said weft-threads, at a point between the bobbins and the weft-end-holder, resting in suitable notches, shown best in Fig. 3, in the periphery of the weft-end-support b' , the weft-end-support and the said holder, one end of which is fitted into the open end of the sleeve d , rotating in unison with the bobbin-feeder.

The plate or disk a' has notches or grooves 5, and opposite the said notches are spring fingers a^2 attached by bolts 7 and prevented from lateral displacement in the notches by guards 8, each guard preferably forming a part of the plate a' and being shaped like the three sides of a square.

The foot of the stand a^7 , see Fig. 1, is attached by suitable bolts 10 to a block or plate resting upon the breast-beam A^{40} , the said stand for a portion of its periphery, see Figs. 4 and 5, having a guard or shield c , attached by bolts 12, the said shield acting to overlap somewhat the ends of the heads of the series of bobbins supplied to the bobbin-feeder, the endmost bobbin of the series always resting

against the stop 13, see Figs. 3 and 5, located at a short distance from the lower end of the guard, the bobbin when in such position, see Fig. 3, being directly under the pusher f' to be described, and directly over the shuttle-box of the lay, when the latter is in its forward position toward the breast-beam. The stand a^7 has, see Fig. 5, a headed stud 16, see Figs. 2 and 4, which forms the fulcrum for a pawl-carrier e of somewhat peculiar shape, see Fig. 4, it being provided with a hub at one end, shown by section in Fig. 11, in which hub is mounted a pin 315, carrying a spring-pressed pawl e' , which engages the teeth of the ratchet wheel a^9 , said pawl being operated by a spring 316 surrounding said pin 315 and connected at one end to the pawl-carrier and at its other end to a hollow collar 317 secured to said pin, as in Fig. 11, said pawl-carrier having a tail-piece e^2 , a spring e^3 acting at one end on the said pawl-carrier and fixed at its other end with relation to the said stud 16 serving normally to move the pawl-carrier in a direction to rotate the bobbin-feeder and keep against the stop 13 thereof the endmost bobbin of the series of bobbins sustained in the feeder, the pawl-carrier being moved in the opposite direction at the completion of the backward stroke of the lay by means of a roller or other projection e^4 , see Fig. 3, carried by the lay, it acting upon said tail-piece.

The ratchet wheel a^9 is prevented from being moved backwardly by a suitable detent e^5 .

It will be understood that inasmuch as the pawl e' is moved by the projection e^4 on the lay to carry the pawl back over the teeth of the ratchet wheel a^9 , the said pawl will engage a ratchet tooth and the tail-piece e^2 will remain elevated or out of range of the projection e^4 as long as the endmost bobbin b rests against the stop 13; but as soon as the said bobbin has been pushed out from the bobbin-feeder into the shuttle S by the pusher, then the spring e^3 immediately acts upon the pawl-carrier and rotates the bobbin-feeder at one stroke the distance necessary to put the endmost bobbin of the series, no matter how far distant from the said stop, against the said stop.

The operator will supply the bobbin-feeder with bobbins as they may be needed, it being necessary to visit the loom for this purpose only when the bobbins in the hopper are nearly exhausted. To do this the operator will take a bobbin in his hand and at a point behind the end of the guard c will put the head of the bobbin in an empty pocket or notch 2, and then slip the tip end of the bobbin into a notch of the plate a' . The stand a^7 has also a suitable hole or opening for the reception of the headed stud f , see Figs. 1 and 3, upon which is mounted the hub of the pusher f' , the said pusher, shown separately in Figs. 3^a and 3^b, being shaped at its front end to present a portion, as 20, to act against the head of the bobbin, and a finger, as 21, to

act against the tip of the bobbin, the surface 20 being in a somewhat lower horizontal plane than the end of the finger 21, so that the head of the bobbin is first struck and carried to-

ward or into the open top of the shuttle S, and thereafter the finger 21 acting against the tip of the bobbin takes it out from the tip-holding device of the disk or plate a' , in case the tip does not start promptly.

The provision of shaping the pusher so that it acts on both the head and tip of the bobbin insures greater certainty of operation of the parts and accuracy of insertion of the bobbin into the shuttle, which shuttle has in practice bobbin holding jaws or devices and a self-threading slot, all as provided for in said United States Patent No. 454,810.

One end f^3 of the pusher has jointed to it at f^4 , a trip f^5 , herein represented as joined by an adjustable connection or rod f^6 , with the detent f^7 which acts to hold the ratchet wheel f^8 , connected with or forming part of the take-up mechanism which may be of any usual construction.

The rock-shaft d' has near its outer or right-hand end, see Figs. 1 and 3, an arm d^4 suitably shaped at its end to engage with or under a pin or projection 310, see Fig. 3, extended from one side of an arm d^{40} pivoted at d^{60} , and on which arm slides the detent f^7 , and, as a result thereof, whenever the weft-fork slide is pushed backward, the weft being absent, as described, the rock-shaft d' will be turned and the said finger d^4 will lift the detent f^7 , thus releasing the take-up, and at the same time the trip f^5 will be put into the range of movement of the bunter C², attached to the lay and common to the patent referred to, the said bunter during the forward movement of the lay meeting the said trip f^5 and actuating the pusher, as provided for in the said patent.

This invention is not intended to be limited to the exact form of devices employed for insuring the placing of the trip f^5 in the range of movement of the bunter when the weft is absent at the weft fork when the reed moves forward to beat the weft into the shed, and instead thereof I may employ any other usual or suitable devices which will operate said trip at the proper time either by or through the weft-fork slide, or by suitable initial devices or by devices of the actuating train or other devices, substantially as provided for in Patent No. 462,919, dated November 10, 1891.

In Fig. 19 I have shown a section of the take-up detent in the line x^{12} Fig. 3. This detent is composed of an arm d^{40} which forms a track to guide the detent f^7 mounted loosely on the said arm, said detent being of usual construction, a lump d^{42} at the free end of the said arm keeping said detent in place.

The pusher having been caused to push a bobbin from the bobbin-feeder into the shuttle when the latter was directly under the bobbin,—the lay being forward as provided for in said Patent No. 454,810,—a spring 22,

one end of which is connected with the pusher and the other with the stud f referred to, acts to quickly elevate the pusher into its normal position.

By the device described the bobbins are brought positively into a predetermined or delivery position against the stop 13, and the weft ends are not tangled, nor is any slack formed therein, due to the movement of the bobbins from the point in which they are placed in the bobbin-feeder and their arrival at the stop.

Referring now to Figs. 10 and 11, g represents the shuttle-binder arranged at the front side of the shuttle-box; g' , its actuating spring, and g^2 shows a plate attached rigidly to the lay and forming the rear side of the shuttle-box, said plate having an overhanging lip or flange, as g^3 , and having at its inner side a notch through its side in order that the positioning device h , shown as an adjustable or two-part arm, mounted upon a stud h' of a lever h^2 , may, at the proper time, be made to move into the shuttle-box through the said slot, and engage the notch s^2 , or a shoulder forming a part thereof, in the rear wall of the shuttle, and push the said shuttle toward the outer end of the shuttle-box, in case the shuttle should be out of position or should have rebounded, and in this way it is made certain that the said shuttle will always be put in exactly the proper position to receive the bobbin b as the latter is pushed out from the bobbin-feeder into the shuttle as provided for in said Patent No. 454,810, the spent bobbin or the bobbin which it is desired to remove and replace by another being pushed out through the shuttle-box into the receiver E, which may be a box or receptacle of any usual character.

The binder g of the shuttle-box is acted upon by a binder finger g^4 , forming part of a rock-shaft g^5 , mounted in bearings fixed to the lay, and said rock-shaft has, as herein represented, a finger g^6 which enters the notched end g^7 of a weft-partner g^8 , pivoted at g^9 , it co-operating with a fixed or stationary member or shoulder g^{10} , forming part of an arm also attached to the lay at its front side.

The arm h^2 , shown partially in plan view in Fig. 11, is extended under the lay toward the front of the loom, and has a hub which is mounted upon a suitable stud h^3 , depending from a plate h^4 , attached to the under side of the lay, the said hub having suitably connected to it one end of a strong spring h^5 , the opposite end of the spring being attached in suitable manner to a collar h^6 , suitably secured or fixed upon the stud h^3 , so that the said spring normally acts to keep a projection h^8 on the arm h^2 against a projection h^9 of the plate h^4 .

Viewing Fig. 8, it will be seen that the projection h^8 overlaps somewhat the stop projection h^9 .

It will be understood that the shuttle needs to be put into exact position with relation to

the pusher only as the latter is to be actuated to put a bobbin into the shuttle, then in the shuttle box, and to actuate the positioning device at this time I have provided the rock shaft d' near the side of the loom where the pusher is situated with an arm d^{46} , see Figs. 1 and 8, which is lifted whenever the rock shaft d' is turned as described by the weft-fork slide to start in motion the pusher, said arm d^{46} acting on the projection h^8 , thus moving the lever h^2 in the direction of the arrow shown in Fig. 11, causing the positioning device h to act quickly and put the shuttle into position.

A suitable spring, as h^{12} , connected with the positioning device at one end and at its other end with the lever h^2 , serves normally to keep the free end of the positioning device in contact with or in proper position with relation to the slotted back-plate g^2 , so as to pass through said slot and engage said shuttle while the positioning device is being moved in the direction of the arrow near it in Fig. 11.

As has already been stated, it is of great moment to obviate bad places in the cloth caused by the failure of a newly-inserted bobbin to lay its weft properly in the shed at the first pick of the shuttle containing the new or fresh bobbin. To overcome this trouble I have devised appliances which I will now describe and which I have combined with the lay and with the usual weft-fork slide.

I have attached to the weft-work slide A^{23} , by a suitable screw 30, a small stand or plate 31, upon which I have pivoted at 32 a trigger 33, shown as an elbow lever. See Figs. 1, 7, and 14. I have also attached to the top of the breast-beam by a screw 34 a trigger-mover 35, which somewhat overlaps the weft-fork stand A^{24} , so as to be in the range of movement of the short arm of the trigger. I have pivoted upon the lay at 36 a knock-off lever 37, it having pivoted upon it near one end at 312 a latch or dog 38, the opposite or left-hand end of the lever, see Fig. 7, resting just above the usual notched holding-plate 38^* attached to the breast-beam, and next the shipper handle 39, herein shown as pivoted at 40 and having its lower end extended into an eye or otherwise suitably connected loosely with a belt-shipper 41, of any usual or suitable construction and provided with suitable wires or arms 42 to control the belt employed to drive the loom and place it either on the fast or loose pulley, according to whether the shipper lever is in its usual notch in the plate 38^* or is out of said notch.

Figs. 1 and 7 show the shipper lever in its usual notch.

Referring now to Fig. 7, let it be supposed that the weft-fork slide is being moved backward by the hammer, the weft being absent opposite the weft fork, and in such movement the short arm of the trigger 33 will meet the trigger-mover 35 and the said trigger will be turned thereby about its pivot 32 into the dotted line position Fig. 14, causing the long arm

of the trigger to pass under the right-hand end of the knock-off lever 37, where, acting against the beveled under side, see Fig. 15, of the latch 38, the trigger will lift the said latch and not turn the knock-off lever about its pivot. As the weft-hammer A^{19} is moved back away from the breast-beam the weft-fork slide will be thrown forward toward the lay, in usual manner, but the trigger 33 will remain in the position in which it was put by contact with the trigger-mover 35, so that if the weft-fork slide should again be operated by the weft-hammer, as when the weft-fork is not tilted by weft, then the said trigger, at the second movement of the weft-fork slide toward the front of the breast-beam will strike the side of the latch 38 of the lever 37, and turn the said lever to knock the shipper handle from its holding notch in plate 38^* , allowing a suitable spring 50, see Fig. 1, connected with said lever and with the stand 51, to move said lever in the direction to shift the belt from the fast to the loose pulley and stop the loom. Should, on the contrary, the shuttle just thrown through the shed, said shuttle containing the new bobbin, leave weft in front of the weft-fork, so that it will be tilted in usual manner, then the weft hammer in its movement, it being moved once for each beat of the lay, will strike the heel 53, see Figs. 6 and 14^a, of the trigger and turn the said trigger back about its pivot 32 into the position shown in Fig. 7. In this way, whenever the first shot of a shuttle containing a new or fresh bobbin does not leave its weft in front of the weft-fork, the loom will be automatically stopped; but, in case said weft thread is left in front of the said fork, the loom will continue to run notwithstanding many changes of bobbins in the shuttle.

The end of the lay containing the shuttle-box has at its under side a casting m , see Figs. 10 and 16, having at its outer end an ear m' which is suitably bolted to an ear m^2 forming part of the shuttle-box bottom, the opposite end of the said casting or deflecting plate having a suitable threaded hole to receive a bolt m^3 , extended into or over a depending ear of the bottom of the shuttle-box. This plate has, near the side of the loom, a cup-shaped or socket-like bobbin-head-arresting device m^4 , and at a short distance therefrom to the right is a projecting rib m^5 , the said bobbin-head-arresting device being directly under the slot in the bottom of the shuttle-box through which the bobbin ejected from the shuttle by an incoming bobbin passes, the head of the bobbin contacting directly with the said bobbin-head-arresting device, while the bobbin at a short distance therefrom acts against the rib m^5 , so that the said bobbin has its head arrested and its body thrown to one side away from the path of movement of the picker stick, which is located at the rear side of the plate m , and consequently the bobbin cannot possibly get in the way of the picker stick so as to be struck thereby. This plate m and its

attached parts are shown enlarged in Figs. 16 to 18, both in side elevation, in top view, and in section in the line $y-y$. In these views it will be seen that the plate has a recess in which is placed a buffer n , which may be of sole leather or other suitable non-metallic material, against which the picker stick may strike at the end of its inward motion.

Referring to Fig. 13, p represents a locking device for the bobbin-feeder, the said locking device, shown best in Fig. 13, consisting of a plate having a notch 80, see Fig. 13^a and a finger 81 said plate being connected to a short shaft 82, see Figs. 4 and 11, extended through a hole in the stand a^7 and having applied to it a collar 83, to which is attached one end of a suitable spring 83^x the other end of the spring being attached to the stand a^7 , so that the spring acts to keep the notch 80 of the locking device in engagement with one of the projections between two notches 2 of the plate or disk a , especially as shown by full line Fig. 13, it so engaging said plate to lock the bobbin-feeder when the pusher is being moved to transfer a bobbin therefrom into the shuttle.

The pusher at its rear side has a projection 44, see Fig. 3^a, which, as the pusher rises, acts against the finger 81 of the locking device, turns it against its spring 83^x, and releases the disk or plate a .

In the operation of the weft-parting device, let it be supposed that the bobbin has just been put into the shuttle. Now the shuttle, acting upon the binder g , moves the latter outwardly so that it, acting against the binder finger g^4 , closes the weft-parter. The picker stick is moved to throw the shuttle through the shed while the lay is at its back stroke, and while the shuttle is in the shuttle-box at the opposite end of the lay, said box not being herein shown, the lay is moved forward to beat in the filling, but the presence of the shuttle in the said box, it having in practice a binder like that already described, acted upon by a like finger connected to the shaft g^3 , said parts not being herein shown because a mere duplicate of the parts already shown, prevents the opening between its members of the weft-parter for the reception of the thread, at that time between the selvage and the thread-support b . The lay, having been moved forward, is started back, and when the crank-shaft is near its top center the lay is put half way back, the shed is formed in the usual manner, and the shuttle, previously thrown as stated across the loom, is thrown back into the shuttle-box from which it started and where it received the bobbin then within it. As soon, however, as the shuttle on its return, as above stated, leaves the opposite shuttle-box, the binder-rock-shaft g^5 is immediately left free to turn and open the weft-parter, so that as the lay continues to move on its backward stroke away from the fell, and while the shuttle is in its flight from the opposite back box to the shuttle-box where it received a bobbin,

the then open weft-parter receives between its members the previous shot of weft, then extending between the selvage and the weft-end-support and holder, and as soon as the shuttle gets into its home box the binder is actuated, as before described, to effect the closing of the weft-parter upon the weft-thread, so that as the lay comes forward again the said weft-parter, acting upon the weft thread, breaks the same off.

Believing myself to be the first to employ a rotating or endlessly-moving bobbin-feeder to receive, contain, and positively carry forward a series of bobbins, in order that they may be properly presented between a pusher and a self-threading shuttle in a shuttle-box, this invention is not intended to be limited to the exact shape shown for the bobbin-feeder, or to the exact mechanism shown for imparting movement to the feeder.

Prior to my invention I am not aware that a weft-fork forming part of a weft stop-motion has ever had combined with it means whereby the weft-fork slide might be moved once as when the filling was absent and not knock off or stop the loom, but knock off or stop the loom at a second movement of the weft-fork slide immediately following the first movement referred to. Nor am I aware that a weft-fork has ever had combined with it a device which, at one movement of the slide after the absence of the weft, would set a trigger, and, a weft having been correctly supplied to the shed, a second device to act upon the said trigger and restore it to its normal or inoperative position to thus prevent the stopping of the loom. Hence this invention is not intended to be limited to the exact form of trigger referred to, or to the means for moving it, as it will be obvious to those skilled in the art that various forms of trigger devices, operating upon substantially the same principle, might be devised without departing from my invention; and the restoring of the trigger to its normal position, even though effected by some moving part of the loom other than the weft-hammer, would, I consider, be within the scope of my invention.

It will be noticed that the bobbin-feeder and the pusher are so devised and combined that the bobbins are arranged in the arc of a circle, the bobbins are supported at their opposite ends, the sides of the bobbins next the center of rotation of the bobbin-feeder are uncovered, and the pusher enters, stands, and works inside the periphery of the bobbin-feeder and within the circle corresponding with the arc of the circle in which the series of bobbins are held, the bobbins being presented in succession between the center of rotation or motion of the bobbin-feeder and the shuttle in the shuttle-box.

I am aware, prior to my invention, that looms have been provided with rotary shuttle-boxes, which I do not claim, and I disclaim any bobbin feeder wherein bobbins or bobbin cases are arranged in a chute or guideway

one against another and adapted to be moved forward by gravity, as the lowermost bobbin or shuttle-case is removed from the bottom of the pile.

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

1. A loom containing the following instrumentalities, viz: a lay; a shuttle box; a shuttle slotted for the passage through it of a bobbin; a pusher; a bobbin feeder having means to engage and positively hold both ends of a series of bobbins arranged parallel each to the other; and actuating mechanism for both the
10 said pusher and the said feeder, whereby the latter is moved intermittently to bring one bobbin after another of the series of bobbins into position between the pusher and the shuttle box and the pusher is made to transfer said bobbins one after another from said
15 feeder into the shuttle in said shuttle box; substantially as described.

2. The lay; its shuttle-box, and pusher, combined with a rotatable bobbin-feeder; a
20 ratchet mechanism; and means to actuate the ratchet mechanism to rotate the bobbin-feeder at the proper time in the direction to feed a bobbin into position with relation to the pusher, substantially as described.

3. A rotatable bobbin-feeder having pockets or notches for the heads of a series of bobbins, combined with a guard to prevent the escape of the bobbins from said feeder except at the proper point where the guard is omitted, substantially as described.
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4. A rotatable bobbin-feeder having a series of pockets or notches to receive the heads of a series of bobbins, combined with a stop against which the bobbin next to be removed from said bobbin-feeder is held, substantially as described.
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5. A movable bobbin-feeder, consisting of a plate having a series of pockets or notches to receive the heads of a series of bobbins, and
45 a plate having a series of holders for the tips of the bobbins, substantially as described.

6. A circularly-moving bobbin-feeder adapted to receive the heads and tips of a series of bobbins, combined with a circularly-
50 moving weft-end-support, to operate substantially as described.

7. A circularly-moving bobbin-feeder adapted to receive the heads and tips of a series of bobbins, combined with a pusher
55 adapted to act on the head and on the tip of the bobbin to thus eject the bobbin from the bobbin-feeder, substantially as described.

8. A circularly moving bobbin-feeder, a pusher, and actuating means therefor, combined with a locking device for said feeder to restrain its rotation while the pusher is acting to eject a bobbin from the bobbin-feeder, substantially as described.

9. In a loom for automatically supplying a
65 shuttle with a bobbin, a lay having a shuttle open for the passage of a bobbin through it, a circularly-movable bobbin-feeder having a

ratchet, a pawl, a pawl-carrier; the lay to move the pawl-carrier in one direction; a spring to move the pawl-carrier in the opposite direction; and a device to prevent retrograde motion of the bobbin-feeder, the combination being and operating substantially as described.

10. In a loom, a lay; its shuttle-box; a weft-partner carried by the lay; a rock shaft carried by the lay and having a finger to engage said weft partner; and means between said rock-shaft and the shuttle-box to open and close the said thread-partner, for the purpose
80 set forth.

11. In a loom in which the shuttle is adapted to be supplied with a bobbin without stopping the loom the following instrumentalities, viz:—a shuttle provided with a shoulder and open for the passage through it of a bobbin; a lay having a shuttle-box slotted for the passage through it of a bobbin ejected from the shuttle and having one of its side walls slotted; a pusher; devices to actuate it; and a bobbin feeder; combined with a positioning device adapted to enter the slot in the shuttle-box and act against the shoulder of the shuttle and move the latter outwardly in the shuttle-box just prior to the action of the pusher, provided the shuttle is not in correct position under the pusher as it is about to remove a bobbin from said bobbin-feeder into the shuttle, substantially as described.
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12. The lay; its shuttle-box; a shuttle provided at one side with a shoulder; a lever pivoted on the said lay; and a dagger to act on the said lever when the weft fails, combined with a finger or arm pivoted on the said lever, and adapted to extend into the
100 shuttle-box and engage a shoulder in the said shuttle; and a spring to normally keep the said finger pressed toward the said shuttle-box and shuttle, substantially as described.

13. In a loom the following instrumentalities, viz:—a shipper handle; a holding device therefor; a weft fork; its carrying slide, a trigger mounted thereon; devices to reciprocate said carrying slide; a trigger actuating device to act against and position said trigger upon a first failure of weft at the weft fork, and a knock-off lever adapted to be acted upon by the positioned trigger on a second failure of weft at the weft fork, substantially as described.
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14. In a loom the following instrumentalities viz:—a shipper handle; a holding device therefor; a weft fork having a tail-piece; a weft fork carrying slide; a trigger movable therewith; a trigger actuating device to act against and position the trigger upon a first failure of weft at the weft fork; a knock-off lever adapted to be turned by the action of the positioned trigger on a second failure of weft at the weft fork; and a weft hammer
130 adapted to engage the weft-fork tail-piece when not tilted to thus move the weft-fork-carrying slide and to also act to restore the trigger into its first normal position when the

weft-fork is tilted by weft as the weft-hammer is being moved toward the breast-beam, substantially as described.

15. In a loom for automatically supplying a shuttle with a bobbin while in the shuttle-box, the following instrumentalities, viz:—a knock-off lever; a lay having a shuttle-box; a pusher to act upon and put a bobbin into the shuttle in the shuttle-box, and a weft-fork and co-operating devices adapted at one backward movement of the weft-fork toward the front of the loom to insure the action of the pusher, and at the next movement of the lay in case the weft fails to lift the weft fork to move the knock-off lever preparatory to stopping the loom, substantially as described.

16. In a loom adapted to automatically supply a shuttle with a bobbin, the following instrumentalities, viz:—a lay having a shuttle-box provided with an opening for the discharge of a bobbin from the shuttle therein; a shuttle slotted to permit a bobbin to be passed through it while in the shuttle-box; a pusher to push a bobbin into the shuttle; a trip co-operating with the pusher and adapted to be engaged to actuate the pusher by or through the movement of the lay toward the breast-beam; a rock shaft; a weft fork; a weft fork slide; means to move said slide; a trigger co-operating with said slide; a trigger moving device; and connecting devices between said weft fork slide and said rock-shaft, and between said rock-shaft and said trip, whereby at the first outward movement of the weft fork slide after the failure of weft to tilt the weft fork, the said catch will be lifted and the said rock-shaft will be turned to put the trip in position to be struck and actuate the pusher, substantially as described.

17. In a loom adapted to automatically supply a shuttle with a bobbin, the following instrumentalities, viz:—a lay having a shuttle-box provided with an opening for the discharge of a bobbin from the shuttle therein; a shuttle slotted to permit a bobbin to be pushed through it while in the shuttle-box; a pusher to push a bobbin into the shuttle, a trip co-operating with said pusher and adapted to be moved by or through the movement of the lay toward the breast-beam; a knock-off lever; a weft fork, its carrying slide, means to move said slide, a trigger mounted on said slide and movable therewith toward

and from said knock-off lever, a device to positively move said trigger on said slide; a rock-shaft, connecting devices between said slide and said rock-shaft, and between said rock-shaft and said trip, whereby at the first outward movement of the weft fork slide after the failure of the weft to tilt the weft fork, the said trigger will be turned without causing the knock-off lever to be moved to stop the loom, the said slide in its said movement effecting the rocking of the said rock-shaft sufficiently to cause it by its connections with said trip to put it in operative position to be struck a blow to move the pusher, and whereby at a second outward movement of said weft fork slide by the absence of the weft as stated, the said trigger is made to act and move the knock-off lever to effect the release of the knock-off lever and the stopping of the loom, substantially as described.

18. In a loom, a pusher adapted to push a bobbin into a shuttle and cause the incoming bobbin to eject the spent bobbin from the shuttle; a lay; and its shuttle-box slotted for the discharge through it of the spent bobbin; and a connected deflector to insure the ejection of the spent bobbin point first, substantially as described.

19. In a loom the following instrumentalities, viz:—a lay its shuttle box; a shuttle; a circularly-moving feeder having a series of bobbin supports therein for the opposite ends of the bobbins, leaving the bobbins between their ends exposed to be acted upon by a pusher; and a pusher arranged between the axis of rotation of the said bobbin-feeder and the said shuttle in the shuttle-box of the lay, whereby the bobbins are removed radially from the bobbin-feeder and into a shuttle, substantially as described.

20. A rotatable bobbin feeder provided with means to hold in place independent one of another a series of bobbins, and a rotatable weft end support, combined with a weft end holder located near the center of rotation of said feeder, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES H. NORTHROP.

Witnesses:

E. D. BANCROFT,
H. F. SEARLES.