A. E. RHOADES.

FILLING EXHAUSTION INDICATING MECHANISM FOR LOOMS.

APPLICATION FILED NOV. 29, 1909.

981,112. Patented Jan. 10, 1911.

Fig. 1.

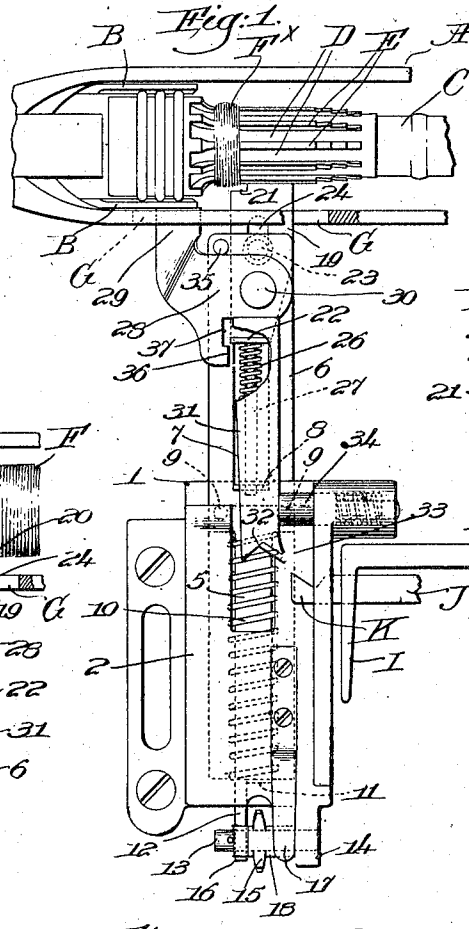


Fig. 4.

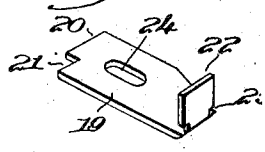


Fig. 6.

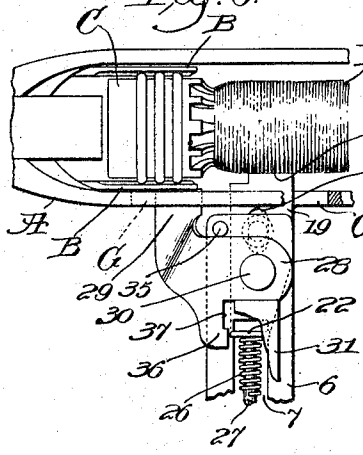


Fig. 5.

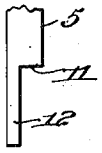


Fig. 2.

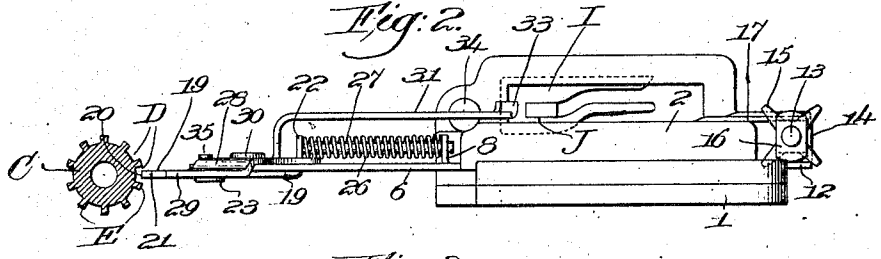
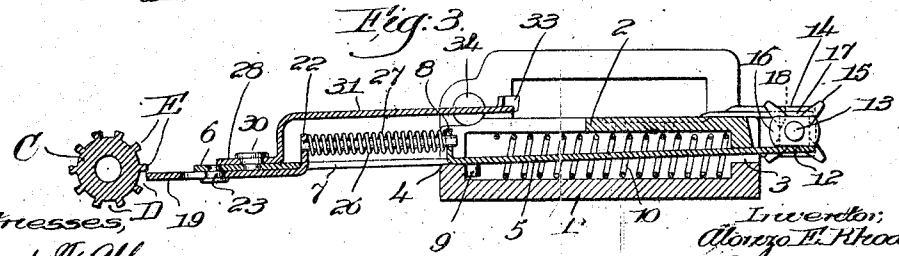


Fig. 3.



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UNITED STATES PATENT OFFICE.

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FILLING-EXHAUSTION-INDICATING MECHANISM FOR LOOMS.

981,112. Specification of Letters Patent. Patented Jan. 10, 1911.

Application filed November 29, 1909. Serial No. 530,325.

To all whom it may concern:

Be it known that I, ALONZO E. RHOADES, a citizen of the United States, and resident of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Filling-Exhaustion-Indicating Mechanism for Looms, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention has for its object the production of novel mechanism to indicate substantial exhaustion of the filling in the working shuttle of a loom and to effect automatically a change in the operation of the loom by or through such indication.

The invention relates more particularly to automatic filling replenishing looms, wherein the running filling is replenished before complete exhaustion in order to prevent blank picks, or picks of short length, from being woven into the cloth.

In my present invention I prefer to use a filling-carrier or bobbin having a series of axially-arranged depressions extending entirely around the barrel and covered by the filling until substantial exhaustion thereof, as in the patent to Northrop No. 686,903 dated November 19, 1901 but I use only one filling-impinging member or feeler, and in order to insure the entrance of the feeler into one of the depressions when the filling has been woven off sufficiently I elevate and depress the feeler automatically on alternate feeling picks. By so doing the feeler is bound to enter such exposed or uncovered depression on either one of two successive feeling picks, to thereby bring about a change in the operation of the loom, for if on one of such picks the feeler impinges on the rib between two depressions it will, on the next feeling pick, enter one of the depressions because of the change in the elevation of the feeler.

In order to obviate uncertainty of operation of the filling-exhaustion-indicating mechanism, due to variations in the size of bobbins, changes in its position in the shuttle, etc., I have devised means whereby the functional movement of the actuating member of such mechanism is prevented until the change in the operation of the loom, such as filling replenishment, is called for, said member at such time being unlocked and free to perform its functions.

The functional movement of such member is brought about by impingement thereof on means mounted on the shuttle, other than the filling, and in the present embodiment of my invention such means is one of the bobbin-holding jaws.

The lock for the actuating member is herein arranged to be controlled by the feeler, which latter intermittingly impinges upon and is moved by the filling in the shuttle until substantial exhaustion, each filling-induced movement of the feeler causing the lock to coöperate with and lock the actuating member. When such movement of the feeler ceases the lock fails to operate and the actuating member is then free to perform its proper functional movement.

As will appear the mechanism is simple and direct acting, the filling-carrier or bobbin itself is free from pressure when the actuating member performs its functions, and the part on the shuttle which coöperates therewith maintains always a fixed relation to the longitudinal axis of the bobbin, obviating uncertainty or irregularity in the operation of the mechanism as a whole.

By a special construction of the impinging edge of the feeler I am enabled to bring about the desired change in the operation of the loom when a very small portion of filling remains, thereby reducing waste very materially while preserving the continuity of the running filling.

The various novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a top plan view of the filling-exhaustion-indicating mechanism of a loom embodying my present invention, with part of a shuttle and the filling-carrier or bobbin therein, the filling being shown as substantially exhausted and the actuating member unlocked and just about to perform its functions; Fig. 2 is a left hand side elevation of the mechanism shown in Fig. 1, but with the filling-carrier in cross-section, and the shuttle omitted; Fig. 3 is a longitudinal section of the reciprocating carrier, its support, the feeler and actuating member, to illustrate more clearly certain constructional features; Fig. 4 is a perspective view of the

filling-impinging member or feeler and the connected actuator-lock; Fig. 5 is a detail in plan of the front end of the feeler-carrier; Fig. 6 is a view similar to Fig. 1 but showing the manner in which the actuating member is locked by or through the presence of a substantial amount of filling in the shuttle.

In the drawing, Figs. 1 and 6, the shuttle A of any suitable character is provided with usual holding means, such as spring jaws B, to grasp and hold the head of the removable filling-carrier or bobbin C, the latter having its barrel provided with a series of axially-arranged depressions D alternating with ribs E, and disposed entirely around the barrel, substantially as shown in Patent No. 686,903 hereinbefore referred to.

The filling completely covers the depressions, as shown at F, Fig. 6, until substantial filling exhaustion approaches, and up to the time a change in the operation of the loom is demanded, (as for instance replenishment of filling in the working shuttle) there will still remain a sufficient covering or winding of filling to prevent the entrance of a filling-impinging member or feeler into one of the depressions D.

When, however, the filling is woven off down to the residual quantity F^x, Fig. 1, which is of sufficient length to traverse the shed one or more times, said depressions are exposed beyond the residual filling F^x, so that the filling-impinging member may enter a depression, and thereby extend a greater distance into the shuttle than is possible when the depressions are covered.

In Figs. 1, 2 and 3, the filling-impinging member is just about to enter a depression, but it will be noticed that the lay can move the shuttle forward a short distance before such impinging member will contact with the bottom of the depression.

The shuttle has an elongated slot G in its front wall, through which the impinging member enters the shuttle, the outer end of the slot exposing part of the adjacent jaw B, see full and dotted lines Figs. 1 and 6.

Referring to Fig. 1, the outer end of a transmitter H is shown, having a forwardly extended part I, provided with a cam-slot, Fig. 2, through which is extended a controller J, said parts being substantially like the corresponding parts in United States Patent No. 843,249 granted February 5, 1907 to Wood and Northrop, and through such parts the action of the feeler mechanism is transmitted to effect the desired change in the loom operation.

Inasmuch as filling replenishing mechanism *per se* is well known and not of my invention it is not herein illustrated, as it may be of the character shown in either of the patents before referred to, and it will be understood that the actuation of transmitter H is herein arranged to bring about filling replenishment.

The free end of controller J is beveled at K, to more certainly engage at times an actuator, to be described, such engagement resulting in forward movement of the controller to thereby act through the slotted part I of the transmitter H and rock the latter on its fulcrum, is a well known banner.

In the present embodiment of my invention a two-part box-like support 1, 2, is in practice mounted on a fixed part of the loom opposite the feeling shuttle-box, the support having openings 3, 4 in its front and rear ends, Fig. 3, for the reception of the flat shank 5 of a reciprocating carrier 6, provided near its rear end with an elongated guide-slot 7 having an upturned and apertured abutment 8 at its front end.

Stop-lugs or pins 9, Figs. 1 and 3, on the carrier within the support serve to limit rearward movement due to the projecting spring 10, coiled about the shank 5 within the support, said spring moving the carrier and its adjuncts into the position shown in Figs. 1, 2 and 3 after a feeling stroke.

The carrier is adapted to tilt on the bottom of the opening 4, and as shown in Fig. 3 the front opening 3 is made deep enough to permit such tilting.

When the front end of the shank 5 is depressed the rear end of the carrier will be elevated, as in Fig. 2, and the rear end of the carrier will be depressed when the front end of the shank is elevated, as in Fig. 3, and the front end of the shank is cut away to leave a lateral shoulder 11 and a narrow finger 12, clearly shown in Fig. 5.

Upon a horizontal stud 13 projecting laterally from an ear 14 of the support I mount rotatably a star-wheel 15, the teeth of which project into the path of movement of the shoulder 11, and secured to or forming part of the star-wheel is a four-sided cam 16, above the finger 12, said cam being longer than it is wide, to form two opposite high portions and intermediate and opposite low portions, clearly illustrated in Figs. 2 and 3.

A leaf-spring 17 has its free end bearing on the square hub 18 of the star-wheel, to prevent overrunning and to retain the cam in a given position till moved positively therefrom.

In Figs. 1 and 2 a high part of the cam engages and depresses the finger 12, so that the rear end of the carrier will be elevated, but when said carrier is moved forward, against the pressure of its spring 10, the shoulder 11 will coöperate with the star-wheel and give it a quarter revolution, positioning the cam 16 as shown in Fig. 3, with its low part opposite the finger 12, so that on the back stroke of the carrier said finger will rise, as the rear end of the carrier is depressed by the weight of the parts thereon.

On the next forward stroke of the carrier the cam will be again turned, this time to present a high part to the finger, to depress it, so that by the means described the rear end of the carrier will be elevated and depressed in alternation, for a purpose to be described.

Upon the rear end of the carrier is slidably mounted a filling-impinging member or feeler 19, preferably made of plate metal, having its transverse impinging edge 20 cut out or notched at its outer corner, at 21, the front end of said member being reduced in width and upturned at 22 to constitute an actuator-lock.

The feeler slides longitudinally upon the bottom face of the carrier 6, being held in place thereon by a headed stud 23 whose shank is fixed in the carrier and passes loosely through a slot 24 in the feeler, the feeler being held from lateral displacement by the sides of the guide-slot 7 entering notches 25, see Fig. 4, in the base of the lock 22, the latter projecting above the carrier.

Manifestly the feeler 19 can move longitudinally upon and with relation to the carrier a distance regulated by the coöperating slot and stud 24, 23, rearward relative movement of said feeler being effected by a light spring 26 coiled around a guide-rod 27 between the lock 22 and the abutment 8, said rod being rigidly secured to the lock and sliding through the apertured abutment.

The feeler will be elevated or depressed as the rear end of its carrier 6 is elevated or depressed, so that on one feeling stroke the feeler will have its impinging edge disposed in one plane while on the next feeling stroke it will be disposed in a higher or a lower plane, as the case may be. Consequently on one of two successive feeling strokes the impinging edge 20 of the feeler will necessarily be opposite one of the depressions D in the barrel of the bobbin irrespective of the angular position of the bobbin in the shuttle.

Should the feeler always move in one plane it might happen that a dividing rib E on the bobbin would come opposite the feeler, so that the filling-exhaustion-indicating mechanism could not operate to effect the desired change in the operation of the loom.

In Fig. 2 the bobbin is shown with one of its depressions D in front of the feeler when elevated; while on the next stroke the feeler, in depressed position, might encounter the lower rib E, and in Fig. 3 I have shown a rib E opposite the elevated position of the feeler, but a depression will be opposite such feeler when lowered on the next feeling stroke. Thus in either case the operation of the exhaustion-indicating mechanism cannot be delayed in its functional operation for more than one feeling stroke, no matter what the angular position of the bobbin in the shuttle.

By the construction described a very prompt and accurate operation of the mechanism is insured at the proper time.

While there is sufficient filling present to cover the depressions D the edge 20 of the feeler 19 impinges upon such filling on every alternate forward beat of the lay, and as the lay completes its beat the feeler is first moved forward upon the carrier, compressing the light spring 26, and then the carrier and feeler complete the forward stroke as a unit. This filling-induced initial movement of the feeler operates to move the actuator-lock 22 from inoperative position, Fig. 1, forward into operative, locking position, Fig. 6, and this movement of the lock into and out of operative position occurs on every feeling pick of the loom until the filling is woven off sufficiently to expose the depressions D the full length of the impinging edge 20. At such time, however, there will still remain a portion of filling $F^{\times}$ long enough to maintain continuity of the filling when replenishment is effected, but such portion $F^{\times}$ is opposite the notch 21 and hence does not interfere with the entrance of the end of the feeler into a depression D. Consequently the feeler will not be moved forward relatively to the carrier 6, and the lock 22 will be maintained by spring 26 in its inoperative position, permitting the unlocked actuating member or actuator to perform its functional movement.

The actuator is herein shown as a substantially L-shaped piece of plate metal 28, 29, pivoted by stud 30 on the top of the carrier a short distance forward of the stud 23, the part 29 projecting rearward at one side and in the plane of the feeler 19, the body 28 being upturned and forwardly extended to present an elongated arm 31 adapted to swing laterally above the lock 22 and abutment 8. At its front end the said arm projects over the top of the member 2 of the carrier-support and it is provided with a V-shaped notch 32, the inner side of which is bent up, as at 33.

A spring-controlled plunger 34 mounted on the support slidably engages the inner longitudinal edge of the arm and tends to maintain the actuator as a whole in the position shown in Fig. 1, the body 28, of the actuator resting against a stop 35 on the carrier, so that when the latter is moved forward the actuator moves with it, its notched arm 31 clearing the beveled end K of the controller J.

Under normal conditions the actuator has no movement relative to the carrier 6, reciprocating with it as a unit, and hence there is no coöperation with the controller.

Filling-induced movement of the feeler positions the lock 22 opposite a locking ex-

tension 36 on the actuator body in front of its pivot 30, as in Fig. 6, so that the actuator is positively locked from its functional movement upon the pivot 30 as a fulcrum, and when so locked the actuator can have no movement whatever relatively to the carrier.

When the bobbin is denuded of filling opposite the impinging edge 20 of the feeler the lock 22 will not be moved forward, as just described, but is held by the action of spring 26 in its inoperative position opposite the recessed part 37 of the locking extension 36, as in Fig. 1, and as the feeler enters a depression D of the bobbin the part 29 of the actuator impinges upon the exposed jaw B in the shuttle, swinging said actuator on its pivot to perform its functional movement before the forward stroke of the carrier 6 begins. By such functional movement the notch 32 in arm 31 is positioned to coöperate with the beveled end K of the controller J, and as the lay continues its advance such movement is transmitted through the actuator to the carrier, said parts moving in unison, and engagement of arm 31 and controller J operate to rock the transmitter H and thereby effect the actuation of the filling replenishing mechanism.

It will be apparent that the functional movement of the actuator can only occur when it is unlocked, by or through cessation of filling-induced movement of the feeler on a feeling pick, and further that such functional movement is effected by the impingement of the part 29 of the actuator upon the jaw B in the shuttle, hence no jarring or shaking of the loom can under any circumstances cause premature operation of the controller J.

The functional movement of the actuator is limited by engagement of the bottom of the recess 37 with the lock 22, and immediately such engagement is effected the forward stroke of the actuator and carrier as a unit begins, the V-shaped notch 32 and the beveled part K of the controller insuring positive and complete coöperation of such parts on the forward stroke.

The upturned side 33 of the notch acts against the beveled edge of the controller to complete the coöperation of the controller and the arm 31 should the initial engagement be somewhat insecure or imperfect.

After a fresh bobbin has been inserted in the shuttle the filling-exhaustion-indicating mechanism resumes its normal operation, the plunger 34 acting through the arm 31 to return the actuator to normal position with relation to the carrier 6, said actuator being locked on each forward stroke of the carrier and unlocked on the return stroke thereof until the filling in the shuttle is substantially exhausted.

While the impinging edge 20 of the feeler projects rearward beyond the impinging part 29 of the actuator it will be remembered that the feeler has an initial forward movement upon the carrier 6 when it impinges on the filling, but as such initial movement locks the actuator premature functional movement of the latter is absolutely impossible should it accidentally impinge upon the means on the shuttle before the proper time. Hence, while any premature operation of the loom-controlling mechanism is prevented it will be evident from the foregoing description that when such mechanism should operate there will be no delay.

Various changes or modifications in construction and arrangement may be made by those skilled in the art without departing from the spirit and scope of my invention as set forth in the claims annexed hereto.

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

1. In a loom, means to control its operation, and a shuttle to contain filling, said means including two members movable in unison and also capable of relative movement, one member intermittingly impinging upon and being moved by the filling in the shuttle until substantial exhaustion thereof, a lock operatively positioned by each of such filling-induced movements to coöperate with and lock the other member but which, when filling replenishment is required, remains in inoperative position and releases and thereby permits functional movement of said second member, and means within the shuttle separate from the filling to impinge upon and effect functional movement of such second member and cause the actuation of the controlling means, when there is no filling-induced movement of the first-named member to operatively position the lock.

2. Controlling mechanism for looms, having two members one of which is intermittingly impinged upon and moved by the filling in the shuttle, a lock, filling-induced movement of such member moving said lock into position to lock the other member from functional movement, means to position the lock inoperatively and thereby permit functional movement of said latter member when filling replenishment is required, a shuttle, and means thereon to impinge on the unlocked member and effect functional movement thereof, to thereby cause the actuation of the controlling mechanism.

3. In filling-exhaustion-indicating mechanism for looms, a yieldingly-sustained member to be intermittingly impinged upon and moved by the filling in the shuttle until substantial exhaustion thereof, a second member, and means to lock it temporarily by each of such filling-induced movements of the first member, said second member never contacting with the filling but being adapted

to impinge upon and receive its functional movement from means carried by the shuttle and then only when said locking means is rendered inoperative by cessation of filling-induced movement of the first member.

4. The combination, in a loom having filling replenishing mechanism, a shuttle to contain filling, means within the shuttle separate from the filling, to be impinged upon, and means to control the time of operation of said mechanism, of a reciprocating carrier, an actuator and a feeler independently mounted thereon, and an actuator-lock on and movable with the feeler, each filling-induced feeler movement positioning said lock to engage and prevent functional movement of the actuator to actuate the controlling means, the said means within the shuttle separate from the filling coöperating with and effecting the functional movement of the actuator when unlocked, and a device acting through the feeler to maintain the lock inoperative upon predetermined exhaustion of the filling in the shuttle.

5. Controlling mechanism for looms, having two members movable in unison and also relatively to each other, a lock positioned intermittingly by filling-induced movement of one member to engage and prevent functional movement of the other member, a shuttle containing a supply of filling adapted to impinge upon and move intermittingly the lock-controlling member to lock the other member until substantial exhaustion of the filling, such latter member then being free from the control of the lock, and means separate from the filling to impinge upon the unlocked member and cause the functional movement thereof to effect the operation of the controlling mechanism.

6. In a loom, a mechanical instrumentality to effect a change in the operation thereof, and a shuttle to contain filling, said instrumentality including a member to intermittingly contact with and be moved by the filling in the shuttle until predetermined exhaustion thereof, a member never contacting with the filling and locked by movement of the first member due to contact with the filling, and means separate from the filling within the shuttle to engage and move said second member and cause the actuation of said instrumentality but only when such movement of the second member is permitted by failure of the first-named member to contact with the filling.

7. In a loom, in combination, a shuttle to contain filling, and means to effect a change in the operation of the loom upon indication of a predetermined exhaustion of the running filling, said means including two members to respectively impinge upon the filling and upon means separate therefrom within the shuttle, and a lock, intermittent impingement of one member upon the filling causing the lock to engage and lock the other member from functional movement until predetermined filling exhaustion, whereupon the lock remains inactive and impingement by the unlocked member effects functional movement thereof to cause the loom-controlling means to operate.

8. In a loom, means to indicate filling exhaustion and adapted thereupon to effect a change in the operation of the loom, said means including a reciprocating carrier, a feeler slidably mounted thereon to indicate filling exhaustion and provided with an actuator-lock, said feeler being intermittingly impinged upon and moved by the filling in the shuttle, and an actuator, pivotally mounted on the carrier, filling-induced movement of the feeler on the carrier causing the lock to engage and prevent pivotal movement of the actuator, and means within the shuttle to impinge on and rock the actuator when the latter is unlocked, the actuator-lock being positioned inoperatively when substantial exhaustion of the filling is indicated by the feeler.

9. In a loom, in combination, a shuttle to contain filling, means to indicate filling exhaustion and adapted to control the operation of the loom, said means including a reciprocating carrier, a spring-controlled feeler slidable thereon and having a lock movable with it into and out of locking position, said feeler intermittingly engaging and being moved by the filling in the shuttle, an actuator mounted to rock on the carrier and having no contact with the filling, filling-induced movement of the feeler causing the lock to engage and restrain the actuator from movement relatively to the carrier and spring-induced, return movement of the feeler withdrawing the lock from engagement with said actuator, and means on the shuttle separate from the filling to impinge upon and rock said actuator when the lock is withdrawn therefrom.

10. In a loom, in combination, a shuttle containing a supply of filling, and filling-exhaustion-indicating mechanism including a feeler to intermittingly enter the shuttle and impinge upon the filling therein, and means to vary automatically the elevation of the contacting portion of the feeler on successive impingements thereof.

11. In a loom, in combination, a shuttle containing a supply of filling, and filling-exhaustion-indicating mechanism including a feeler to intermittingly enter the shuttle and impinge upon the filling therein, and means actuated by filling-induced movement of the feeler to vary automatically the elevation of its contacting portion on successive impinging movements.

12. In a loom, in combination, a shuttle containing a supply of filling, and filling-exhaustion-indicating mechanism including

a reciprocating feeler to intermittingly impinge upon and be moved by the filling in the shuttle, a fixed support on which the feeler can tilt, and means actuated by reciprocation of the feeler to coöperate with and tilt said feeler on its support, to alternately elevate and depress the impinging end thereof.

13. In a loom, a shuttle, a filling-carrier therein having a series of axially-arranged depressions covered by the filling until substantial exhaustion thereof, filling-replenishing mechanism, and controlling means therefor including a feeler to intermittingly impinge upon the filling covering said depressions, and an instrumentality to elevate and depress the impinging end of the feeler in alternation to thereby insure the entrance of the feeler into a depression when exposed by substantial filling exhaustion.

14. In a loom, a shuttle, a filling-carrier therein having a series of axially-arranged depressions covered by the filling until substantial exhaustion thereof, filling replenishing mechanism, and controlling means therefor including a reciprocating feeler having a notched impinging edge to intermittingly impinge upon and be moved by the filling covering said depressions until substantial exhaustion of the filling, the impinging edge of the feeler at such time entering a depression while a portion of filling remains opposite the notch and an instrumentality to elevate and depress the impinging edge of the feeler in alternation, to insure the entrance of said edge into an exposed depression.

15. In a loom, a shuttle, a filling-carrier therein having a series of axially-arranged depressions covered by the filling until substantial exhaustion thereof, filling replenishing mechanism, and controlling means therefor including a reciprocating feeler to intermittingly impinge upon and be moved by the filling covering said depressions, an actuator, a lock controlled by such feeler movement to restrain the actuator from functional movement, an instrumentality to elevate and depress the impinging end of the feeler in alternation, to insure the entrance thereof into a depression when uncovered by substantial filling exhaustion, and means within the shuttle other than the filling to impinge upon and effect functional movement of the actuator when unlocked by cessation of filling-induced movement of the feeler.

16. In a loom, in combination, a running shuttle, means to control the operation of the loom, including a spring-controlled reciprocating carrier, a feeler slidable on the latter, a light spring to project the feeler, said feeler intermittingly engaging and being moved upon the carrier by the filling within the shuttle, to first compress the feeler-spring and then retract the carrier, an actuator pivoted on the carrier, a lock positioned by filling-induced movement of the feeler to engage and hold the actuator from pivotal movement, and inoperatively positioned by the feeler-spring to release the actuator, and means within the shuttle separate from the filling to immediately impinge upon and effect functional movement of said actuator and retract the carrier when filling-induced movement of the feeler ceases, to cause the actuation of the loom controlling means.

17. A loom having, in combination, a feeler entering the shuttle, an actuator, an actuator-lock controlled by the feeler to prevent the actuator from performing its functions until that part of the filling-carrier registering with the feeler is denuded of its filling, a spring to render inoperative said actuator-lock and means within the shuttle to engage and cause the actuator to perform its functions when unlocked.

18. A loom having, in combination, an actuator-lock and a connected feeler which enters the shuttle to coöperate with the filling therein, such coöperation operatively positioning said lock on each feeling pick, means to return the actuator-lock to inoperative position after it has been operatively positioned, an actuator, loom controlling means coöperating solely with the actuator when unlocked and abnormally positioned, and means carried by the shuttle to engage and abnormally position the unlocked actuator.

19. An automatic filling replenishing loom having, in combination, a shuttle having a filling-carrier provided with axial depressions covered by the filling until substantial exhaustion thereof, a feeler having a reciprocating movement only, and adapted to enter the shuttle and impinge upon the filling, an actuator having a normal reciprocating movement and an abnormal swinging movement, a lock connected with the feeler and moved by filling-induced movement of the feeler to lock said actuator from swinging movement, a controlling device for the filling replenishing mechanism set in action by engagement with said actuator when it is swung, and means to engage and swing the actuator when unlocked by entrance of the feeler into an uncovered depression on the filling-carrier.

20. An automatic filling replenishing loom having, in combination, a shuttle having a filling-carrier provided with axial depressions covered by the filling until substantial exhaustion thereof, a feeler having a reciprocating movement only, and adapted to enter the shuttle and impinge upon the filling, an actuator having a normal reciprocating movement and an abnormal swinging movement, a lock connected with the feeler and moved by filling-induced movement of the feeler to lock said actuator from swing-

ing movement, a controlling device for the filling-replenishing mechanism set in action by engagement with said actuator when it is swung, and supporting means for the filling-carrier, to engage and swing the actuator when unlocked by the entrance of the feeler into a depression of the filling-carrier uncovered by denudation of the filling.

21. A loom having, in combination, a shuttle to contain filling, an actuator adapted when unlocked to impinge upon and be swung by means in the shuttle, a loom controlling device coöperating only with the actuator when so swung, an actuator-lock operatively positioned by the filling in the shuttle on each feeling pick until substantial exhaustion of such filling, and means to return the actuator-lock to inoperative position after it has been operatively positioned.

22. A loom having a feeler and an actuator movable relatively thereto, the feeler entering the shuttle to coöperate with the filling therein and the actuator to coöperate at times with and be moved by the bobbin-holding jaws in the shuttle, in combination with a lock which normally is moved intermittingly by the feeler into position to lock the actuator but, when the filling demands replenishment, fails to be moved to locking position and thereby permits the functional movement of the actuator by coöperation with the bobbin-holding jaws, and the shuttle provided with said jaws.

23. A loom having a reciprocating feeler and a swinging actuator, a common support on which they are independently movable, and a shuttle, the feeler coöperating with the filling therein and the actuator being at times engaged and swung by other means mounted on the shuttle, in combination with a lock movable with the feeler and thereby intermittingly positioned to lock the actuator, but which is inoperatively positioned by the feeler upon substantial exhaustion of the filling in the shuttle, to thereby release the actuator and permit functional movement thereof by coöperation with the means on the shuttle.

24. A loom having a shuttle provided with bobbin-holding means exposed at one side of the shuttle, in combination with a feeler to enter the shuttle and be moved intermittingly by the filling therein until substantially exhausted, an actuator to at times engage said holding means and be moved thereby to perform its functions, and an actuator-lock which is positioned temporarily and operatively by each filling-induced movement of the feeler to lock the actuator from functional movement, movement of the actuator to perform its functions being permitted by said lock only when filling-induced movement of the feeler ceases.

25. Filling-exhaustion-indicating mechanism for looms, comprising a reciprocating feeler and its carrier, a support for and upon which the carrier can move longitudinally and also tilt, a rotating cam to coöperate with and tilt the carrier on alternate filling-induced strokes, to thereby elevate and depress the feeler, and means operated by longitudinal movement of the feeler-carrier to rotate said cam step by step, combined with a shuttle, and a filling-carrier therein having axial depressions covered by the filling until substantial exhaustion thereof, the raising and lowering of the feeler in alternation insuring the entrance thereof into a depression when uncovered by withdrawal of the filling.

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

ALONZO E. RHOADES.

Witnesses:
G. L. Bell,
E. D. Osgood.