No. 803,654. PATENTED NOV. 7, 1905.

E. S. WOOD & J. NORTHROP.

FILLING EXHAUSTION INDICATING MECHANISM FOR LOOMS.

APPLICATION FILED MAY 25, 1905.

2 SHEETS—SHEET 1.

Fig: 1.

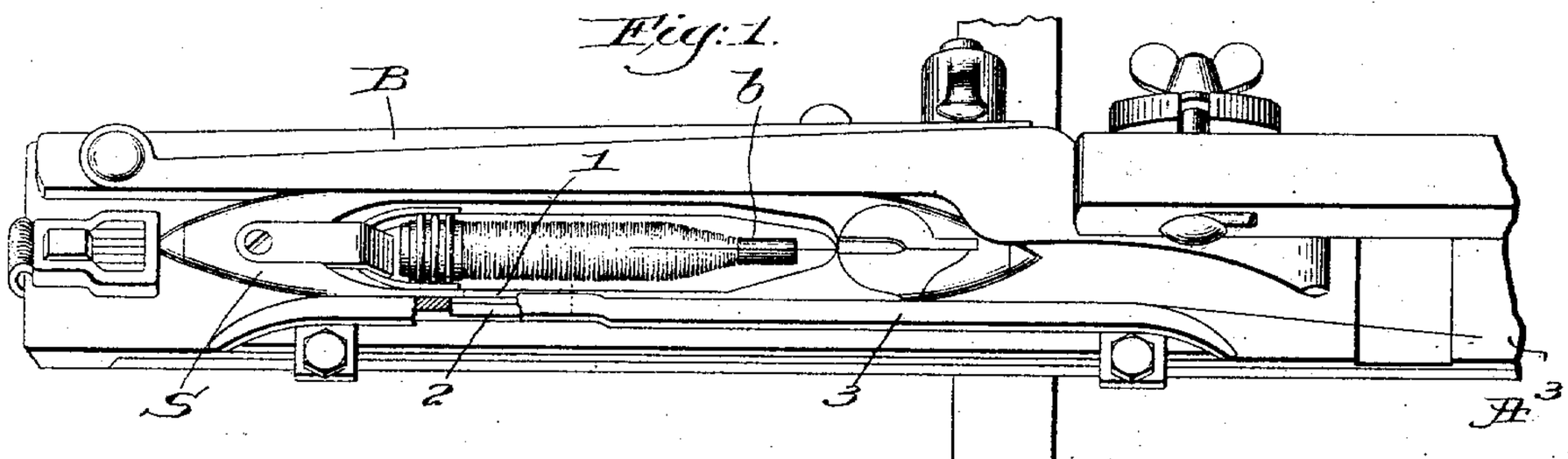
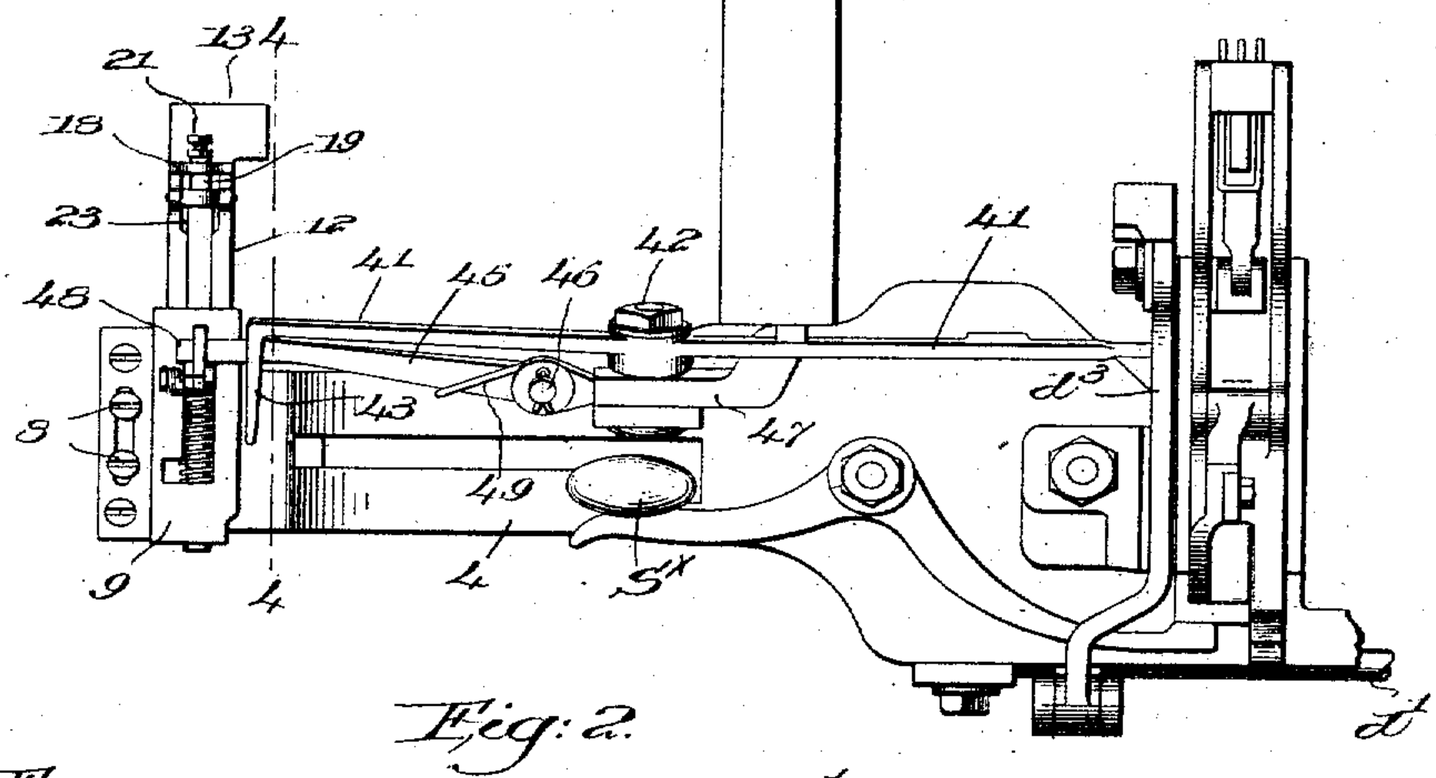
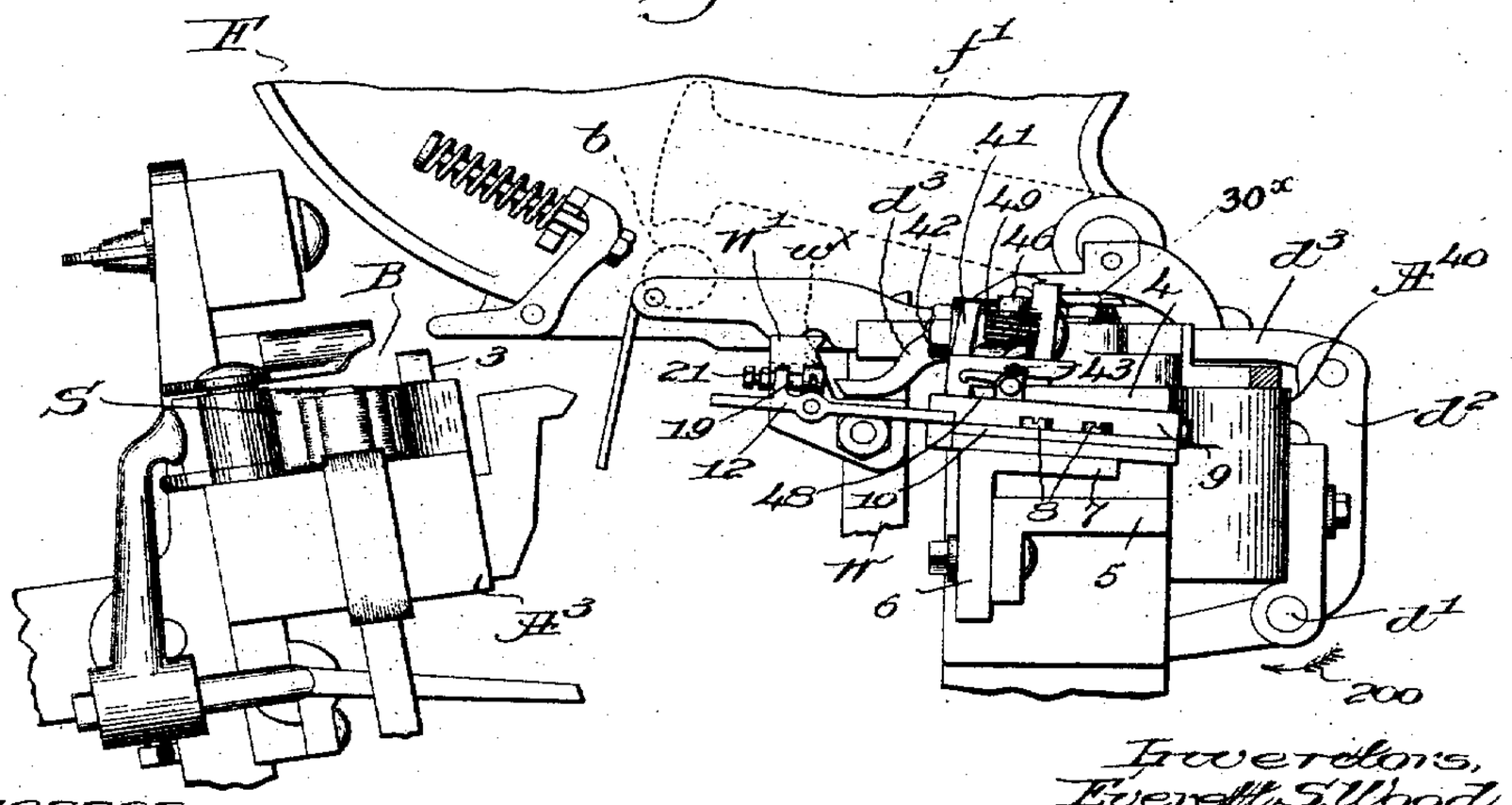


Fig: 2.





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2 SHEETS—SHEET 2.

Fig: 3.

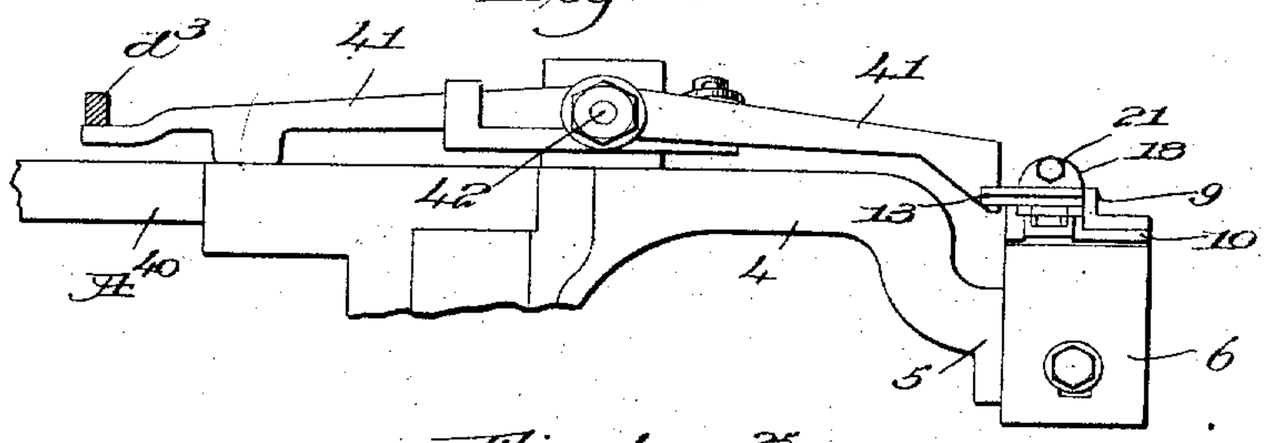


Fig: 4.

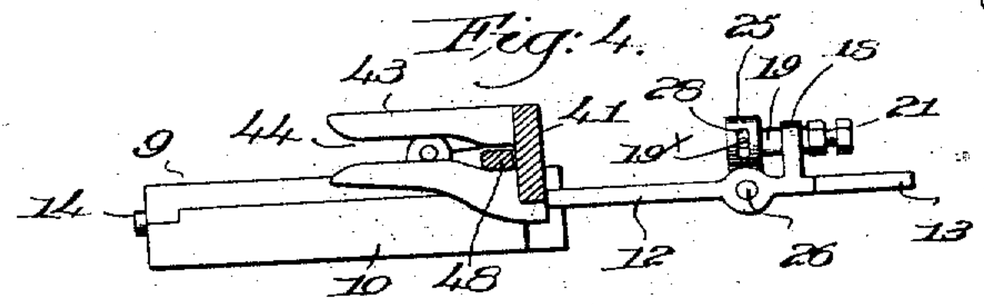


Fig: 5.

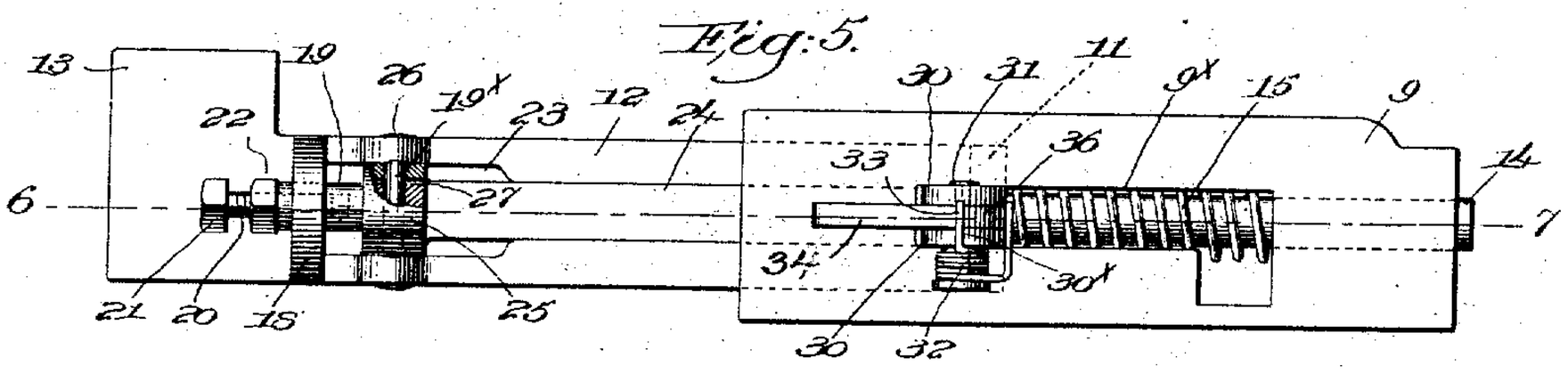


Fig: 6.

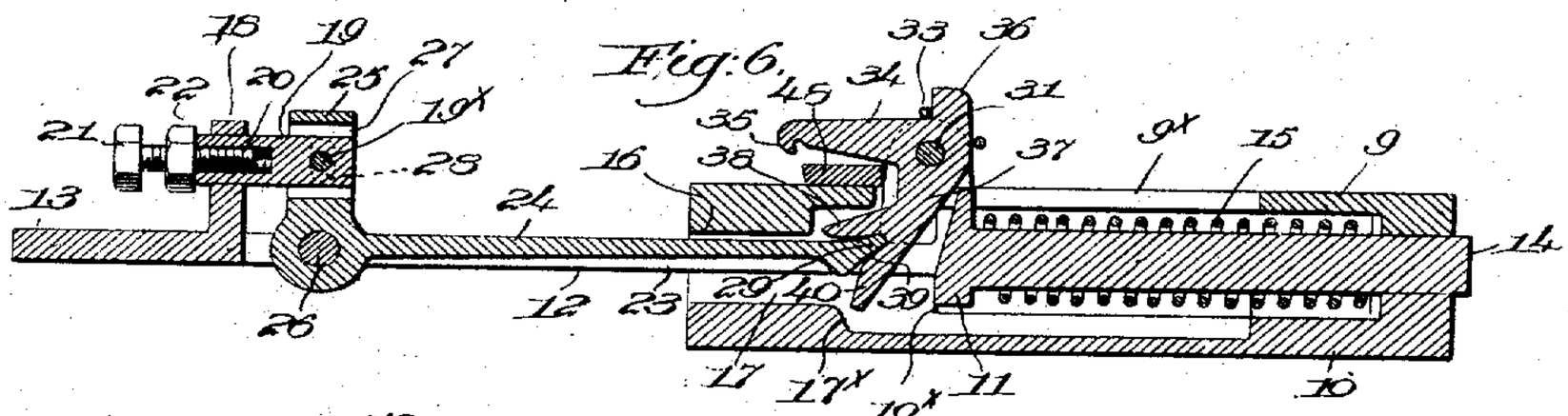


Fig: 7.

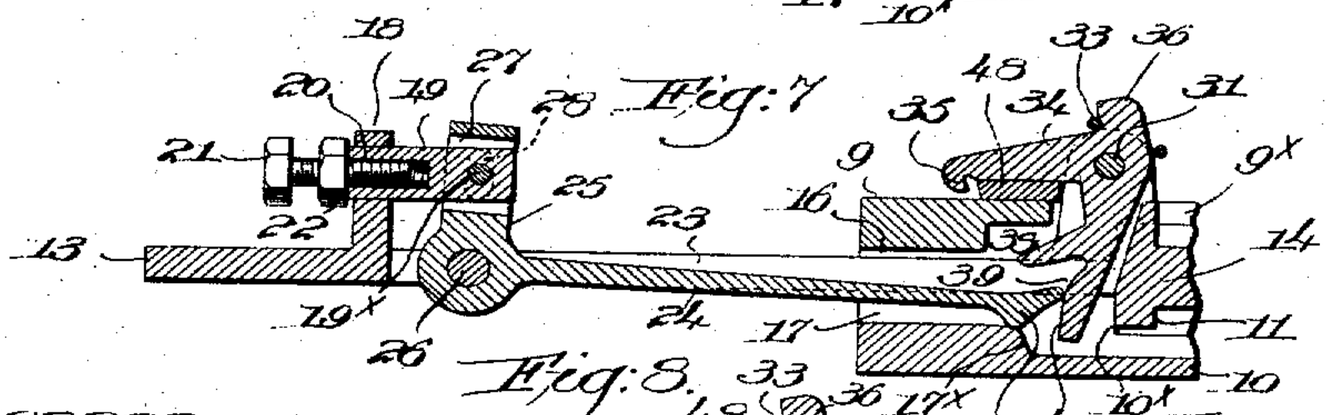
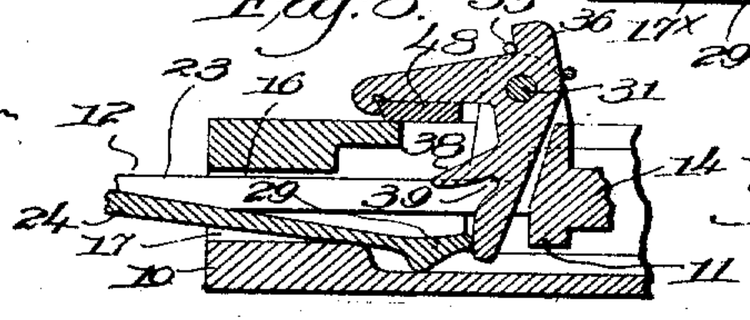


Fig: 8.



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UNITED STATES PATENT OFFICE.

EVERETT S. WOOD AND JONAS NORTHROP, OF HOPEDALE, MASSACHUSETTS, ASSIGNORS TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

FILLING-EXHAUSTION-INDICATING MECHANISM FOR LOOMS.

No. 803,654. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed May 25, 1905. Serial No. 262,161.

To all whom it may concern:

Be it known that we, EVERETT S. WOOD and JONAS NORTHROP, citizens of the United States, and residents 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 drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object the production of novel filling-exhaustion-indicating mechanism for looms whereby a change in the operation of the loom is effected automatically when the running filling has become substantially exhausted or woven off to a predetermined extent. Such change in the operation of the loom may be automatic stoppage, or it may be the actuation of a suitable instrumentality to effect automatic replenishment of the running filling without loom-stoppage, one form of replenishing instrumentality being shown in United States patent to Northrop No. 529,940, wherein the running shuttle is automatically provided with fresh filling while the loom continues in action.

Our present invention is illustrated herein in connection with an automatic filling-replenishing loom of the before-mentioned "Northrop" type.

In the practical embodiment of our present invention as herein illustrated and described the filling-exhaustion-indicating mechanism comprehends two movable members, one of which intermittingly impinges on and is moved by means within the shuttle until the running filling is exhausted to a predetermined extent, the other member being then movable longitudinally on said first-named member, an actuator on the latter operatively positioned by or through such longitudinal movement, and means to immediately and positively lock the actuator in its operative position. The member which controls the operative positioning and the locking of the actuator is movable with relation to the other member only when the predetermined exhaustion of the filling permits and then by impingement on a vibrating part of the loom, such as the shuttle, and when the actuator is operatively positioned the movement of the member on which it is mounted effects the actuation of a mechanism or instrumentality which controls the operation of the loom. Inasmuch as the actuator is locked immediately upon its movement into operative position, the actuation of the loom-controlling instrumentality is assured even should there be a temporary disengagement of the vibrating part of the loom and the member which is moved by impingement thereon. These and other novel features of our 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 a portion of the left-hand side of a loom with one embodiment of our invention applied thereto, the running shuttle being in position for coöperation with the filling-exhaustion-indicating mechanism on the forward beat of the lay. Fig. 2 is a left-hand side elevation of the mechanism shown in Fig. 1, a portion of the automatic filling-replenishing mechanism at the opposite side of the loom being shown. Fig. 3 is a rear elevation of the transmitter intermediate the feeling devices and the replenishing mechanism. Fig. 4 is an inner side elevation, taken at the left of the line 4 4, Fig. 1, of the feeling devices and a portion of the transmitter and its controller. Fig. 5 is a greatly-enlarged top plan view, partly broken out, of the filling-impinging member or feeler, the parts mounted thereon, and the stand or casing in which said member is yieldingly sustained. Fig. 6 is a longitudinal section thereof on the line 6 7, Fig. 5, all of the parts being shown in their normal relative positions, the actuator, to be referred to, being inoperatively positioned. Fig. 7 is a similar view on said line 6 7, Fig. 5, but showing the actuator in its operative position and the means for locking it therein just before the active stroke of the supporting member begins; and Fig. 8 is a sectional detail showing the slight change in the relative position of the locking means after the active stroke has commenced.

The filling-feeder F, Fig. 2, on the breast-beam A^{40}, the transferrer f' to transfer filling carriers or bobbins b one by one from the feeder to the automatically self-threading shuttle S, the controlling rock-shaft d', having fast upon it an upturned arm d^2, pivotally connected with the rearwardly-extended latch d^3, and the weft-hammer W, with which

the latch at times coöperates, may be and are all of well-known construction and operate in a manner familiar to those skilled in the art. When the rear end of the latch enters the path of the head W′, it enters a recess $w^{\times}$, (see dotted lines, Fig. 2,) and by the forward stroke of the weft-hammer the latch is pushed forward, acting through arm d^2 to turn the rock-shaft d' in the direction of arrow 200 to effect the operation of the replenishing mechanism, substantially as in the Northrop patent referred to. The latch, weft-hammer, rock-shaft, and intervening connections constitute controlling means for the loom and in the present instance govern the time of operation of the replenishing mechanism.

As is usual in so-called "feeler-looms," the shuttle S is shown in Fig. 1 as having an opening 1 in its side wall to register with the usual opening 2 in the front wall 3 of the shuttle-box B when the shuttle is properly boxed therein. The notched holding-plate 4 for the shipper $S^{\times}$ (omitted in Fig. 2) is depressed at 5 and supports a vertically-adjustable bracket 6, having an inclined top 7, on which is adjustably secured by screws 8 a casing or feeler-stand 9 10, substantially as in our United States Patent No. 789,472, dated May 9, 1905, the inclination of the stand enabling the feeler to move in a path closely coincident with the path of the swinging lay A^3 for the reasons set forth in said patent. The two parts of the stand are chambered out internally to receive the front end of the feeler, which forms one member of the filling-exhaustion-indicating mechanism, said member being shown herein as a flat elongated metallic plate 12, laterally enlarged at its rear end to form a head 13 and having a transverse portion 11 to slide freely within the chambered stand. A preferably cylindrical shank 14 extends forward from the enlargement 11 and slides freely through an opening in the front of the stand, a spring 15, coiled around the shank, (see Figs. 5 and 6,) moving the feeler member rearward into the position shown in said figures, shoulders $10^{\times}$ on the stand limiting such movement by cooperation with the enlargement 11. The flat body 12 is slidably supported and guided in the opening 16 in the rear end of the stand, and the bottom of the opening is longitudinally and centrally deepened, as at 17, Figs. 6 to 8, leaving a shoulder $17^{\times}$ at its forward end, to be again referred to.

An upright transverse bearing 18 is rigidly secured to or forms part of the member 12 adjacent its head 13 to slidably support a shuttle-bunting or shuttle-actuated member 19, parallel to the feeler member and movable with it and also longitudinally relatively thereto, said member 19 having its rear end internally threaded to receive the threaded shank 20 of a bunter 21, thus adjustably held in position and secured in adjusted position by a suitable check-nut 22.

From the bearing 18 forward to the enlargement 11 the flat body 12 is shown as centrally and longitudinally slotted at 23 to receive the long arm or extension 24 of a lever-like device or bell-crank fulcrumed on the body 12 by a transverse pin 26, the short arm 25 of said device being upturned and recessed at 27 to receive loosely the front end of the member 19. A cross-pin $19^{\times}$ on the latter enters elongated slots 28 in the sides of the recess 27, so that sliding movement of the member 19 in its bearing in parallelism with the feeler member will rock the bell-crank on its fulcrum 26. Owing to the difference in the length of the lever-arms 24 and 25, a very slight longitudinal movement of the member 19 will impart a greatly-amplified movement to the extremity of the arm 24, such extremity being enlarged, as at 29, Figs. 6, 7, and 8.

We have herein provided the feeler member with upturned parallel ears 30 at the front end of the slot 23 and projecting freely through an elongated opening $9^{\times}$ in the top member 9 of the stand, and between the ears an actuator is fulcrumed at 31, the fulcrum-pin being extended beyond one ear to receive a coiled spring 32, one end thereof being held against the front of the ear and its free end 33 crossing the actuator and when at rest bearing against a shoulder $30^{\times}$ on the ear adjacent the spring. The actuator 34 is made as a flat plate having a downturned hook 35 and projecting above the rear end of the stand, the actuator projecting toward the rear of the loom, and above the fulcrum 31 the actuator is upturned at 36 to be engaged by the end 33 of the spring. The latter is so wound that normally the actuator is held elevated (see Fig. 6) in inoperative position. A depending extension or foot 37 of the actuator is carried down between the ears 30 into the stand and through the feeler-slot 23, the rear edge of the foot being shaped to present a toe 38 and a cam-face below it, said cam-face having a curved operating portion 39 and a substantially flat locking portion 40 below. The toe lies above the enlargement 29 on the lever extension or arm 24, and the cam part depends in front of such enlargement, the relative position of the parts under normal conditions being shown in Fig. 6, and at such time the extension 24 is elevated and the bunter member 19 is in its rearmost position relatively to the feeler. The enlargement 29 is so shaped as to lie normally in the crotch between the toe 38 and the operating portion 39 of the cam-face, and when so positioned the member 19, bell-crank 24 25, and actuator 34 all move in unison with the feeler proper and are relatively immovable. This relative quiescence of the parts continues so long as there is more than a predetermined amount of filling in the shuttle, the impingement of the feeler-head 13 upon the filling

moving the feeler forward, compressing the spring 15, before the shuttle-wall can impinge upon the bunter 21 on the member 19, so that there will be no relative movement of the connected feeler members 12 and 19, the spring 32 acting to hold the actuator, bell-crank, and member 19 quiescent, (with respect to the feeler proper, 12.)

It is to be understood that the head 13 passes through the opening 2 in the box-wall on each beat up and through the aperture 1 in the shuttle-wall on each alternate beat up of the lay. When, however, substantial exhaustion of the filling in the shuttle permits the feeler to enter the shuttle a predetermined distance, the diminution of the yarn mass will then be great enough to permit impingement of the bunter 21 upon the shuttle-wall before the feeler-head engages the filling, whereupon the member 19 will be moved forward in its bearing 18 parallel to the feeler before the active or forward stroke of the feeler begins. Such movement of the shuttle-actuated member immediately rocks the lever-like device 24 25, and the arm 24 is depressed from the position shown in Fig. 6 to that shown in Fig. 7, the enlargement 29 wiping over the operating portion 39 of the cam-face on the actuator-foot and moving the actuator 34 into operative position, the completion of such movement of the enlargement 29 carrying it from the cam portion 39 to the locking portion 40, (see Fig. 7,) locking the actuator positively in its operative position. At such time the enlargement 29 is brought to rest upon the bottom of the recess 17 just at the top of the shoulder $17^{\times}$, and the active stroke of the feeler now begins by virtue of the force transmitted through the shuttle-wall to the member 19 and operatively-connected parts. Immediately the enlargement 29 passes beyond the shoulder $17^{\times}$ and the shuttle-pressure lowers the enlargement into the position shown in Fig. 8, positively locking the parts in such position during the remainder of the stroke, the extension 24 being then on dead-center, the actuator being locked by the continued coöperation of the enlargement 29 and the locking portion 40 of the cam. By thus providing for the locking of the actuator contemporaneously with its operative positioning and its retention in locked condition no change can take place in the relative position of said actuator should the feeler device jump forward and temporarily separate the shuttle-wall and the bunter, and the mechanism must necessarily operate as designed. The movement of the member 19 in parallelism with the feeler by pivotally connecting it with the lever-like device obviates any tendency to prevent the proper movement of such member 19 when engaged by the shuttle-wall. Were such member rigidly connected with the lever-like device, the bunter would slide upon the shuttle-wall when the said lever-like device turned or rocked on its fulcrum, and the friction between the shuttle-wall and bunter would be so great as to delay or altogether prevent the movement of the lever-like device, thus interfering with the proper operation of the feeler device. This is particularly true should the bunter wear into the shuttle-wall at all or if the wall should have a depression or unevenness of surface of any kind at the point of contact. With the construction shown there cannot be any movement of the bunter along the shuttle-wall, and hence the trouble before mentioned is absolutely and completely obviated.

By making the lever-like device light in weight and locating its fulcrum 26 very close to the center of gravity thereof and within the path of movement of the feeler 12 there is practically no tendency to move said device by momentum, and a very light spring 32 is amply sufficient to retain the parts in normal position and to return them thereto after relative movement of the feeler members hereinbefore described. So long as there is sufficient filling in the shuttle to impart movement to the feeler proper by impingement thereon the actuator and the other parts mounted on the feeler remain relatively quiescent, the actuator being inoperatively positioned and so held, and consequently no change in the operation of the loom can be effected until just the desired point of exhaustion of filling is attained. Adjustment of the bunter regulates with great accuracy and closeness the quantity of filling remaining at such time, the indicating mechanism being also adjusted thereby for bobbin diameter and width of shuttle.

Means for effecting a change in the operation of the loom by or through forward movement of the operatively-positioned actuator will now be described.

A transmitter 41 is fulcrumed on a stud 42 substantially parallel to the path of movement of the feeler, the inner end of the transmitter extending beneath the latch d^3 and normally sustaining it in inoperative position, and at its opposite outer end the transmitter is bent laterally to form an upright ear 43 (see Figs. 1, 2, and 4) and having a cam-slot 44, substantially as in our patent hereinbefore referred to. A controller for the transmitter is arranged in positive and sliding connection therewith and is shown as an arm 45, fulcrumed on an upright stud 46 on a bracket 47, rigidly supported on the holding-plate 4, the free end of the controller passing through the cam-slot 44 and across the top of the feeler-stand. The extremity 48 of the controller passes under the actuator 34, and it is below the normal path of movement of the hook 35 thereof, as in Fig. 6, and preferably both hook and rear edge of the foot are slightly beveled to secure a firm contact when in operative engagement, as in Fig. 8. A spring

49 normally holds the controller-foot in the low or inner end of the cam-slot 44, as shown in Fig. 4, and movement of the controller to the high or outer end of such slot will manifestly depress the adjacent end of the transmitter, rocking the latter on its fulcrum 42 and moving the latch d^3 into position to be engaged by the weft-hammer W, as hereinbefore explained. So long as the actuator 34 is inoperatively positioned the reciprocation of the feeler device will move said actuator back and forth above the controller-foot and no cooperation therewith can take place. When, however, the exhaustion of filling reaches the desired point, the actuator is operatively positioned and instantly locked, as has been described, and then the foot 48 will be directly in the path of the hook 35, as shown in Fig. 7, before the active stroke of the feeler has begun. Consequently as the active stroke is effected by the forward movement of the lay the actuator and controller positively coöperate and the free end of the controller is moved forward as the stroke of the feeler is completed. Thereby the transmitter is rocked on its fulcrum, the controller moving from the inner toward the outer end of the cam-slot 44, and the operation of the controlling means or instrumentality for the loom will be effected. The locking of the actuator not only insures the actuation of the desired instrumentality, as described, but it also serves to hold down the free end or foot 48 of the controller as the latter is moved outward, obviating the necessity of a fixed guard therefor. After the active stroke of the feeler the spring 15 effects the return stroke as the lay swings back, and as the enlargement 29 engages the shoulder $17^{\times}$, which is slightly inclined, as shown, it is thrown above the position shown in Fig. 7 and returned to the control of the spring 32, so that the latter restores the actuator to inoperative position and resets the member 19 as the shuttle-wall recedes from the bunter.

The sliding positive connection between the transmitter and the controller is not broadly claimed herein; but it is illustrated in connection with the novel portions of our present invention as an efficient and desirable mechanism for use in connection therewith.

Various changes or modifications may be made by those skilled in the art without departing from the spirit and scope of our invention, one practical and efficient embodiment whereof is herein shown and described.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a filling-exhaustion-indicating mechanism for looms, the combination with a feeler adapted to intermittingly impinge upon and be moved by means in the shuttle, and an actuator mounted on and movable relatively to the feeler, of means to effect such relative movement of said actuator when the feeler passes a predetermined distance into the shuttle, an instrumentality the actuation whereof is caused by or through the feeler upon such change in the position of the actuator, and means to lock the actuator in its changed position until actuation of said instrumentality is assured.

2. In a filling-exhaustion-indicating mechanism for looms, the combination with a yieldingly-sustained feeler adapted to be impinged upon and intermittingly moved by the filling in the shuttle, an actuator mounted on and movable relatively to the feeler, and an operatively-connected bunter to engage the shuttle and effect such relative movement of the actuator when the filling in the shuttle is substantially exhausted, of an instrumentality the actuation whereof is caused by or through the feeler upon such change in the position of the actuator, and means to positively lock the actuator in its changed position until the actuation thereof is assured.

3. In a filling-exhaustion-indicating mechanism for looms, the combination with a feeler adapted to intermittingly impinge upon and be moved by means in the shuttle, and an actuator mounted on and movable relatively to the feeler, of an instrumentality whose actuation is effected by or through the actuator when operative, means to render the actuator operative when the feeler passes a predetermined distance into the shuttle, and means to automatically lock the actuator in operative position independently of said instrumentality until the actuation thereof has been assured.

4. In a filling-exhaustion-indicating mechanism for looms, the combination with a yieldingly-sustained feeler adapted to be impinged upon and intermittingly moved by the filling in the shuttle, an actuator mounted on and movable relatively to the feeler, and means to engage the shuttle and effect such relative movement of the actuator when the filling in the shuttle is substantially exhausted, of an instrumentality the actuation whereof is caused by or through the feeler upon such change in the position of the actuator, and means to positively lock the actuator in such changed position until the actuation thereof has been initiated.

5. In a filling-exhaustion-indicating mechanism for looms, two connected members relatively movable in parallelism, one of which is moved by impingement upon the filling within the shuttle and the other relatively to the first-named member by impingement upon the shuttle when the filling is exhausted to a predetermined extent, an instrumentality the operation of which is effected by or through the filling-actuated member and which is dependent upon the relative movement of the shuttle-actuated member, and means to positively retain said latter member in its changed position long enough to insure the actuation of said instrumentality.

6. In a filling-exhaustion-indicating mechanism for looms, two connected members relatively movable in parallelism, one of which is moved by impingement upon the filling within the shuttle and the other relatively to the first-named member by impingement upon the shuttle when the filling is exhausted to a predetermined extent, an actuator on the first-named member operatively positioned by the relative movement of the shuttle-actuated member, an instrumentality the actuation of which is caused by coöperation with the actuator when operatively positioned, and means to automatically lock the actuator in such operative position independently of said instrumentality and until actuation thereof is initiated.

7. In a filling-exhaustion-indicating mechanism for looms, two connected members relatively movable in parallelism, one of which is moved by impingement upon the filling within the shuttle and the other relatively to the first-named member by impingement upon the shuttle when the filling is exhausted to a predetermined extent, an actuator on the first-named member operatively positioned by the relative movement of the shuttle-actuated member, an instrumentality the actuation of which is caused by coöperation with the actuator when operatively positioned, means to positive lock the actuator in such operative position when moved thereinto by or through relative movement of the shuttle-actuated member, and a separate device to release the actuator when actuation of said instrumentality has been effected.

8. In a filling-exhaustion-indicating mechanism for looms, two connected and relatively movable members one of which is moved by impingement upon the filling in the shuttle and the other relatively to the first-named member by impingement upon the shuttle when the filling is substantially exhausted, an actuator on the first-named member and rendered operative by relative movement of the shuttle-actuated member, an instrumentality whose actuation is effected by coöperation with the operatively-positioned actuator, means to lock the actuator when so positioned, and a positively-acting device to release the actuator when actuation of said instrumentality has been effected.

9. In a filling-exhaustion-indicating mechanism for looms, the combination with a yieldingly-sustained feeler adapted to be impinged upon and intermittingly moved by the filling in the shuttle, a normally inoperative actuator thereon, means to move the actuator into operative position when the filling in the shuttle is substantially exhausted, an instrumentality the actuation of which is effected by coöperation with the operatively-positioned actuator, and means independent of said instrumentality to lock the actuator in operative position and retain it in such position until the actuation of said instrumentality is assured.

10. In a filling-exhaustion-indicating mechanism for looms, the combination with a yieldingly-sustained feeler adapted to be impinged upon and intermittingly moved by the filling in the shuttle, a movable actuator thereon, means to move it into operative position when the filling in the shuttle is substantially exhausted, an instrumentality, including a controller adapted to coöperate with the actuator when the latter is operatively positioned, to effect a change in the operation of the loom, and means independent of the controller to lock the actuator in operative position in engagement with the controller and to retain it locked until the actuation of said instrumentality has been initiated by or through the controller.

11. In a loom, a shuttle to contain a supply of filling, filling-replenishing mechanism, and means to control the time of its operation, combined with a reciprocating feeler, an actuator pivotally mounted thereon, filling-induced movement of the feeler preventing cooperation of the actuator and said controlling means until predetermined exhaustion of the filling in the shuttle, and means to operatively position the actuator and immediately lock the same in operative position upon such exhaustion of the filling.

12. A controlling mechanism for looms, having two members adapted to be impinged upon, one member being movable upon and in parallelism with the other member, an actuator mounted on the latter member, means for impinging on the said member to thereby move it and the actuator, means, when exhaustion of the filling in the shuttle permits, for impinging first on the other member, moving it longitudinally and operatively positioning the actuator, whereby movement of said actuator in unison with the member on which it is mounted will cause the actuation of the controlling mechanism, and separate means to automatically lock the actuator in operative position.

13. In filling-exhaustion-indicating mechanism for looms, in combination, a feeler adapted to intermittingly impinge upon and be moved by means within the shuttle, a member mounted on the feeler and adapted to be moved longitudinally on and in parallelism with the feeler when the latter passes a predetermined distance into the shuttle, an actuator on the feeler and operatively positioned by such longitudinal movement of said member, means to lock said actuator when operatively positioned, a transmitter, a relatively movable controller therefor, and a cam on one and a cooperating follower on the other, the movement of the actuator into operative position causing it to coöperate with the controller to act through the cam and follower connection to effect a positive and definite movement of the

transmitter, the locking of the actuator being effected simultaneously with its movement into operative position independently of the controller.

14. In filling-exhaustion-indicating mechanism for looms, in combination, a feeler adapted to intermittingly impinge upon and be moved by means within the shuttle, a member mounted on the feeler, and adapted to be moved longitudinally on and in parallelism with the feeler when the latter passes a predetermined distance into the shuttle, an actuator on the feeler and operatively positioned by such longitudinal movement of said member, means acting contemporaneously with operative positioning of the actuator to lock it in such position, a transmitter, a relatively movable controller having a positive, sliding connection therewith, to positively effect its movement, the movement of the feeler causing coöperation of the operatively-positioned actuator and the controller to thereby effect the operation of the transmitter, locking of the actuator being effected independently of the controller, and means to release the actuator after the operation of the transmitter.

15. In a loom, means to control its operation, including a transmitter, and a positively-coöperating controller, combined with a member adapted to be moved longitudinally by the impingement thereon of the shuttle, a feeler to intermittingly engage the filling in the shuttle and prevent longitudinal movement of said member until exhaustion of the filling to a predetermined extent, an actuator on the feeler, connections between the actuator and said member whereby longitudinal movement of the latter effects coöperation of the actuator and controller, to cause the operation of the controlling means for the loom by or through the transmitter, and means independent of the controller to lock the actuator in operative position.

16. In filling-exhaustion-indicating mechanism for looms, two connected and relatively movable members one of which is moved by impingement upon the filling within the shuttle and the other longitudinally on the first-named member by impingement on the shuttle upon predetermined exhaustion of filling therein, mechanism the operation of which is effected through the longitudinal movement of the shuttle-actuated member, a transmitter intermediate such mechanism and said connected members, a controller operatively connected with the transmitter, a hooked actuator on the filling-actuated member and overhanging the controller, longitudinal movement of the shuttle-actuated member causing the actuator to coöperate with and move the controller, and means independent of the latter to lock said actuator in coöperating position with the controller until movement thereof to operate the transmitter has been effected.

17. In filling-exhaustion-indicating mechanism for looms, a yieldingly-sustained feeler adapted to intermittingly impinge upon and be moved by the filling in the shuttle, a member slidably mounted on the feeler and adapted to be moved longitudinally thereon when the feeler passes a predetermined distance into the shuttle, an actuator fulcrumed on the feeler, means intermediate the slidable member and the actuator to operatively position the latter and lock it in such position by or through longitudinal movement of said member relatively to the feeler, and an instrumentality the actuation whereof is effected by or through coöperation with said actuator when operatively positioned.

18. In filling-exhaustion-indicating mechanism for looms, a yieldingly-sustained feeler adapted to intermittingly impinge upon and be moved by the filling in the shuttle, a member slidably mounted on the feeler and adapted to be moved longitudinally thereon when the feeler passes a predetermined distance into the shuttle, an adjustable bunter on said member, an actuator fulcrumed on the feeler, means intermediate said slidable member and the actuator to operatively position the latter and lock it in such position upon longitudinal movement of the said member on the feeler, and an instrumentality the actuation whereof is effected by or through coöperation with the operatively-positioned actuator.

19. In filling-exhaustion-indicating mechanism for looms, a yieldingly-sustained feeler adapted to intermittingly impinge upon and be moved by the filling in the shuttle, a member mounted on the feeler and movable relatively thereto in parallelism therewith, an adjustable bunter on said member, to impinge upon the shuttle and effect such relative movement of said member when the filling is substantially exhausted, an actuator movably mounted on the feeler, a positively-acting connection between the actuator and said bunter-carrying member, to operatively position the actuator when said member is moved by impingement of the bunter on the shuttle, and an instrumentality the actuation whereof is effected by coöperation with the operatively-positioned actuator.

20. In filling-exhaustion-indicating mechanism for looms, a yieldingly-sustained feeler adapted to intermittingly impinge upon and be moved by the filling in the shuttle, a member slidably mounted on the feeler and adapted to be moved longitudinally thereon by impingement on the shuttle when the filling is substantially exhausted, an actuator carried by the feeler and operatively positioned by or through shuttle-induced movement of said member, means to lock the actuator in operative position simultaneously with such positioning, whereby temporary disengagement of the shuttle and the member actuated thereby cannot release the actuator, and an instrumentality, including a controller, the actua-

tion whereof is effected by or through coöperation of the operatively-positioned actuator and the controller.

21. In a loom provided with filling-replenishing mechanism, and controlling means therefor, including a movable controller, a longitudinally-movable, yieldingly-sustained feeler adapted to intermittingly engage and be moved by the filling in the shuttle, a shuttle-bunting member mounted on the feeler and movable longitudinally thereon by impingement on the shuttle when the filling is substantially exhausted, a hooked actuator fulcrumed on the feeler and having a depending foot provided with a cam-face having positioning and locking portions, a lever-like device pivoted on the feeler and operatively connected at one end with the shuttle-bunting member, the opposite end of said device cooperating with the cam-face on the actuator-foot, the actuator overhanging the controller and normally clearing the same, longitudinal movement of the bunting member on the feeler rocking said device to cause its end to first wipe over the operating portion of the cam-face, to thereby operatively position the actuator to coöperate with the controller, and then to engage the locking portion of the cam-face and hold the actuator in its operative position.

22. In filling-exhaustion-indicating mechanism for looms, a longitudinally-slotted feeler having a bearing thereon, an actuator pivotally mounted on the feeler and having a foot depending through the slot, the feeler intermittingly impinging upon and being moved by the filling in the shuttle, a bunter member slidable in the bearing in parallelism with the feeler, to impinge upon the shuttle and be slid in its bearing upon substantial exhaustion of the filling, a bell-crank lever fulcrumed in the feeler-slot and operatively connected at one end with the bunter member, to be rocked by shuttle-induced movement of said member, the opposite end of said bell-crank coöperating with the foot of the actuator, to operatively position the same and lock it in such position when the bunter member rocks the bell-crank, and an instrumentality whose actuation is effected by or through coöperation with the operatively-positioned actuator as the feeler is moved by impingement upon the substantially exhausted filling in the shuttle.

23. In a loom, means to control its operation, said means including a transmitter and a coöperating controller, combined with a feeler adapted to intermittingly engage and be moved by the filling in the shuttle, an actuator mounted on the feeler and when operatively positioned acting through the controller to move the transmitter, and means to automatically move the actuator into operative position, and lock it when so positioned, when the filling in the shuttle is exhausted to a predetermined extent.

24. A mechanical filling-exhaustion-indicating mechanism, comprising a yielding feeler having a normally inoperative actuator thereon provided with a cam extension, a lever carried by the feeler and coöperating with said extension, means to rock said lever when the filling is substantially exhausted, to act upon the cam extension and operatively position and then lock the actuator, and a transmitter adapted to be actuated by or through the operatively-positioned actuator when moved by and in unison with the feeler.

25. A mechanical filling-exhaustion-indicating mechanism, comprising a feeler adapted to be impinged upon by means in the shuttle, an overhanging hooked actuator pivoted on the feeler, a lever mounted on the latter and adapted to be moved relatively thereto when the filling in the shuttle has been exhausted to a predetermined extent, an instrumentality, including a normally quiescent controller lying beneath the actuator, to be actuated by coöperation of the controller and actuator, and a cam portion on the actuator with which the lever coöperates, movement of the lever relatively to the feeler acting through said cam portion to operatively position said actuator with respect to the controller and lock it in such position, to cause movement of the controller by or through movement of the feeler.

26. In a loom, means, including a feeler, to indicate filling exhaustion and adapted to cause the operation of filling-replenishing mechanism, and means carried by the feeler to lock said indicating means in operating condition when such condition is effected by or through predetermined exhaustion of the filling.

27. In a loom, mechanism to indicate filling exhaustion and adapted to control the operation of the loom, and means, acting automatically upon predetermined exhaustion of the filling, to lock said indicating mechanism in operative condition until the control of the operation of the loom is assured.

28. In a filling-exhaustion-indicating mechanism for looms, a feeler adapted to intermittingly impinge upon and be moved by means in the shuttle, an actuator mounted on and movable relatively to the feeler from inoperative to operative position, and means operative upon exhaustion of the filling to a predetermined extent to lock the actuator in its operative position.

29. In a loom, filling-replenishing mechanism and means to control the time of its operation, combined with a reciprocating feeler having movably mounted thereon an actuator for said means, said actuator being rendered operative upon exhaustion of the filling to a predetermined extent, and means to lock the actuator when operatively positioned.

30. In a loom, mechanism to indicate filling exhaustion and adapted to control the operation of the loom, a locking instrumentality to

assure the operation of the controlling means through said mechanism upon predetermined exhaustion of the filling, and means to release the locking instrumentality after the operation of the controlling means has been initiated.

31. In a loom, a shuttle to contain a supply of filling, mechanism to indicate filling exhaustion and adapted to control the operation of the loom, including a feeler to intermittingly impinge upon and be moved by means in the shuttle, a member mounted on and adapted to be moved in parallelism with the feeler, when the filling is exhausted to a predetermined extent, and means to prevent the indicating mechanism from operating after the lay has passed a given point in its path of movement.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

Witnesses:

EVERETT S. WOOD.
JONAS NORTHROP.

GEORGE OTIS DRAPER,
ERNEST W. WOOD.

Correction in Letters Patent No. 803,654.

It is hereby certified that in Letters Patent No. 803,654, granted November 7, 1905, upon the application of Everett S. Wood and Jonas Northrop, of Hopedale, Massachusetts, for an improvement in "Filling-Exhaustion-Indicating Mechanism for Looms," an error appears in the printed specification requiring correction, as follows: On page 5, line 31, the word "positive" should read *positively;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of November, A. D., 1905.

[SEAL.]

F. I. ALLEN,
Commissioner of Patents.

W. M. Mostues
Chief Div. 19.

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[SEAL.]

F. I. ALLEN,

Commissioner of Patents.

W. M. Mortimer
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