No. 789,471. PATENTED MAY 9, 1905.

E. S. WOOD & J. NORTHROP.

FILLING EXHAUSTION INDICATING MECHANISM FOR LOOMS.

APPLICATION FILED FEB. 2, 1905.

2 SHEETS—SHEET 1.

Fig: 1.

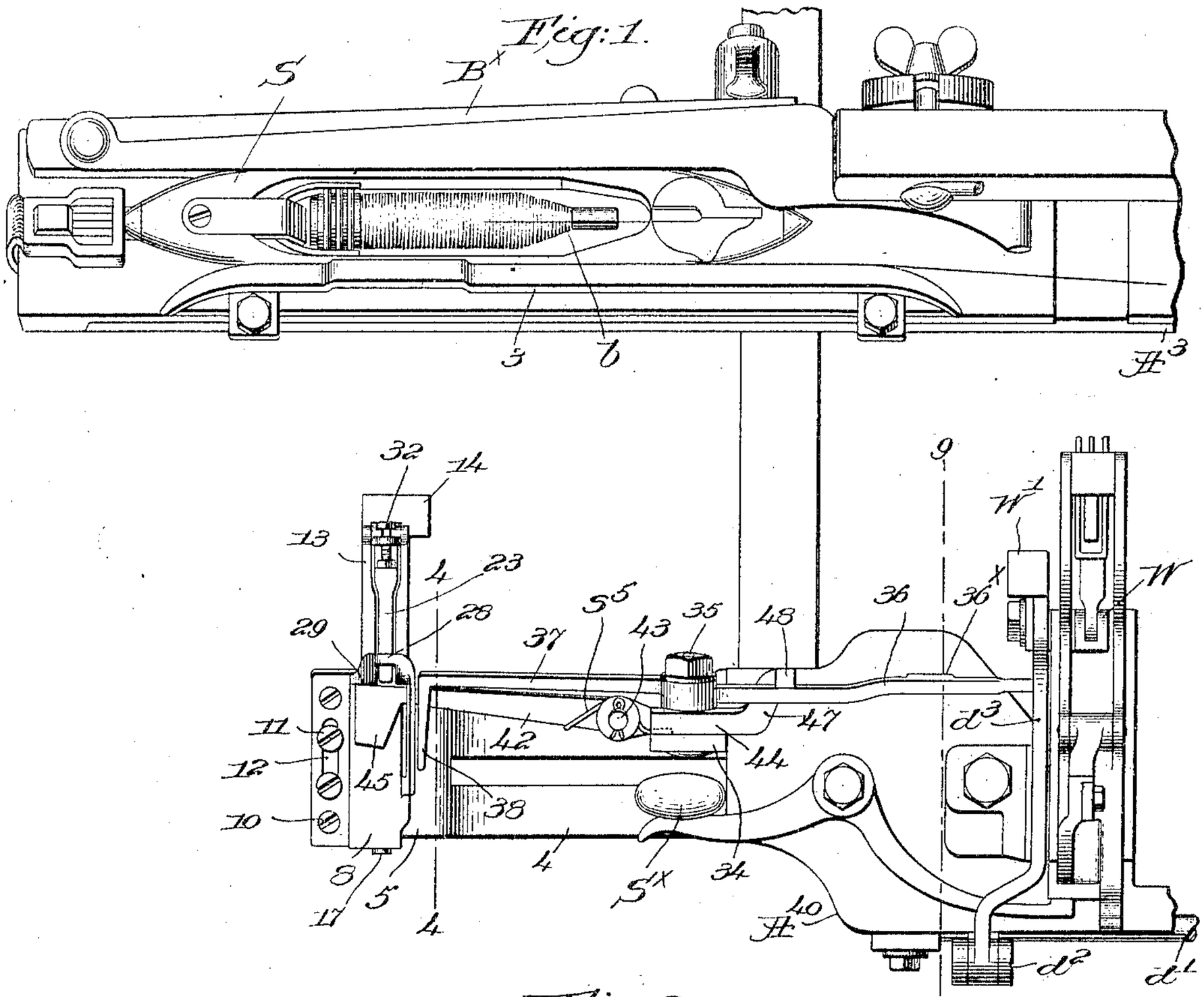
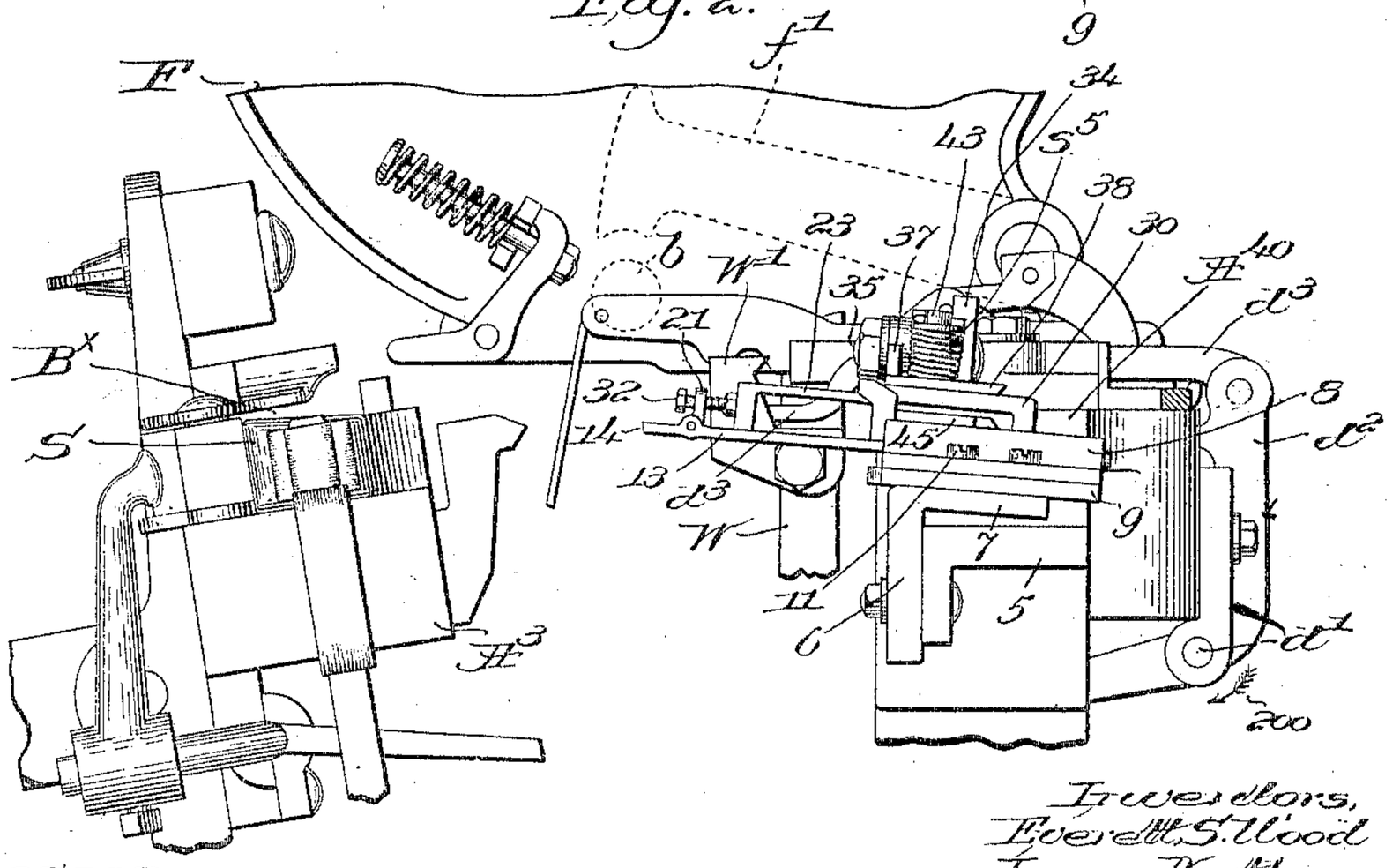


Fig: 2.



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2 SHEETS—SHEET 2.

Fig: 3

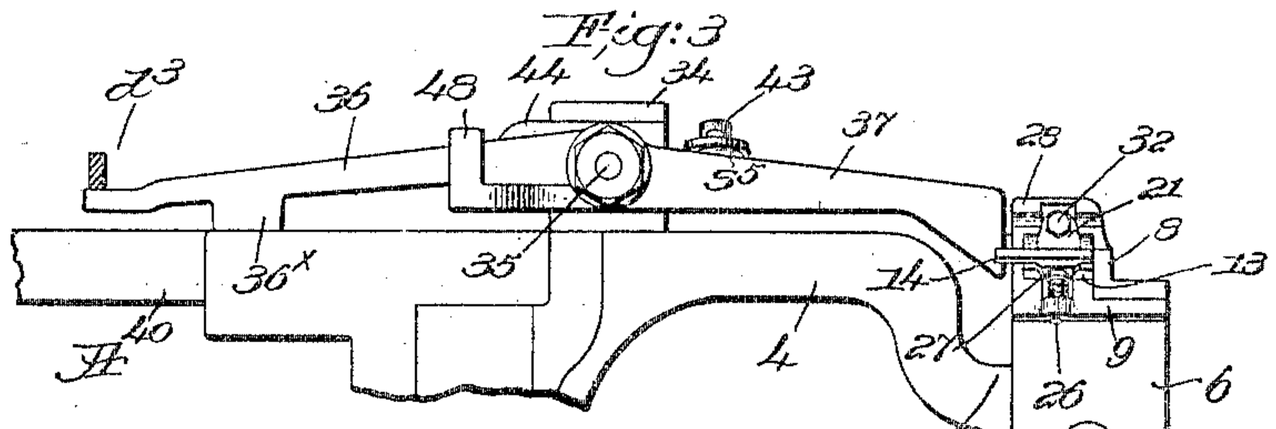


Fig: 4.

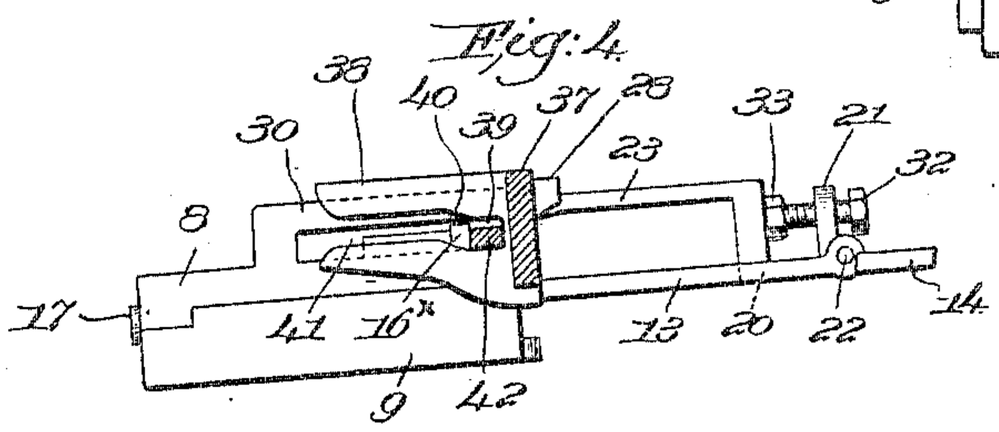


Fig: 8.

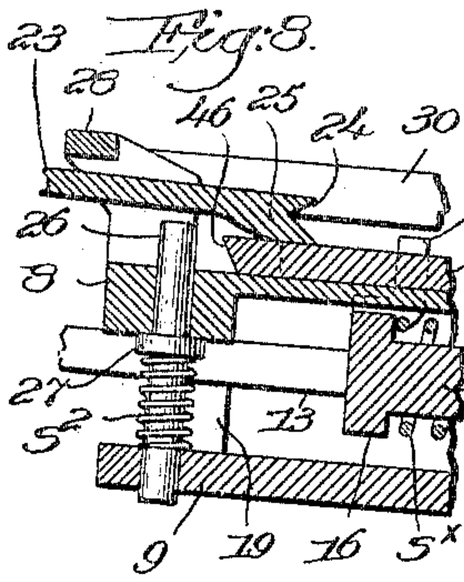


Fig: 6.

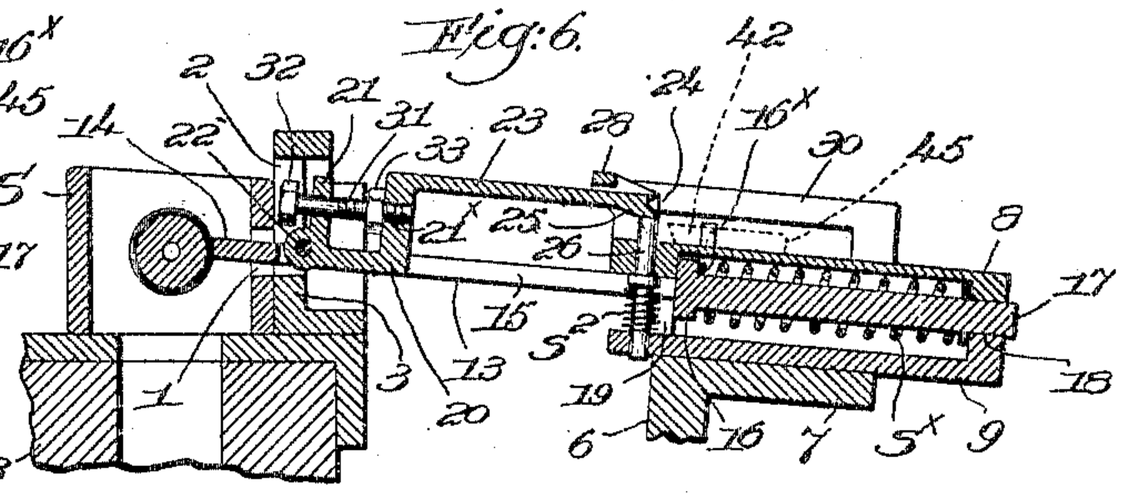


Fig: 5.

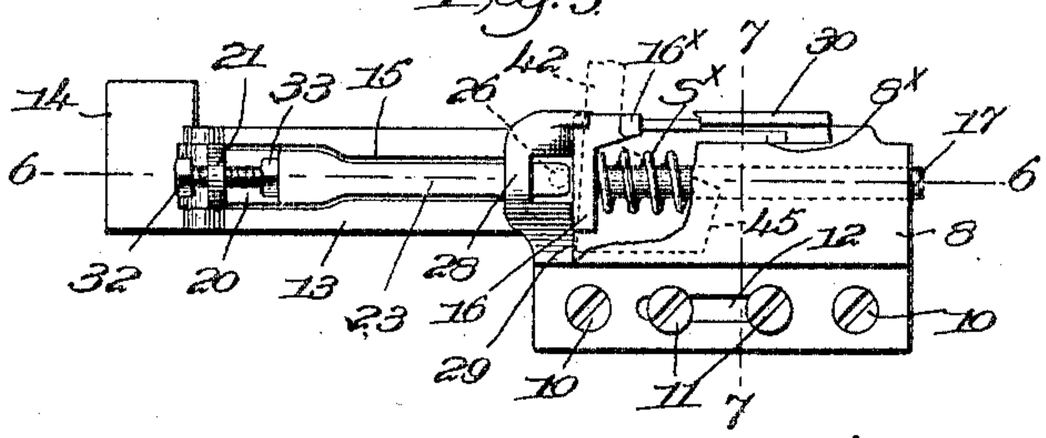


Fig: 7.

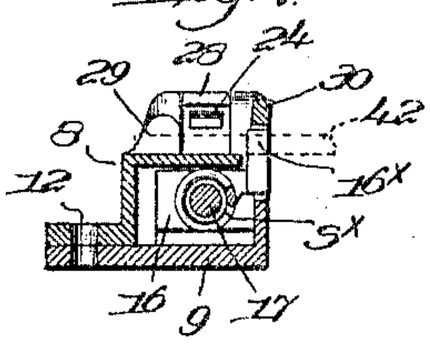
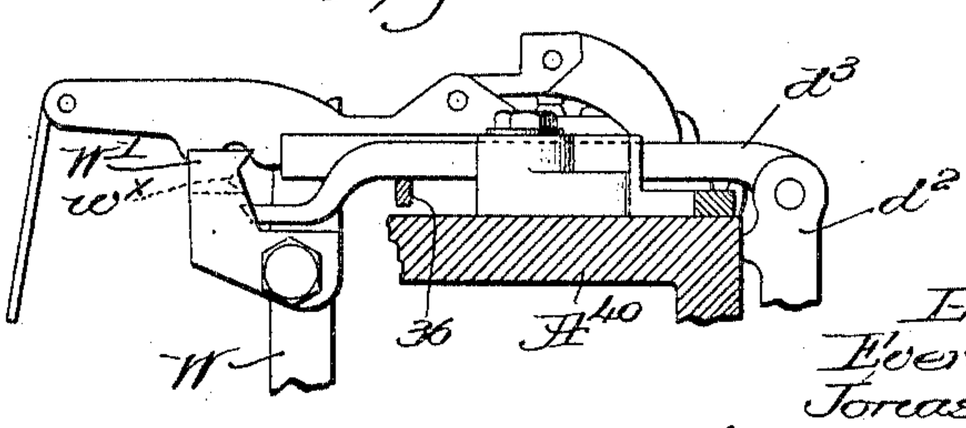


Fig: 9.



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No. 789,471. Patented May 9, 1905.

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.

SPECIFICATION forming part of Letters Patent No. 789,471, dated May 9, 1905.

Application filed February 2, 1905. Serial No. 243,783.

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 characters on the drawings representing like parts.

This invention has for its object the production of novel means for detecting and indicating the substantial exhaustion of filling in the running shuttle of a loom to thereupon effect automatically a change in the operation of the loom, such as the stoppage thereof automatically or the automatic replenishment of the running filling while the loom continues to run.

In the present practical embodiment of our invention the quantity of filling in the running shuttle is detected and indicated by a mechanical feeler device actuated by a vibrating part of the loom instrumentality, the construction and arrangement being such that the loom can be stopped by or through usual shipper mechanism or the filling replenished through the operation of automatic replenishing mechanism, such, for instance, as is shown in United States Patent to Northrop, No. 529,940.

We have so constructed the feeler and cooperating parts that the operation thereof is made very certain and exact at the required time—viz., when the desired filling exhaustion in the shuttle is attained—and we have practically eliminated the chance of premature change in the operation of the loom. We have also made provision for positively controlling and locking in both operative and inoperative position the transmitting means intermediate the feeler device and the mechanism which effects a change in the operation of the loom, so that when the transmitting means is rendered operative it cannot accidentally fail to perform its desired function, and when in its inoperative condition such means can only be rendered operative by the proper instrumentality.

Various parts of the mechanism have been strengthened, rendered more accurate in operation, and caused to perform the requisite movements very positively and promptly.

The various novel features of construction, arrangement, and operation as practically embodied in our present 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 sufficient portion of the left-hand side of a loom to be understood with one embodiment of our invention applied thereto, the running shuttle being positioned for coöperation between the filling therein and the feeler device on the forward beat of the lay. Fig. 2 is a left-hand side elevation of the parts of the loom illustrated in Fig. 1, a portion of the automatic filling-replenishing mechanism being shown at the opposite side of the loom. Fig. 3 is a rear elevation of the feeler device and the transmitter with which it coöperates when a change in the operation of the loom is called for. Fig. 4 is an enlarged detail of the feeler device viewed from the inner side thereof, the detail being taken on the line 4 4, Fig. 1, looking toward the left. Fig. 5 is a top plan view, enlarged, of the feeler device, the top of the supporting-stand being broken out, the parts being shown in the position assumed between the end of the return or inactive stroke of the feeler and the beginning of the active stroke. Fig. 6 is a longitudinal sectional view thereof on the line 6 6, Fig. 5. Fig. 7 is a transverse section through the stand on the line 7 7, Fig. 5, looking toward the left. Fig. 8 is an enlarged sectional detail of a portion of the mechanism illustrated in Fig. 6 to show the relative position of the parts when the feeler has passed a predetermined point in its active stroke; and Fig. 9 is a detail of the parts at the right of the line 9 9, Fig. 1, looking toward the right and showing the latch and its actuator, to be referred to.

Referring to Figs. 1 and 2, the lay A^3, the breast-beam A^{40}, the filling-feeder F, partly shown in Fig. 2 and adapted to contain a reserve supply of filling carriers or bobbins *b*, the transferrer *f'* to transfer the bobbins one by one to the shuttle S, and the controlling rock-shaft *d'* to effect a replenishment of filling in the running shuttle when the rock-shaft is turned in the direction of the arrow 200, Fig. 2, may be and are all substantially as in Patent No. 529,940, referred to, the arm d^2, fast on the rock-shaft, having pivotally connected therewith a rearwardly-extended latch d^3 to at times coöperate with a vibrating actuator, shown herein as a weft-hammer W.

As shown best in Fig. 9, the weft-hammer has an attached head W' recessed at $w^\times$, and when the rear end of the latch is moved into the path of the head it enters the recess, the forward movement of the weft-hammer then pushing the latch forward and swinging the arm d^2 to turn the rock-shaft *d'* and effect the actuation of the filling-replenishing mechanism in well-known manner. The actuator, latch, rock-shaft, and connections between them constitute controlling means for the loom and in the present instance operate primarily to govern the time of operation of the replenishing mechanism.

The controlling means is caused to operate by filling-exhaustion-indicating mechanism embodying our present invention, and the novel features thereof will now be described in detail.

The automatically self-threading shuttle has an opening 1 in its side wall (see Fig. 6) to register with an aperture 2 in the front wall 3 of the shuttle-box $B^\times$, Figs. 1 and 2, when the shuttle is properly boxed therein.

The notched holding-plate 4 for the shipper $S^\times$ is dropped at its outer end at 5 to support a vertically-adjustable bracket 6, the bracket-top 7 being inclined, as shown in Fig. 2, for a purpose to be referred to.

A two-part stand comprising upper and lower members 8 and 9, bolted together at 10, Fig. 5, is secured to the bracket-top by suitable screws 11, the screws passing through longitudinal slots 12 in the flanged portion of the stand, so that the latter can be adjusted fore and aft with relation to the breast-beam. The inclination given to the stand, due to the inclination of the bracket-top 7, causes the yieldingly-sustained feeler to move in a path closely coinciding with the path of movement of the lay as it swings back and forth, so that the pressure upon the feeler, due to impingement upon the filling, acts directly along the path of movement of the feeler without any tendency to bend or twist the same.

The feeler proper is preferably made as an elongated flat metallic plate 13, having a laterally-enlarged head 14 and a longitudinal central opening or slot 15 extending from the head to a transverse enlargement 16, (clearly shown in Fig. 5,) provided at one side with an upturned lug $16^\times$, which projects through a longitudinal slot $8^\times$ in the top of the part 8 of the stand.

A cylindrical shank 17 extends forward from the enlargement 16 through the stand, the interior of the latter being sufficiently large to permit said enlargement to slide freely, a spiral spring $s^\times$ being coiled around the feeler-shank between said enlargement and the outer end of the stand, the forward end of the shank being slidably supported in an opening 18 in the front end of the stand, the rear end of the latter having an aperture 19, through which the flat portion or body 13 of the feeler extends.

The feeler-spring $s^\times$ is only strong enough to project the feeler into the position shown in Figs. 1, 2, 5, and 6 in readiness to impinge upon the filling in the shuttle as the lay beats up.

Inasmuch as impingement occurs before the lay reaches front center, the feeler will be moved forward bodily as the lay completes its forward beat, such forward stroke of the feeler being termed the "active" or "feeling" stroke, and as the lay swings back the expansion of the spring $s^\times$ restores the feeler to normal position, the spring thus effecting the inactive or return stroke of the feeler.

As will be familiar to those skilled in the art, the feeler-head enters the registered openings in the box-wall and shuttle, respectively, on every alternate beat, the head on such beats passing into the shuttle and impinging on the filling on the filling-carrier. Until such time as the filling is substantially exhausted the feeler will be intermittingly moved outward, the amplitude of such filling-induced movement of the feeler gradually decreasing as the diameter of the yarn mass on the filling-carrier is decreased.

Upon the member 13 of the feeling device we mount a lever-like member 20 21, fulcrumed within the slot 15 on a transverse pin 22, the part 20 of said member being upturned and then extended forward to form an elongated extension 23, having a notch 24 in its front end, (see Figs. 6 and 8,) the under side of said extension being cut away to leave the extremity adjacent the notch thicker, as at 25, than the rest of the extension. Such thickened end is at times yieldingly supported by an upright plunger 26, which is slidably mounted in holes in the upper and lower portions of the stand, a light spring s^2 (see Figs. 6 and 8) encircling the plunger between the lower part of the stand and a collar 27 on the plunger adapted to abut against the adjacent upper portion of the stand to limit the lifting movement of the plunger.

When the feeler device is in the position shown in Fig. 6, the yielding support 26 engages the thickened end of the extension 23 and maintains the said extension in the posi-

tion therein shown; but when the feeler has been moved forward far enough the end of the extension passes off from the top of the plunger 26, as shown in Fig. 8, the extension at such time being supported by other means to be described. At its rear end the upper portion 8 of the stand is upturned to form a transverse arch 28, overhanging the extension 23 and preventing the latter from jumping up improperly, due to vibration or shaking when the loom is running. The front part of the arch 28 is shaped to present a transverse stop-shoulder 29, for a purpose to be described, and a guide 30 extends forward from the arch along the top of the portion 8 of the stand, said guide being broken out in Fig. 5 to show some of the parts beneath. The short arm 21 of the rocking feeler member is upturned above the feeler and is provided with a hole to receive the smooth part of the threaded shank 31 of a bunter 32, the shank being shown in Fig. 6 as entering a threaded hole $21^{\times}$ in the upright portion of the extension 23, connecting it with the body 20, and a check-nut 33 holds the bunter in adjusted position.

The lever-like device or rocking member 20 21 is movable bodily with the feeder proper, 13, and also has a movement relatively thereto on its fulcrum 22.

In Fig. 6 we have shown the position of the bunter 32 with relation to the shuttle-wall on a feeling-pick of the loom before the filling is substantially exhausted. Normally the impingement of the feeler-head upon the filling will move the feeler forward before the shuttle-wall can impinge upon the bunter, so that there will be no relative movement of the connected feeler members, the spring-acting device or plunger 26 holding the rocking member quiescent (with respect to the feeler proper) during the first part of its stroke. When substantial exhaustion of the filling in the shuttle permits the feeler to enter the shuttle a predetermined distance, however, the diminution of the yarn mass will then be great enough to permit impingement of the bunter upon the shuttle-wall before the feeler-head engages the filling, whereupon the lever-like device will be rocked upon its fulcrum before the active or forward stroke of the feeler begins. When rocking movement of the lever-like device is thus effected, the plunger 26 is depressed and the notched end of the extension 23 will be lowered from its normal path of movement.

By making the rocking feeler member light in weight and practically balancing it on its fulcrum with the aid of the very light spring s^2 the inclination of such member is readily and quickly overcome, and the spring offers very little resistance to the rocking movement, the object of the spring-acting support 26 being of course to normally maintain the rocking member quiescent with relation to the member 13 of the feeling device during at least a portion of the stroke of the latter.

Rocking movement of the lever-like member operates to effect the actuation of the controlling means for the loom in a manner which we will now explain.

The plate 4 is provided with an upturned ear 34, which carries a fulcrum-stud 35 substantially parallel to the path of movement of the feeler, and on this stud is fulcrumed a transmitter, (shown as a lever 36 37,) operatively connecting the latch d^3 and the filling-feeling device. The inner extremity of the arm 36 extends beneath the latch d^3, (see Figs. 1 and 3,) and normally supports the latch in inoperative position, a downturned lug $36^{\times}$ on the transmitter-arm at such time bearing on the top of the breast-beam. At the opposite or outer end of the transmitter the arm 37 is in the present embodiment of our invention bent laterally to form an upright ear 38, (very clearly shown in Fig. 4,) said ear extending close to the inner side of the guide 30, hereinbefore referred to. (See Fig. 1.) The ear is provided with a cam, (shown as a slot having substantially parallel portions 39 and 41,) connected by an inclined or sloping portion 40.

We have provided a controller for the transmitter in positive sliding engagement therewith and coöperating with the transmitter in such manner that its movement from operative to inoperative position, or vice versa, is effected positively through the controller, while the latter locks the transmitter in one or the other position.

We have herein shown the controller as an arm 42, fulcrumed on an upright stud 43 on a bracket 44, carried by the ear 34, the fulcrum-studs 35 and 43 being located substantially at right angles to each other, so that the transmitter and the controller move in intersecting planes which are also substantially at right angles to each other.

The free end of the controller is extended through the cam-slot in the lateral ear of the transmitter and through the guide 30, said guide permitting swinging movement of the controller while preventing any lifting thereof, the outer end of the guide serving as a stop to limit the outward swing of the controller, the path of movement of the latter being substantially parallel to the plane in which the feeler moves.

Referring to Fig. 4, wherein the controller is shown in the lower straight portion 39 of the cam-slot, it will be manifest that movement of the controller to the left or toward the front of the loom in actual practice will act through the inclination 40 of the cam-slot to depress the adjacent end of the transmitter and rock the latter on its fulcrum 35, thereby elevating the transmitter-arm 36 and moving the latch d^3 into position to be engaged by its actuator.

The sliding connection between the control-

ler and the transmitter is of the slot-and-pin type; but it will be manifest that at all times the controller positively governs the transmitter and whether the latter is in the position shown in the drawings or in its operative position—viz., when the controller is in the straight part 41 of the cam-slot—the transmitter will be locked from rocking movement while in that particular position. A mere reversal of the parts providing the controller with the cam-slot and having the transmitter coöperate therewith is manifestly within the scope of our invention. It follows that no accidental rocking movement of the transmitter can be effected by shock or jar or by the movement of any part of the loom instrumentality.

The end of the controller projecting through the slotted ear 38 is extended over the top of the feeler-stand and enlarged to form a flat foot 45, which normally is below the path of movement of the extension of the rocking feeler member 20 21. The rear edge of the foot is preferably sharpened or beveled, as at 46, to at times coöperate with the notched end of the extension 23.

So long as there is sufficient filling in the running shuttle the extension 23 will be supported by the yielding plunger 26 as the feeling stroke begins; but after the thickened end 25 has passed beyond the plunger it will drop onto the top of the controller-foot 45, as shown in Fig. 8. The length of the foot is sufficient to support the extension throughout the greater portion of the active and return strokes of the feeler, preventing a continuous rising and falling or vibration of the rocking feeler member.

By cutting away the under side of the extension 23 to deprive the latter of the support of the plunger after engagement with the controller we overcome any tendency of the plunger-spring to disengage the controller and rocking member, as would otherwise occur should the contact between the latter and the shuttle-wall be broken before completion of the feeler-stroke and the plunger be permitted to coöperate with the extension throughout the feeler-stroke.

The rocking movement of the member 20 21, due to impingement of the bunter on the shuttle, must always take place before the notched end of the extension has passed beyond the beveled edge of the controller-foot, and when such rocking is effected the edge 46 enters the notch, and as the forward stroke of the feeler continues the controller will be swung on its fulcrum 43, and, as has been described, the transmitter will be thereby rocked or tilted on its fulcrum to effect the operation of the controlling means for the loom.

A spring s^5, coiled around the fulcrum-stud 43, is fixed at one end and at the other end connected with the controller, the winding of the spring being such that it acts normally to hold the controller against the stop face or shoulder 29 of the bridge 28, as hereinbefore explained.

The lug $16^{\times}$ on the enlargement 16 of the feeler projects in front of the controller, and its main purpose is to always insure a fixed relation between the free end of the extension 23 and the adjacent edge of the controller-foot, the projection insuring the proper positioning of the controller at the instant the active or feeling stroke begins, such positioning of course being effected at the end of the return stroke of the feeler. The coöperation of the projection with the controller also aids in returning the controller to its normal position after each feeling-beat of the lay.

The bracket 44 is shaped to present two opposed and upright portions 47 48, between which the arm 36 of the transmitter moves, the said portions thus forming a guide for the transmitter, preventing any lost motion thereof in case the fulcrum-stud should become worn or the hole therefor in the transmitter should become improperly enlarged.

It will be seen that a very slight rocking movement of the feeler member 20 21 will depress the lower side of the notch 24 of its extension below the beveled edge 46 of the controller-foot, and if this movement is effected, no matter how slight, the proper coöperation between the extension and the controller-foot will follow, and the transmitter will be properly operated.

If for any reason the sharp edge of the part 46 should engage a corresponding edge of the notch in the extension, no harm can result, as the controller will either be actuated, as has been explained, or as the feeler moves forward the two parts will slip out of engagement, and the operation of the transmitter will be effected on the next detecting-pick.

The filling-exhaustion-indicating mechanism, herein shown and described, is adapted to control either a filling-replenishing mechanism or a loom-stopping mechanism, either mechanism constituting means to control the operation of the loom, and we have used the phrase "filling-exhaustion-indicating mechanism" to mean a device to govern the operation of such controlling means for a loom.

The rocking member of the feeler is so shaped and its weight so disposed with relation to its fulcrum that there is practically no tendency whatever to rock said member by impact of the other member of the feeler device upon the filling.

Our invention is not restricted to the precise construction and arrangement herein shown and described, as the same may be modified and rearranged in various particulars by those skilled in the art without departing from the spirit and scope of our invention.

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

1. In filling-exhaustion-indicating mechan-

ism 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 relatively thereto when the feeler passes a predetermined distance into the shuttle, a transmitter, and a controller in positive engagement with and movable relatively to the transmitter, relative movement of the member on the feeler into coöperation with the controller causing the latter to effect a definite operative movement of the transmitter.

2. 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 relatively thereto when the feeler passes a predetermined distance into the shuttle, a transmitter, and a relatively movable controller therefor, a cam on one, and a coöperating follower on the other, relative movement of the member on the feeler into coöperation with said controller acting through the cam and follower connection to effect a positive and definite movement of the transmitter.

3. 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 relatively thereto when the feeler passes a predetermined distance into the shuttle, a transmitter, and a relatively movable controller mounted independently of the transmitter and having a positive, sliding connection therewith, to govern at all times the position of the transmitter, movement of the member on the feeler relatively thereto and into coöperation with the controller causing the operation of the transmitter.

4. 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 relatively thereto when the feeler passes a predetermined distance into the shuttle, a transmitter, and a relatively movable controller mounted independently of the transmitter and having a positive, sliding connection therewith, to lock the transmitter in operative or inoperative position and positively effect its movement from one to the other position, movement of the member on the feeler into coöperation with the controller acting through the latter to effect the operation of the transmitter.

5. In a loom, means to control its operation, including a transmitter, and a positively coöperating controller mounted independently thereof, combined with a member adapted to be rocked by the impingement thereon of the shuttle, and a feeler to intermittingly engage the filling in the shuttle and prevent rocking of said member until exhaustion of the filling to a predetermined extent, rocking of said member effecting its coöperation with the controller and through the same causing the transmitter to effect the operation of the controlling means for the loom.

6. In filling-exhaustion-indicating mechanism for looms, in combination, a feeler device having two members adapted to be impinged upon, means for impinging first on one of said members, means, when exhaustion of the filling permits, for impinging first on the other member, a transmitter, and a controller to lock and also govern the movement of the said transmitter, initial impingement on the last-named feeler member acting upon the controller to first unlock, and then positively move the transmitter into operative position.

7. In a loom provided with filling-replenishment mechanism, and controlling means therefor, including a transmitter, in combination, an independently-mounted controller for said transmitter, a device adapted to be moved by the shuttle into engagement with and actuate the controller, and a feeler to prevent such movement of said device until predetermined exhaustion of the filling in the shuttle, the controller being moved in unison with the feeler when the controller and the shuttle-actuated device are in coöperation.

8. In filling-exhaustion-indicating mechanism for looms, in combination, a feeler adapted to intermittingly impinge upon and be moved by filling in the shuttle, a member mounted to rock on the feeler by impingement on the shuttle when the filling therein is substantially exhausted, a tilting transmitter, a controller in positive engagement with and movable relatively to the transmitter and normally out of the path of movement of the said rocking member, and mechanism operated by tilting of the transmitter, rocking movement of the feeler member effecting its engagement with the controller to move the latter relatively to the transmitter and thereby tilt the latter.

9. In filling-exhaustion-indicating mechanism for looms, in combination, a feeler adapted to intermittingly impinge upon and be moved by filling in the shuttle, a member mounted to rock on the feeler by impingement on the shuttle when the filling therein is substantially exhausted, a tilting transmitter, an angularly-movable controller for the transmitter, a cam on one and a coöperating follower on the other of said parts, to positively tilt the transmitter by or through movement of the controller, rocking movement of the feeler member causing it to engage and move the controller, and mechanism operated by tilting of the transmitter.

10. In a loom, means to control its operation, including a transmitter, combined with a feeler device having two members adapted to be impinged upon, means for impinging first on one of said members, means, when exhaustion of the filling permits, for impinging

first on the other member and movable means intermediate said latter member and the transmitter to lock the latter in operative or inoperative position and also move it from one to the other position, initial impingement on the last-named feeler member acting through said movable means to unlock and then positively move the transmitter to operative position.

11. In a 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 relatively to the first-named member by impingement on the shuttle upon predetermined exhaustion of filling, mechanism the operation of which is effected through the movement of the shuttle-actuated member, a transmitter intermediate such mechanism and said connected members, and having an attached ear provided with a cam-slot, and a movable controller having a portion thereof extended through the cam-slot, movement of the shuttle-actuated member causing it to coöperate with and move the controller and thereby operate the transmitter by or through its coöperation with the cam-slot.

12. In a loom provided with filling-replenishing mechanism, and means to control the operation thereof, including a tiltable transmitter, in combination, a swinging controller having a bevel-edged foot, said transmitter and controller being movable in intersecting planes, a positive, sliding connection between the transmitter and controller, to effect the operation of the former by or through movement of the latter, a yieldingly-sustained feeler adapted to intermittingly engage and be moved longitudinally by filling in the shuttle, a lever-like device fulcrumed on the feeler and adapted to be rocked by impingement on the shuttle when the filling therein is substantially exhausted, one arm of said device having a notch and normally sliding across the foot of the controller, rocking of said device effecting engagement of its notched arm with the beveled edge of the controller-foot, to move the controller and thereby tilt the transmitter as the feeler moves longitudinally, to effect the actuation of said controlling means for the filling-replenishing mechanism.

13. 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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, a transmitter adapted to tilt on a fulcrum parallel to the feeler and having an offset ear provided with a cam-slot, a swinging controller fulcrumed at right angles to the transmitter-fulcrum and extended through the cam-slot, and a fixed guide for said controller, shuttle-induced movement of the member on the feeler effecting its engagement with the controller to swing the same and thereby tilt the transmitter.

14. 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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, a transmitter adapted to tilt on a fulcrum parallel to the feeler, a fixed guide for the transmitter, a swinging controller fulcrumed at right angles to the latter, a fixed guide for the controller, and a positive locking and actuating connection between the controller and transmitter, whereby swinging movement of the former tilts the latter, the connection locking the transmitter in all positions, shuttle-induced movement of the member on the feeler effecting its engagement with the controller to swing the same by or through subsequent movement of the feeler.

15. 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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, a tilting transmitter, a controller mounted independently of and positively connected with the transmitter, said controller having an extended foot over which one end of the member on the feeler normally passes, shuttle-induced movement of said member effecting engagement thereof with the controller to move it and tilt the transmitter, and a device to yieldingly maintain the end of said member in position to pass over the controller-foot under normal conditions.

16. 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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, a tilting transmitter, a controller mounted independently of and positively connected with the transmitter, said controller having an extended foot over which one end of the member on the feeler normally slides, shuttle-induced movement of said member effecting engagement thereof with the controller to move it and tilt the transmitter, and a relatively stationary device to engage and yieldingly support the end of said member until it passes onto the controller-foot when the loom is running under normal conditions.

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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a pre-

determined distance into the shuttle, a tilting transmitter, a controller mounted independently of and positively connected with the transmitter, said controller having an extended foot over which one end of the member on the feeler normally slides, shuttle-induced movement of said member effecting engagement thereof with the controller to move it and tilt the transmitter, and a yieldingly-controlled device to support the end of said member until the feeler has reached a predetermined point in its filling-induced stroke.

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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, a tilting transmitter, a controller mounted independently of and positively connected with the transmitter, said controller having an extended foot with a beveled edge, the adjacent end of the member on the feeler having a notch, shuttle-induced movement of said member effecting engagement of the notched end thereof with the beveled edge of the foot, to move the controller and thereby tilt the transmitter, and a device to yieldingly support the notched end of said member until it either passes beyond or is rocked into engagement with the edge of the controller.

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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, one arm of said member being cut away on its under side between its free end and its fulcrum, a tiltable transmitter, an independently-mounted controller to govern the movement thereof, said controller having a foot in front of the cut-away arm of said member and normally out of its path of movement, shuttle-induced movement of said member moving the free end of its arm into engagement with the foot of and to move the actuator, to tilt the transmitter, and a yieldingly-controlled device to support the said arm of the pivoted member until the movement of the feeler brings the cut-away portion of the arm above said device, to free the arm from the support of said device.

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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, a tilting transmitter, a controller mounted independently of and positively connected with the transmitter, said controller having an extended foot over which one end of the member on the feeler normally slides, and by which it is supported during a portion of the feeler-stroke, shuttle-induced movement of said member effecting engagement thereof with the edge of the controller to move it and thereby tilt the transmitter, and a device to yieldingly support the end of said member until it passes the edge of the controller-foot, said device yielding to permit shuttle-induced movement of said member.

21. In a loom provided with filling-replenishing mechanism, and controlling means therefor, including a tiltable transmitter, in combination, a spring-governed, swinging controller, a positive sliding connection between it and the transmitter, fixed stops to limit movement of the controller, a longitudinally-movable, yieldingly-sustained feeler adapted to intermittingly engage and be moved by the filling in the shuttle, a lever-like device pivotally mounted on the feeler and adapted to be rocked by impingement on the shuttle when the filling is substantially exhausted, shuttle-induced rocking movement of the lever-like device effecting its engagement with and actuation of the controller, to operate the transmitter, and means to yieldingly sustain said lever-like device until the end of one arm thereof has either passed by or engaged the adjacent edge of the controller.

22. In a loom provided with filling-replening mechanism, controlling means therefor, including a latch, and a vibrating actuator, combined with a feeler device comprising two relatively movable members, one of which is moved intermittingly by filling in the shuttle until substantial exhaustion of such filling, the other member then being adapted to first engage and be moved by the shuttle, a tilting transmitter coöperating at one end with the latch, a swinging, spring-governed controller, a slot-and-pin connection between it and the adjacent end of the transmitter, the controller normally lying out of coöperative position relatively to the shuttle-engaging member of the feeler device, rocking of the latter effecting its engagement with the controller to move the same and tilt the transmitter, whereby the latch is moved into the path of its actuator, fixed means to guide and limit movement of the controller, and a yielding support to normally prevent operative engagement of the shuttle-engaging member of the feeler device with the controller.

23. In a loom, means to control its operation, including a transmitter, combined with a controller in positive, sliding engagement with and to operate the transmitter, a feeler adapted to intermittingly engage and be moved by the filling in the shuttle, means mounted on the feeler to engage and actuate the controller when the filling in the shuttle is exhausted to a predetermined extent, and means to insure a predetermined relation between the positions of the controller and the means on the

feeler at the instant of the engagement of the filling by the feeler.

24. In a loom, means to control its operation, including a transmitter, combined with a controller in positive, sliding engagement with and to operate the transmitter, and provided with a foot having a beveled edge, a feeler adapted to intermittingly engage and be moved by the filling in the shuttle, a member mounted on the feeler and movable automatically with relation thereto when the filling in the shuttle is exhausted to a predetermined extent, said member having a notched end to engage the beveled edge of the controller at such time and move it to operate the transmitter, and means movable with the feeler to insure a fixed relation between the edge of the controller and the notched end of the said member at the end of the return stroke of the feeler.

25. A mechanical filling-exhaustion-indicating mechanism, comprising a yieldingly-sustained feeler having an upturned lug, a lever carried by the feeler and having an extension, a transmitter, a controller in positive engagement with the transmitter and adapted to operate and lock the same, said controller having a foot extended beneath the normal path of the extension and behind the lug on the feeler, and a yielding support for said extension, said support and foot acting successively to normally retain the lever quiescent relatively to the feeler, movement of the lever relatively to the feeler effecting engagement with and movement of the controller-foot to unlock and operate the transmitter, the lug acting on the return stroke of the feeler to maintain a fixed relation between the controller-foot and the adjacent end of the lever extension.

26. In a loom, an instrumentality to indicate filling exhaustion and adapted to cause the operation of filling-replenishing mechanism, said instrumentality including a filling-feeler and a relatively movable member, carried thereby, having an extension, and means to prevent said indicating instrumentality from operating after the lay has passed a given point in its movement, said means including a member having a widened foot to maintain inoperative the member on the feeler after its extension passes onto the foot.

27. In filling-exhaustion-indicating mechanism for looms, a feeler to intermittingly impinge upon and be moved by filling in the shuttle, a member mounted on the feeler and movable relatively thereto when the filling in the shuttle is substantially exhausted, said member having an extension notched at its end, and mechanism, including a swinging member having a beveled edge, adapted to effect filling replenishment, the operation of said mechanism being caused by movement of the notched end of the extension into engagement with the beveled edge of said swinging member, and subsequent movement of the latter.

28. In filling-exhaustion-indicating mechanism for looms, a feeler to intermittingly impinge upon and be moved by filling in the shuttle, a member mounted on the feeler and movable relatively thereto when the filling in the shuttle is substantially exhausted, said member having an extension notched at its end, and mechanism, including a swinging member having a beveled edge, adapted to effect filling replenishment, the operation of said mechanism being caused by movement of the notched end of the extension into engagement with the beveled edge of said swinging member, and subsequent movement of the latter, combined with a device governed by the feeler to act upon the swinging member and place the beveled edge thereof in a predetermined relation to the end of the extension prior to the active stroke of the feeler.

29. In filling-exhaustion-indicating mechanism for looms, a feeler to intermittingly impinge upon and be moved by filling in the shuttle, a member mounted to rock on the feeler by impingement on the shuttle when the filling therein is substantially exhausted, an extension on said member, a movable transmitter, a swinging controller, a slot-and-pin connection between it and the transmitter, to move it from inoperative to operative position and to lock it from movement in either position, a foot on the controller lying below the normal path of movement of the extension, and a spring-controlled device to normally elevate the end of the extension until it passes onto the controller-foot, rocking of the member on the feeler causing the extension to engage and move the controller and thereby operate the transmitter, combined with mechanism actuated by such operation of the transmitter.

30. 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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, and a vertically-reciprocating device to yieldingly maintain the end of said member in inoperative position until the feeler has passed the predetermined distance into the shuttle.

31. 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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, a tilting transmitter and a controller to coöperate with the said member after the feeler has reached a predetermined point in its stroke, said con-

troller being adapted to thereafter maintain said member in a fixed relation to the feeler.

32. 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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, one arm of said member being cut away on its under side between its free end and its fulcrum, and a yieldingly-controlled device to support the said arm of the pivoted member until the movement of the feeler brings the cut-away portion of the arm above said device, to free the arm from the support thereof.

33. 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 pivotally mounted on the feeler and adapted to be rocked when the feeler passes a predetermined distance into the shuttle, one arm of said member being cut away on its under side between its free end and its fulcrum, a tiltable transmitter, an intermittingly-mounted controller to govern the movement thereof, and a yieldingly-controlled device to support said arm until its coöperation with said controller, after which said arm is freed from the support of the said device.

34. In a loom, an instrumentality to indicate filling exhaustion, and adapted to cause the operation of filling-replenishing mechanism, said instrumentality including a filling-feeler, and a relatively movable member carried thereby, a transmitter, and means mounted independently of the transmitter to prevent said indicating instrumentality from operating after the lay has passed a predetermined point in its movement.

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

EVERETT S. WOOD.
JONAS NORTHROP.

Witnesses:
CLARE H. DRAPER,
GEORGE OTIS DRAPER.