No. 843,249. PATENTED FEB. 5, 1907.

E. S. WOOD & J. NORTHROP.

# FILLING EXHAUSTION INDICATING MECHANISM FOR LOOMS.

APPLICATION FILED MAR. 3, 1906.

2 SHEETS—SHEET 1.

Fig: 1.

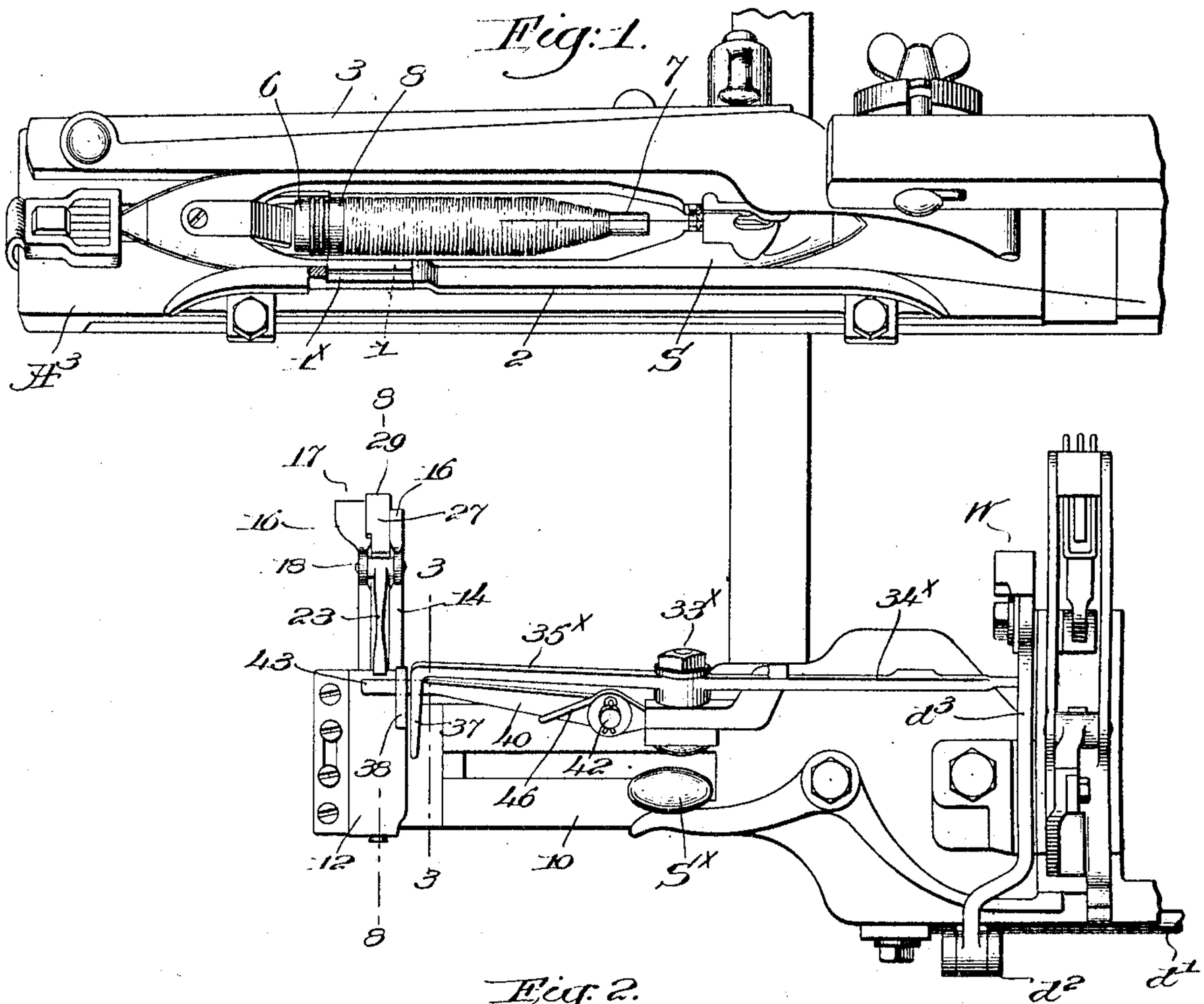
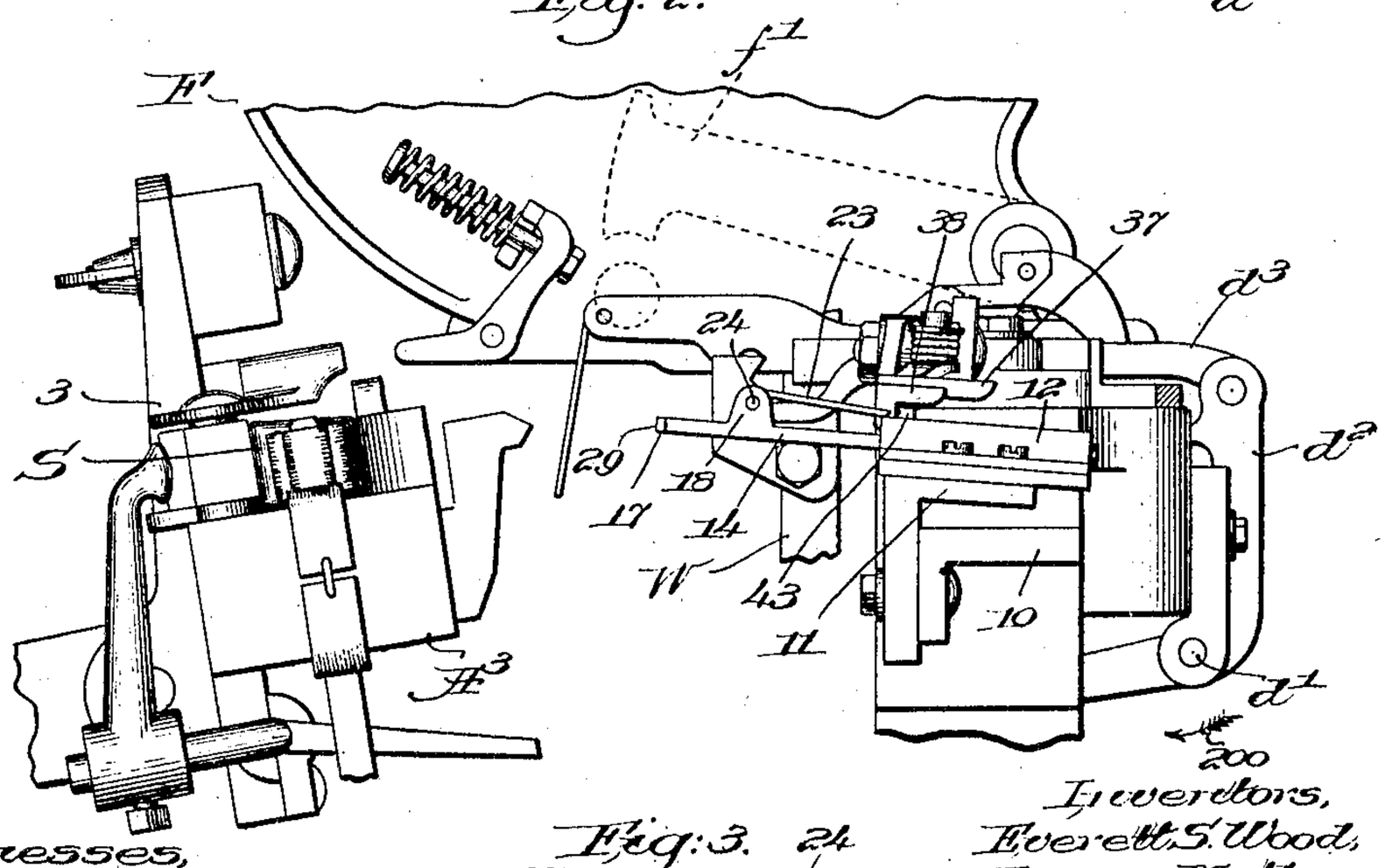
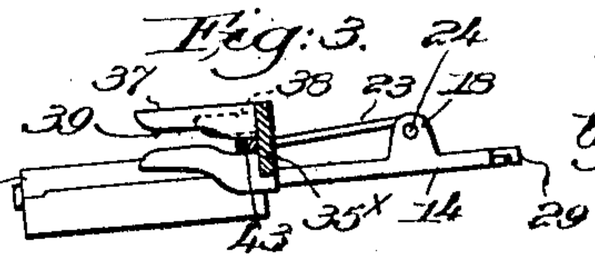



Fig. 2.




Witnesses,
Edward H. Allen.
Thomas J. Drummond.

Fig: 3.




Inventors,
Everett S. Wood,
Jonas Northrop,
by Glenny & Bugbee
Attys.

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2 SHEETS—SHEET 2.

Fig: 4.

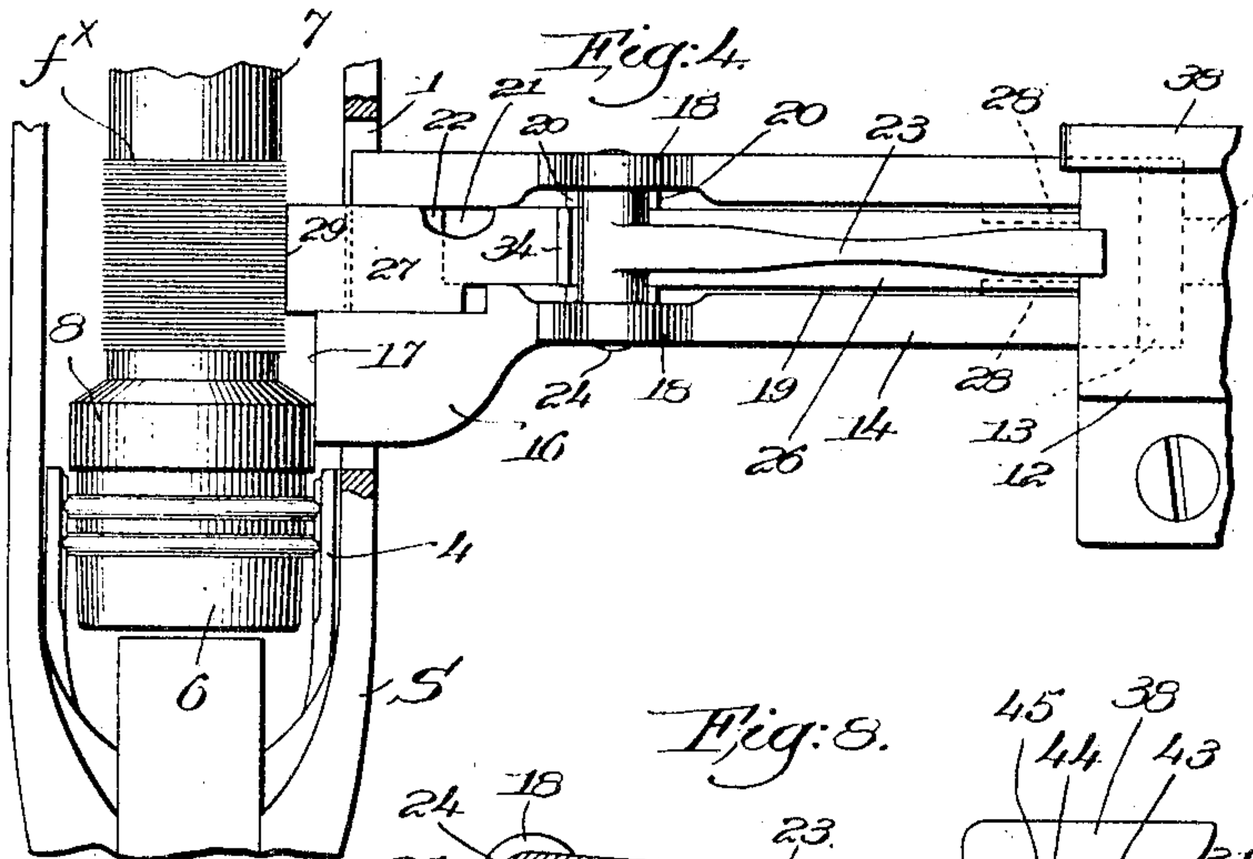



Fig: 5.

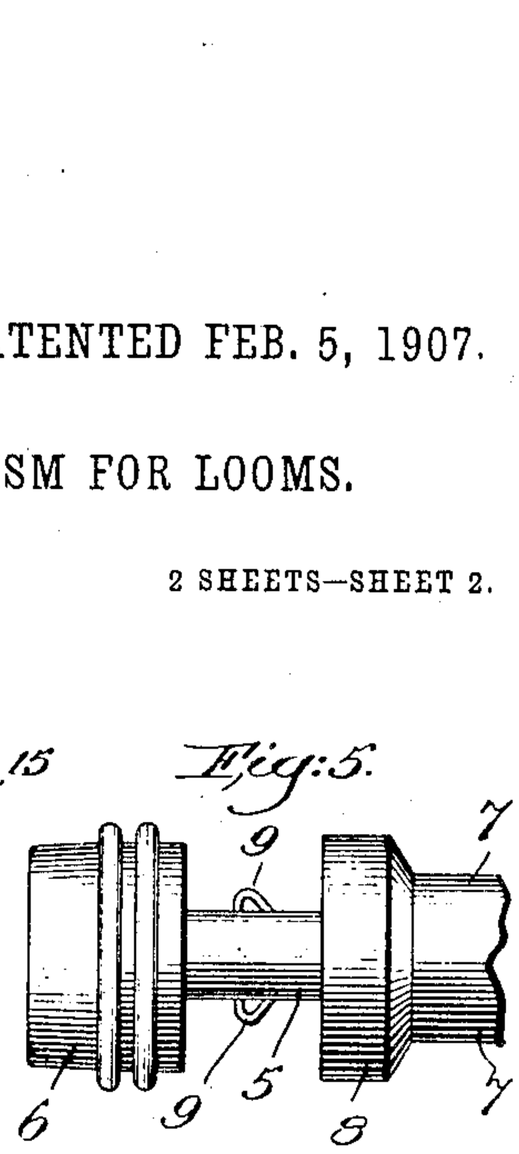



Fig: 8.

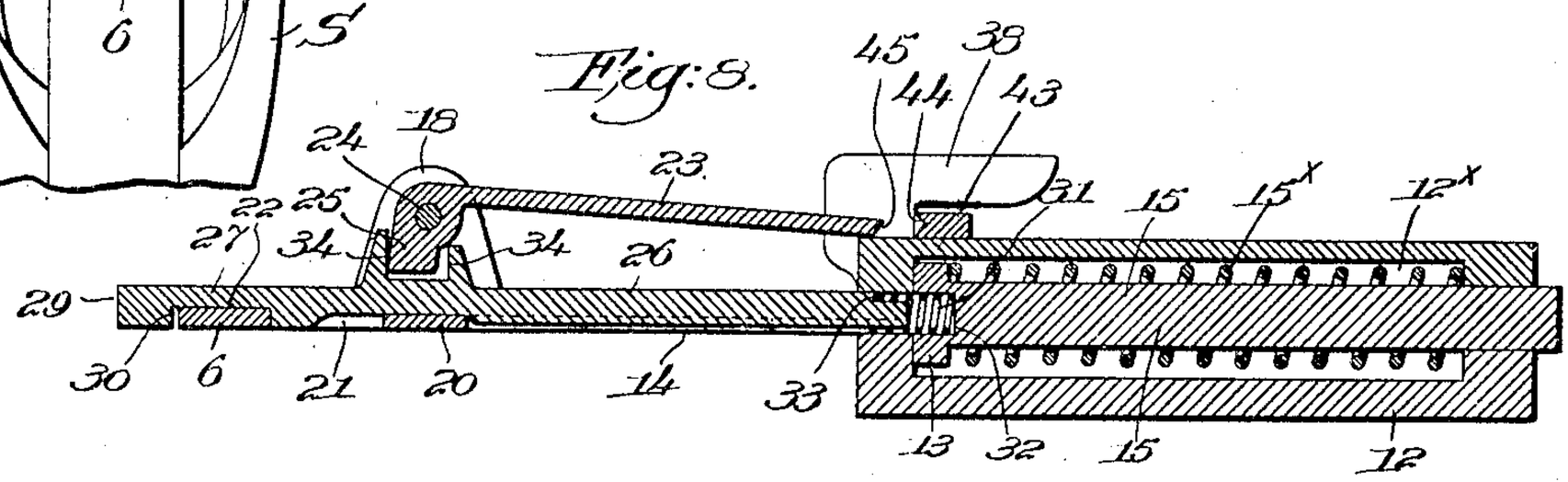



Fig: 9.

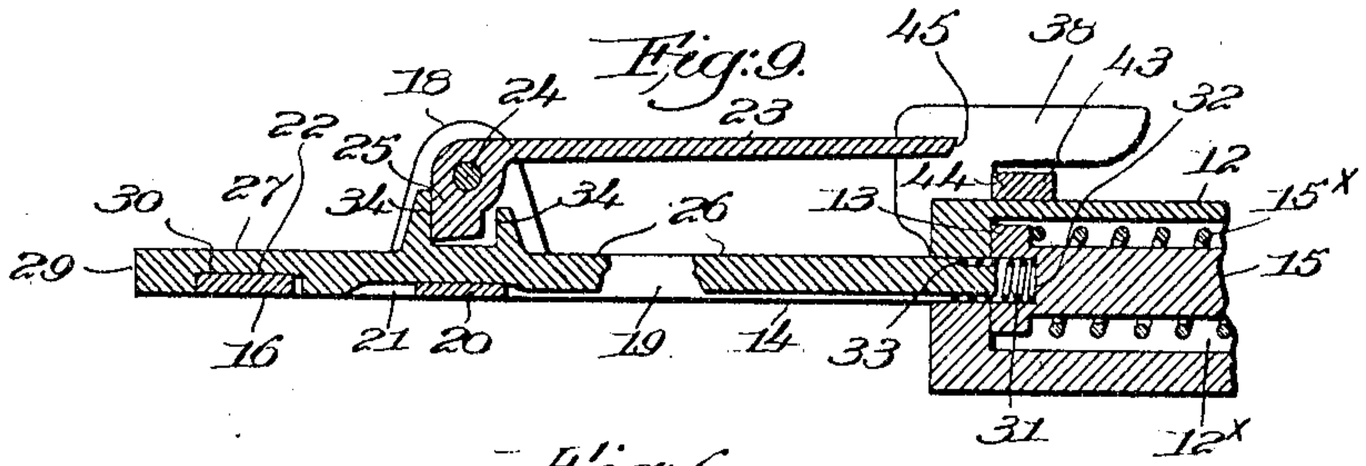



Fig: 6.

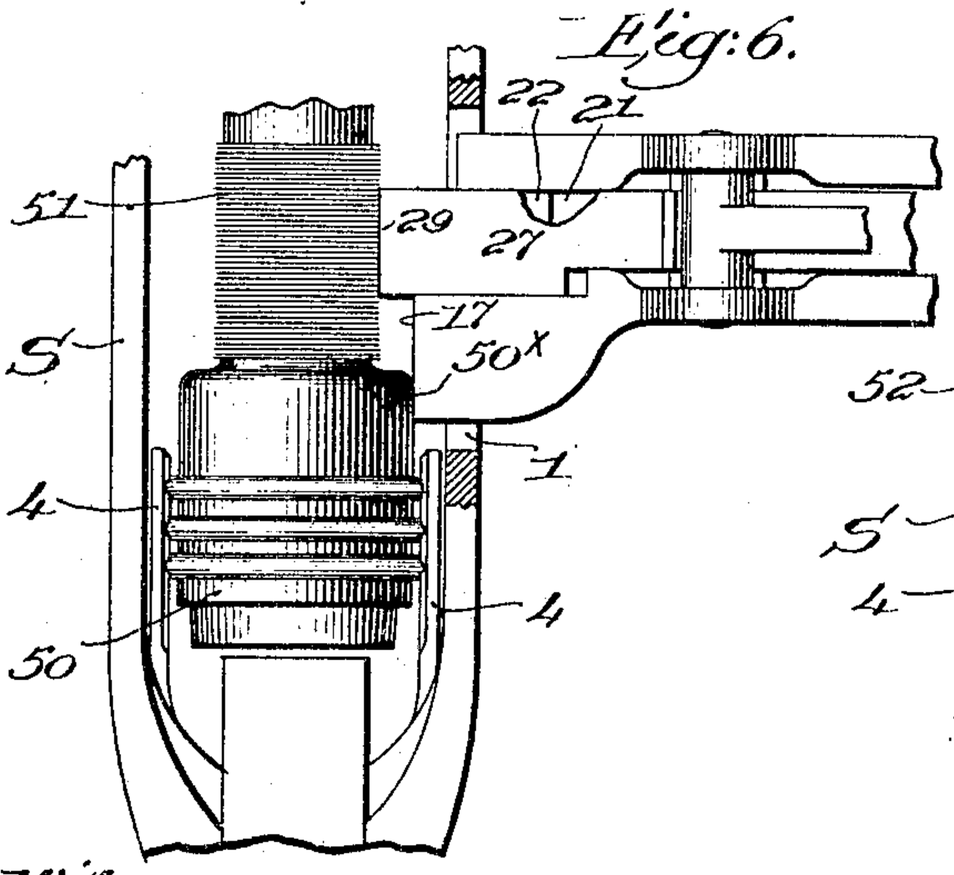
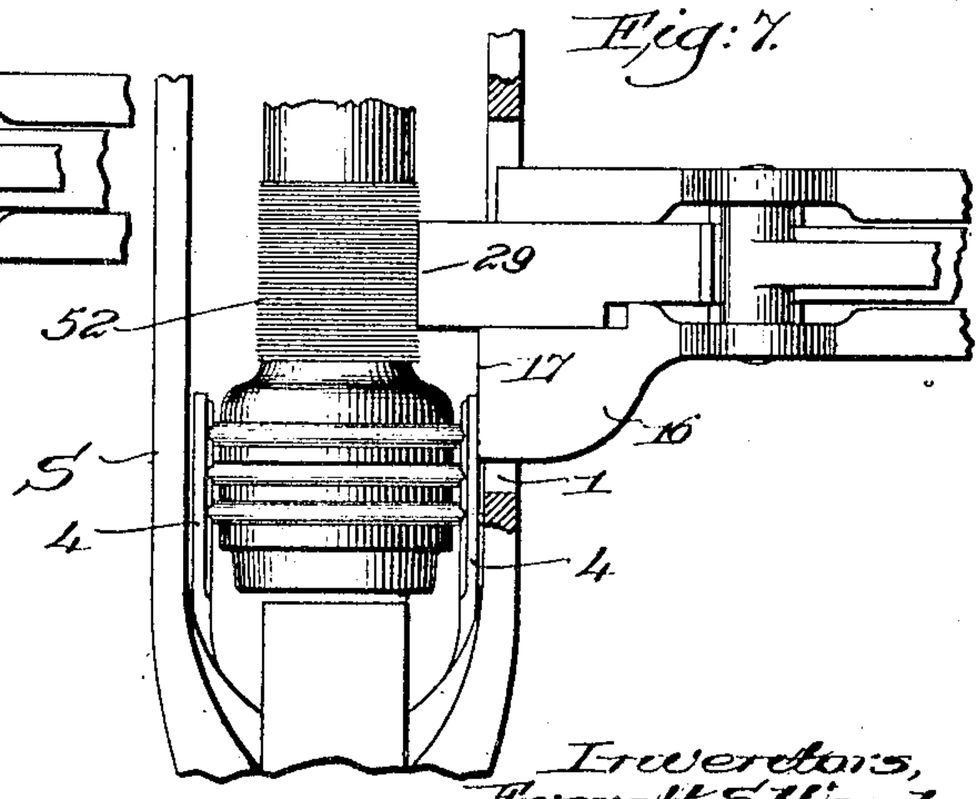



Fig: 7.




Witnesses,
Edward H. Allen.
Thomas J. Drummond.

Inventors,
Everett S. Wood,
Jonas Northrop,
by Crosby & Gregory
Attys.

# 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. 843,249. Specification of Letters Patent. Patented Feb. 5, 1907.

Application filed March 3, 1906. Serial No. 304,045.

*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 on the drawings representing like parts.

In order to positively control and effect a change in the operation of a loom when the filling in the running-shuttle has become substantially exhausted or woven off to a predetermined extent, various instrumentalities or mechanisms have been devised and put into practical operation.

The change in the operation of the loom may be the automatic stoppage thereof to enable manual replenishment of filling to be made, or it may be the actuation of mechanism to automatically effect replenishment of the running filling without stopping the loom.

Automatic filling replenishment may be effected by mechanism of the "Northrop" type, as disclosed in United States Patent No. 529,940 and other patents, wherein a fresh supply of filling is inserted automatically in the running shuttle of the automatically self-threading class without stopping the loom. Such looms are in extensive use, and we have herein illustrated one practical embodiment of our invention in connection with a loom of the Northrop type above referred to.

Our present invention has for its object the production of novel and efficient mechanism to control and effect a desired change in the operation of the loom when the running filling is substantially exhausted or woven off to a predetermined extent, and, broadly considered, our invention comprehends purely mechanical control of the loom in contradistinction to electric or electromechanical control.

In the present embodiment of our invention the filling-exhaustion-indicating mechanism comprehends a mechanical feeler device governed and operated solely by or through means within the shuttle, the effective action of such device occurring when the running filling is exhausted to the predetermined extent, taking place without contact between the filling in the shuttle and any part of the feeler device.

The feeler device comprehends two movable members, one of which intermittingly impinges upon and is moved by means within the shuttle until the running filling is substantially exhausted, the second member, up to that time inactive or passive, thereupon impinging upon other means within the shuttle and by such impingement becoming active and effecting the actuation of the loom-controlling mechanism.

An "actuator," as it has been termed hereinafter, is mounted on one of said members and controlled by the other member, the actuator being positioned inoperatively by the latter until the predetermined filling exhaustion is attained, whereupon the member becoming active operates while the actuator is operatively positioned and the desired change in the operation of the loom is effected.

As will appear hereinafter, there is no pressure upon the filling in the shuttle at the instant one of the members of the feeler device changes from passive to active condition and at such instant the formerly-active member becomes passive or inert or "dead" in relation to the filling.

In making the bobbin or filling-carrier the finishing or final cut is made with a forming-tool of hardened steel and made with great accuracy possible in tool-making, so that for a given forming-tool a constant radial distance or difference in diameter is insured between the barrel or step of the filling-carrier and its head—that is, the external diameters of the head and barrel will differ by exactly the same amount in any number of bobbins finished by the same forming-tool or duplicates thereof. Consequently it is as accurate to "feel" between the yarn or filling on the filling-carrier and the head thereof as between the filling and the part of the carrier on which the filling is actually wound. This we utilize in the preferred embodiment of our present invention, as will appear hereinafter. There is great advantage, moreover, in employing a feeler device

wherein the actuating or active part or member never contacts with the filling, and especially in such a feeler device which effects a change in the operation of the loom immediately upon contact with some means within the shuttle, such as the filling-carrier or something pertaining thereto.

The construction and operation of our present apparatus is such that premature action is impossible, and a much desired result is attained—viz., a feeler device depending solely on the filling-carrier or means within the shuttle—and at the same time the structure is exceedingly simple and certain in its operation.

In our invention no adjustment is required, for the relative position between the impinging faces of the members of the feeler device is in the first instance made and adapted to the particular form of filling-carrier to be used. Furthermore, it matters not what shuttle is used, whether it be a little larger or a little smaller or whether the shuttle is new or nearly worn out.

As will appear hereinafter, the relative forward position of the shuttle in the shuttle-box and the position of the lay at the end of its forward beat have no effect upon the action and accuracy of operation of the feeler device. In other words, the delicacy and accuracy of operation of the feeler device in our present invention is determined in its making, and in the making of the tool which is used to shape or form the filling-carrier, in both of which cases great accuracy is easily obtainable. The adjustment of the feeler device is thus taken out of the hands of unskilled mill operatives and placed in the hands of skilled mechanics.

The various novel features of construction, arrangement, and operation 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 shown in position to coöperate with the filling-exhaustion indicating or controlling 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 automatic filling-replenishing mechanism at the opposite side of the loom being illustrated. Fig. 3 is a detail on the line 3 3, Fig. 1, looking toward the left, showing the feeler device and the locking-controller for the transmitter. Fig. 4 is an enlarged detail in plan showing the manner in which the feeler device coöperates with the filling-carrier in the shuttle, the filling-carrier being of a special construction. Fig. 5 is a view of the head end of the filling-carrier proper and the skewer on which it is mounted when in the shuttle. Fig. 6 is a view similar to Fig. 4, showing a different form of filling-carrier. Fig. 7 is a like view, but illustrating the manner in which our invention can be arranged to operate in connection with the spring-jaws in the shuttle which hold the filling-carrier in position. Fig. 8 is a much-enlarged longitudinal section on the line 8 8, Fig. 1, taken through the center of the feeler member proper of the feeler device, the parts being in normal position. Fig. 9 is a like view, but showing the relative change in the position of the several parts, due to filling-induced movement of the feeler member.

The filling-feeder F, Fig. 2, to contain the reserve supplies of filling and the transferrer $f'$ to transfer the filling-carriers or bobbins one by one to the automatically self-threading shuttle S, the controlling rock-shaft $d'$ to effect replenishment of filling in the running shuttle, the upturned arm $d^2$, fast on said rock-shaft and having pivotally connected with it a rearwardly-extended latch $d^3$, adapted to at times coöperate with a vibrating actuator, such as the weft-hammer W, Fig. 1, may be and are all of well-known construction and operation in the Northrop type of loom.

When the rear end of the latch is moved into position to be engaged by the head of the weft-hammer, the forward movement of the latter pushes the latch forward and through arm $d^2$ turns the rock-shaft $d'$ in the direction of arrow 200, Fig. 2, to effect the operation of the replenishing mechanism. Herein the actuator, latch, rock-shaft, and intervening connections constitute loom-controlling means which herein govern the time of operation of the replenishing mechanism. The actuation of such controlling means is effected by or through filling-exhaustion-indicating mechanism, but only when the running filling becomes exhausted to a predetermined extent, so that premature filling replenishment cannot take place, while the action is certain and positive when the predetermined exhaustion is attained.

As is usual in apparatus of this general character, the shuttle has a side opening 1 to register with the opening $1^\times$ in the front wall 2 of the feeling or indicating shuttle-box 3, Fig. 1.

The shuttle is shown as having spring-jaws 4 to engage and support the filling-carrier, and in Figs. 1, 4, and 5 we have shown a compound carrier comprising a skewer 5, having rings on its butt 6, and a bobbin having a barrel 7 and a head 8 and adapted to slip onto the skewer and be held in position by suitable catches 9, the jaws 4 engaging the rings on the butt 6. It is to be understood, however, that this compound filling-carrier is not of itself novel, nor do we make any claim thereto *per se*, and so far as concerns its behavior in the shuttle or when transferred thereto or ejected therefrom it differs in no way from

the ordinary one-piece bobbin or filling-carrier.

The barrel 7 and head 8 are accurately formed by a tool of the precise shape required, so that the difference in diameter between said parts is a constant quantity, and we avail ourselves of this fact in that embodiment of our invention wherein the feeling action is between the yarn or filling and the head, as will appear.

The holding-plate 10 for the shipper $S^{\times}$ has at its outer end a vertically-adjustable bracket 11, on which is secured a stand 12, preferably inclined at such an angle that the feeler moves in a path closely coincident with the path of the lay $A^3$, substantially as in our prior patent, No. 789,472, dated May 9, 1905, and as shown in Fig. 2. Said stand is conveniently made in two parts bolted together and chambered out at $12^{\times}$, Figs. 8 and 9, to receive a transverse and rectangular enlargement 13 on one member, termed the "carrier," of the feeler device forming a part of the exhaustion-indicating mechanism.

The carrier is made as a flat elongated metal plate 14, extending rearwardly from the enlargement or cross-head 13, a preferably cylindrical shank 15 extending forward from the latter and freely sliding through an opening in the front end of the stand 12.

The cross-head slides in the chamber $12^{\times}$ and is guided therein, a spring $15^{\times}$, coiled around the shank between the front end of the stand and the cross-head, acting to project or move the carrier rearward to the position shown in Figs. 1, 4, 8, and 9, the rear end of the stand limiting such movement.

The body portion 14 of the carrier slides within a suitable opening in the rear end of the stand, and the rear end of the carrier is laterally enlarged to form a head 16, having a transverse impinging face or edge 17.

Upturned parallel ears 18 are formed on the carrier, which latter is longitudinally cut out at 19 from the cross-head to the ears, leaving a transverse bar 20 between their bases, and beyond the bar the carrier is cut out or apertured at 21. the head being longitudinally recessed at 22 to form a seat for and in which slides the feeler member, to be described.

An actuator is mounted on the carrier, and it is herein shown as an elongated arm 23, fulcrumed between the ears 18 on a pin 24, and having a short lug 25 depending below the fulcrum, the actuator extending forward above the carrier and projecting above the top of the stand 12, as shown clearly in Figs. 8 and 9.

The third member of the feeler device and what may be termed the "feeler proper," is mounted on the carrier and has a limited movement relative thereto. and by or through such movement controls the actuator 23. Herein the feeler is shown as an elongated bar 26, having a somewhat broader head 27, which fits slidably in the seat 22 of the carrier-head and rests upon the bottom thereof, the body portion of the feeler being disposed within the slot 19 and at its forward end resting on guide ribs or ledges 28. (Shown in dotted lines, Fig. 4.) The feeler is also slidably supported on the cross-bar 20, Figs. 8 and 9, and is slightly recessed for the purpose.

The feeler-head 27 has an impinging face or edge 29 and a transverse recess 30 in its under side to receive the portion of the carrier-head 16 beyond the opening or aperture 21, the fore-and-aft width of the recess 30 being such that a slight longitudinal movement of the feeler can be effected with relation to the carrier.

A light spring 31, seated in a socket 32 in the carrier cross-head 13, bears against a shoulder 33 on the front end of the feeler, the strength of the spring being sufficient merely to project the feeler when unopposed into the position shown in Figs. 4 and 8.

A positive connection is provided between the feeler and the actuator 23 by introducing the lower end of the lug 25 between transverse abutments or shoulders 34 on the body or shank of the feeler.

Owing to the great difference in lever-arms, comparing the lug 25 and the actuator 23, the slight forward movement of the feeler on the carrier is sufficient to elevate the tip of the actuator a considerable distance above the top of the stand 12, as shown in Fig. 9.

By properly shaping the adjacent faces of the lug 25 and the rearmost shoulder 34 said faces come into parallel contact when the actuator is elevated, Fig. 9, or in inoperative position, thereby preventing said actuator from being unduly elevated and acting as a limiting-stop for the said actuator when it is moved into inoperative position.

When the lay beats up and the shuttle is boxed in the shuttle-box 3, the feeler will enter the shuttle and its face 29 will impinge upon the filling, and the feeler will thereby first be moved forward upon and relative to the carrier for the slight distance permitted by the clearance of the recess 30 in the feeler-head. Then the continued forward movement of the lay will move both feeler and carrier forward in unison against the action of spring $15^{\times}$.

The initial filling induced and relative movement of the feeler acts through lug 25 to position inoperatively the actuator 23 by swinging the latter into the position shown in Fig. 9, and consequently when the carrier begins to move forward with the feeler the actuator is inoperative and so remains during that forward stroke. On the return stroke as the lay swings back the spring $15^{\times}$ returns or projects the carrier rearward to the full extent of its movement, Fig. 8, and as the

filling recedes from the impinging face 29 of the feeler the weight of the actuator and the stress of the light spring 31 operates to reset the feeler in impinging position and to return the actuator to operative position. The spring 31 will overcome any possible tendency of the relatively movable parts to stick, and by its use the actuator can be so made as to be in very nearly stable equilibrium *per se*, if desired.

Each filling-induced movement of the feeler will first inoperatively position the actuator, as described, and then the feeler and carrier will move outward in unison, the feeler thus intermittingly impinging on and being moved by means within the shuttle, such means herein being the filling; but manifestly the amplitude of filling-induced movement of feeler and carrier will gradually decrease as the filling diminishes and the distance between the barrel of the filling-carrier and the surface of the filling decreases. This gradual and intermittent diminution in the amplitude of the stroke of the carrier and feeler (moving in unison) proceeds until the filling in the shuttle is substantially exhausted or exhausted to a predetermined extent.

Referring to Fig. 4, it will be seen that there is substantially the same relative distance between the impinging faces 29 and 17 of the feeler and the carrier when the said members are normal as between the surfaces of the barrel and head 7 and 8 of the bobbin in the shuttle and that the face 29 of the feeler extends by that amount beyond the face 17 of the feeler-carrier. The smaller part of the filling-carrier is opposite the more extended part of the feeler device or barrel opposite feeler, while the larger part of the filling-carrier is opposite the less extended part—viz., the impinging face 17 of the feeler device.

As previously pointed out, the construction of both filling-carrier and feeler device can be made with the required degree of accuracy in the first instance, so that no adjustment is left to the unskilled handling of the loom operator in the mill.

We have herein embodied our invention in such a structure that as the amplitude of filling-induced movement of the feeler member gradually decreases the distance between the impinging face 17 of the feeler-carrier and some means within the shuttle gradually decreases, so that when the desired or predetermined filling exhaustion is reached such face 17 will impinge upon the means within the shuttle. In Figs. 1 and 4 such means is the head 8 of the filling-carrier or bobbin, the slot 1 in the shuttle-wall being made long enough to permit ready entrance of the carrier-head 16, with ample clearance. (See Fig. 4.) As the face 17 is quite wide, a considerable variation in the position of the shuttle in the shuttle-box may occur without causing the part 8 within the shuttle to move forward out of range of the impinging portion of the feeler-carrier. Furthermore, as the impingement of both feeler and feeler-carrier is upon separate things, both within the shuttle, and maintaining a certain relation to each other, it will be manifest that variations in the lay-stroke will have no effect whatever upon the operation of the feeler device. At the instant that the diminution in the diameter of the yarn mass permits the feeler-head to extend so far into the shuttle that there can be no filling-induced movement of the feeler the latter remains dead, inert, or passive on the carrier, and the actuator will remain quiescent and in its operative position, Fig. 8. The feeler, previously active and by its action positioning inoperatively the actuator and also maintaining the carrier passive, now becomes passive, while the carrier changes from a passive to an active condition, for it immediately impinges upon the head 8 of the filling-carrier and is moved forward thereby as the lay completes its forward beat, the carrier and actuator moving forward together as a unit. The feeler is of course moved forward with the carrier; but the feeler is absolutely inert and non-contacting with the filling remaining on the barrel of the filling-carrier, the remaining filling being indicated at $f^{\times}$, Fig. 4. Such filling remainder may be of any desired quantity; but it is in practice at least sufficient to extend a couple of times across the lay to insure a complete pick of filling in the cloth after exhaustion indication and before filling replenishment, reducing the waste to the lowest possible degree.

The change in the operation of the loom is effected by or through the exhaustion-indicating mechanism with absolute promptness and precision at the proper instant, and at such instant there is non-contaction between the filling and the feeler proper, or, indeed, any part of the feeler device. The operation of the latter is dependent solely upon the filling-carrier in the structure so far described or on something closely pertaining to the filling-carrier and within the shuttle, as will be explained. There can be no premature change in the operation of the loom, however, for while there is sufficient filling within the shuttle to impart a movement to the feeler by impingement thereon such movement will inoperatively position the actuator, so that the loom operation cannot be changed until just exactly the desired degree of filling exhaustion is reached. Until such time the feeler is primarily moved by impinging on the filling, while a secondary movement of the feeler-carrier is effected through said feeler; but when the latter noncontacts with the filling the feeler-carrier is moved immediately and primarily.

Means for causing the forward movement

of the operatively-positioned actuator to effect a change in the operation of the loom will be described; but as such means is substantially the same as shown and described in our prior patent, No. 789,472, of May 9, 1905, it will not require detailed description.

Referring to Figs. 1 and 2, the stud $33^{\times}$, the transmitter $34^{\times}$ $35^{\times}$, fulcrumed thereon and having its inner end extended beneath the latch $d^3$ to normally sustain it in inoperative position, the laterally-bent and upright ear 37, (see Fig. 3,) adjacent a guide 38 on the stand 12, the cam-slot 39 in said ear, and the controller for the transmitter may be and are all as in our patent just referred to, the controller being shown as an arm 40, fulcrumed on the stud 42. The free end of the controller passes through the cam-slot 39, under the guide 38, and across the top of the stand 12, the end or foot 43 of the controller extending into the operative path of movement of the actuator 23, the tip of the latter being beveled at 45, while the rear edge of the foot is notched at 44, Figs. 8 and 9. Normally the controller is in the low portion of the cam-slot 39, and if movement of the controller is effected toward the front of the loom it will act through the cam-slot to depress the adjacent end of the transmitter, rocking the latter on its fulcrum and moving the latch $d^3$ into position to be engaged and moved by the actuator or weft-hammer W. No movement of the controller 40 can be effected so long as filling-induced movement of the feeler inoperatively positions the actuator with its sharpened tip 45 above the foot 43 of the controller, and when such tip passes forward beyond the notched edge 44 of the foot the actuator cannot by any possibility coöperate with and move the controller. When, however, the predetermined filling exhaustion occurs, the actuator remains operatively positioned, as the feeler-carrier impinges upon means within the shuttle, and as the lay moves the feeler-carrier forward the tip of the actuator engages the notched edge 44 of the controller-foot, moving the controller forward and first unlocking and then operatively rocking the transmitter. A spring 46 acts normally to hold the controller in the low or rear end of the cam-slot 39, locking the transmitter in inoperative position. Either a filling-replenishing mechanism or a loom-stopping mechanism constitutes means to control or effect a change in the operation of the loom, and the filling-exhaustion-indicating mechanism governs the operation of such controlling means. Instead of arranging the feeler device to coöperate with a compound filling support or carrier, such as is illustrated in Figs. 4 and 5, an ordinary one-piece filling-carrier or bobbin may be used, as shown in Fig. 6, the head of the feeler-carrier impinging upon the head or butt 50 of the filling-carrier. The diameter of such head or butt 50 is greater than that of the step or barrel 51 by the desired amount, and preferably the said butt is lengthened beyond the usual rings, as at $50^{\times}$, to clear the ends of the holding-jaws 4 in the shuttle. The operation of the feeler device does not differ, however, from that already described, the filling impinging on the feeler until substantial filling exhaustion, and immediately the feeler-carrier impinges on the butt 50, and the change in the operation of the loom is effected. We can also arrange the feeler to cooperate with the filling on the filling-carrier until predetermined exhaustion and the feeler-carrier to immediately impinge on the holding-jaws 4, as shown in Fig. 7, the only change required being in making the slot 1 in the shuttle-wall long enough to expose a portion of the adjacent jaw. When this arrangement is employed, it will be manifest that the distance between the barrel 52 of the filling-carrier, Fig. 7, and the outer face of the holding-jaws is the "critical distance," as it may be termed, and the normal distance between the impinging faces 29 and 17 of the feeler device must correspond.

Whichever arrangement be employed it will be manifest that one member of the feeler device intermittingly impinges on and is moved by means within the shuttle, such as the filling, until predetermined filling exhaustion, and immediately the other member of the feeler device impinges on means also within the shutter, but other than the first-named means or the filling, and thereupon a change in the operation of the loom is effected.

In each of Figs. 4, 6, and 7 the filling is supposed to have been exhausted to the predetermined extent, so that the other means within the shuttle is impinged on by the feeler-carrier or member of the feeler device which is not the feeler proper.

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

1. Controlling mechanism for looms, having two members adapted to be impinged upon, an actuator mounted on one member and operatively connected with the other member and movable relatively thereto, means for impinging on one member to thereby position inoperatively said actuator, a shuttle, and means within it for impinging on the other member only when substantial exhaustion of the filling within the shuttle permits, to move the actuator while operatively positioned and thereby cause the actuation of the controlling mechanism, neither of said members contacting with the filling at such time.

2. In a loom, means to control its operation, and a shuttle to contain a supply of filling, said controlling means including two members adapted to be impinged upon, one

of said members intermittingly impinging upon and being moved by the filling in the shuttle until predetermined exhaustion thereof, the second member never contacting with the filling, an actuator inoperatively positioned by each of such movements of said member, and means within the shuttle to impinge upon the other of said members only when through substantial exhaustion the filling fails to move the first-named member, to thereby move the actuator while operatively positioned and cause the actuation of the controlling means.

3. In filling-exhaustion-indicating mechanism for looms, a yieldingly-sustained feeler adapted to be intermittingly impinged upon and moved by the filling in the shuttle until substantial exhaustion of such filling, an actuator inoperatively positioned by such feeler movements, and a member never contacting with the filling and adapted to impinge upon means within the shuttle only when filling-induced feeler movement ceases, to thereby move the actuator while operatively positioned.

4. In filling-exhaustion-indicating mechanism for looms, a yieldingly-sustained feeler adapted to be intermittingly impinged upon and moved by the filling in the shuttle until substantial exhaustion of such filling, an actuator inoperatively positioned by such feeler movements, and a feeler-carrier never contacting with the filling and maintained passive by filling-induced movement of the feeler, and adapted, upon failure of such movement of the feeler, to initially impinge upon means within the shuttle other than the filling and thereby become active to move the actuator while operatively positioned.

5. In a loom, a shuttle adapted to support a filling-carrier and having a side opening opposite the head thereof, and filling-replenishing mechanism, combined with means to control the time of operation of said mechanism, including a feeler to enter the opening in the shuttle on alternate picks and impinge upon and be moved by the filling until predetermined exhaustion thereof, and a member which never contacts with the filling and which enters the opening and impinges upon the filling-carrier to effect the operation of the controlling means when, by reason of predetermined filling exhaustion, filling-induced movement of the feeler ceases.

6. In a loom, a shuttle to contain a supply of filling, means within the shuttle other than the filling to be impinged upon, filling-replenishing mechanism, and means to control the time of its operation, combined with a reciprocating carrier, and a feeler and an actuator, independently mounted thereon, filling-induced movement of the feeler preventing coöperation of the actuator and said controlling means, and coöperation of the carrier and said means within the shuttle, until predetermined exhaustion of the filling in the shuttle, the carrier never contacting with the filling.

7. In a loom, a shuttle to contain a supply of filling, means to effect a change in the operation of the loom, including a reciprocating carrier never contacting with the filling, a feeler mounted thereon to intermittingly impinge upon and be moved by the filling in the shuttle until predetermined exhaustion thereof, filling-induced movement of the feeler effecting movement of the carrier, and means within the shuttle other than the filling, operative upon failure of the filling to impinge upon the feeler, to impinge upon the carrier and affect the operation of the loom-controlling means independently of the feeler.

8. In a loom, a running shuttle, controlling mechanism for the loom, having two members adapted to be impinged upon, one supporting the other, an actuator mounted on one member and movable relatively to both members, means within the shuttle for impinging on one member to move it and thereby position inoperatively said actuator, and other means within the shuttle, for impinging on the other member when exhaustion of the running filling permits, to move the actuator while operatively positioned and thereby cause the actuation of the controlling mechanism, both members being out of contact with the filling when the operatively-positioned actuator is moved.

9. In a loom, a running shuttle, controlling mechanism for the loom, having two members adapted to be impinged upon, one supporting the other, an actuator mounted on one member and movable relatively to both members, means within the shuttle for impinging on one member to move it and thereby position inoperatively said actuator, and other means within the shuttle for impinging on the other member when exhaustion of the running filling permits, to move the actuator while operatively positioned and thereby cause the actuation of the controlling mechanism, and means to restore said members to impinging position, neither member contacting with the filling when the operatively-positioned actuator is moved.

10. In a loom, a running shuttle, controlling mechanism for the loom, having two members adapted to be impinged upon, an actuator, means within the shuttle for impinging on one member to move it and thereby position inoperatively said actuator, and other means within the shuttle, for impinging on the other member only when exhaustion of the running-filling permits, neither member contacting with the filling at such time, to move the actuator while operatively positioned and thereby cause the actuation of the controlling mechanism.

11. In filling-exhaustion-indicating mech-

anism for looms, in combination, a feeler device having two members adapted to be impinged upon, an actuator mounted on one, and controlled by the other of said members, a running shuttle, means within it for impinging on one of said members, and thereby rendering inoperative the actuator, other means also within the shuttle for impinging, when exhaustion of the filling permits, on the other member to move the actuator while operatively positioned, a transmitter, and a controller to lock and also move the same, movement of the operatively-positioned actuator acting through said controller to unlock and move the transmitter.

12. In a loom, a shuttle to contain a supply of filling, means within the shuttle other than the filling, and mechanical means to effect, while out of contact with the filling, a change in the operation of the loom by engagement with such other means within the shuttle, the filling in the latter preventing such engagement until exhausted to a predetermined extent.

13. In a loom, mechanical means to effect a change in the operation thereof, and a shuttle to contain a supply of filling, said means including a member to intermittingly contact with the filling in the shuttle until predetermined exhaustion of the filling, and a member never contacting with the filling, to engage means other than the filling within the shuttle and cause the actuation of said mechanical means only when such engagement is permitted by non-engagement of the first-named member and the filling.

14. In a loom, a shuttle to contain a supply of filling, and mechanical means to control the operation of the loom by engagement with means within the shuttle only upon predetermined exhaustion of the filling, said controlling means operating when out of contact with the filling in the shuttle.

15. In a loom, a shuttle to contain a supply of filling, and mechanical filling-exhaustion-indicating 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, intermittent impingement of one member upon the filling preventing impingement of the other member until predetermined exhaustion of the filling, whereupon the loom-controlling means is caused to operate, neither member contacting with the filling.

16. In a loom, a shuttle, a filling-carrier therein to sustain a supply of filling, and mechanical means to control the operation of the loom by engagement with the filling-carrier upon predetermined exhaustion of the filling thereon, the means including a member intermittingly acted upon by the filling prior to its predetermined exhaustion, to prevent such engagement, said means being adapted to operate when such member thereof is not contacting with the filling.

17. In a loom, a shuttle, a filling-carrier therein to sustain a supply of filling, and mechanical means to control the operation of the loom, said means including a member never contacting with the filling and adapted to engage the filling-carrier, and a member to prevent such engagement by intermittent impingement on the filling upon the carrier until such filling is exhausted to a predetermined extent.

18. In a loom, mechanical means to indicate filling exhaustion and adapted thereupon to effect a change in the operation of the loom, said means including a reciprocating feeler-carrier, and a feeler mounted thereon to indicate filling exhaustion, the feeler and feeler-carrier being out of contact with the filling in the shuttle when substantial exhaustion of the filling is indicated, and means within the shuttle to impinge on the feeler-carrier only when such exhaustion is indicated.

19. In a loom, mechanical means to indicate filling exhaustion and adapted thereupon to effect a change in the operation of the loom, said means including a yieldingly-supported, reciprocating feeler-carrier never contacting with the filling and adapted to engage means within the shuttle and effect the operation of the said mechanical means, and a feeler supported by and movable relatively to the feeler-carrier, to intermittingly impinge upon and be moved by the filling in the shuttle until substantial exhaustion of such filling, such filling exhaustion being indicated through the instrumentality of the feeler, the latter preventing any engagement of the feeler-carrier with means within the shuttle until the feeler and filling in the shuttle cease to contact.

20. In a loom, a shuttle to contain a filling-carrier, mechanical means to indicate filling exhaustion and adapted to control the operation of the loom, said means including a reciprocating member and a feeler mounted thereon, said member having no contact with the filling and impinging upon the filling-carrier when substantial exhaustion of the filling in the shuttle is indicated by non-engagement of such filling and the feeler, whereby the operation of the controlling means is effected through the instrumentality of the filling-carrier when there is no contact between the feeler and the filling.

21. In a loom, a shuttle to contain a filling-carrier provided with a supply of filling, a feeler adapted to intermittingly engage and be moved by means within the shuttle, and a feeler-carrier to effect a change in the operation of the loom by or through impingement on the filling-carrier upon substantial ex-

haustion of the filling, the feeler-carrier operating independently of said means within the shuttle.

22. In a loom, a shuttle to contain a supply of filling, separate means within the shuttle to be impinged upon, and a mechanical instrumentality to change the operation of the loom, including a member to intermittingly impinge upon the filling in the shuttle until substantial exhaustion of such filling, and a second member which never contacts with the filling adapted to impinge upon said separate means within the shuttle only when, by reason of substantial exhaustion of the filling, the latter fails to be impinged upon by the member adapted so to do, the impingement of said second member effecting the actuation of said instrumentality.

23. In a loom, a shuttle to contain a supply of filling, and a mechanical instrumentality to effect a change in the operation of the loom upon substantial exhaustion of the running filling, including a normally passive member, never contacting with the filling, and a member to intermittingly impinge upon the filling in the shuttle and maintain the first-named member passive, the filling impinging member becoming passive upon substantial exhaustion of the filling and permitting the passive member to become active by or through impingement upon means within the shuttle other than the filling.

24. In a filling-exhaustion-indicating-mechanism for looms, a feeler adapted to intermittingly engage and be moved by means within the shuttle, an instrumentality acting independently of said means to engage other means within the shuttle only upon substantial exhaustion of the filling, to thereby change the operation of the loom, a shuttle to contain a supply of filling, and such other means to be engaged, within the shuttle and separate from the filling therein.

25. In filling-exhaustion-indicating mechanism for looms in combination, a shuttle to sustain a supply of filling, other means within the shuttle, a mechanical instrumentality to effect a change in the operation of the loom by engagement with such other means within the shuttle, the filling in the latter preventing such engagement until exhausted to a predetermined extent, a transmitter, and a controller to lock and also move the same, the engagement of said instrumentality with the means within the shuttle acting through the controller to unlock and move the transmitter.

26. In filling-exhaustion-indicating mechanism for looms, in combination, a shuttle, a filling-carrier therein to sustain a supply of filling, mechanical means to control the operation of the loom by engagement with the filling-carrier upon predetermined exhaustion of the filling thereon, said means being adapted to operate when non-contacting with the filling, a transmitter, and a controller to lock and move the same, engagement of the mechanical means with the filling-carrier acting through the controller to unlock and move the transmitter.

27. In a loom, in combination, a running shuttle, and controlling mechanism for the loom, having two members adapted to be impinged upon, the member first impinged upon being adapted to move the other, an actuator, means within the shuttle to impinge on one member and inoperatively position the actuator, other means within the shuttle to impinge on the other member, only when predetermined exhaustion of the filling permits, and move such member independently of the filling, to effect movement of the actuator while operatively positioned and thereby cause the actuation of the controlling mechanism, the simultaneous movement of both members after either is impinged upon moving the actuator bodily therewith in either its inoperative or its operative position.

28. In a loom, a shuttle to contain a filling-carrier having a head and smaller barrel, combined with mechanism to effect a change in the operation of the loom, including two relatively movable members having impinging faces normally positioned to correspond substantially to the difference in diameter between the head and barrel of the filling-carrier, and an actuator mounted on one and controlled by the other member, the latter member being adapted to intermittingly impinge upon and be moved by the filling on the barrel to thereby position inoperatively the actuator and also prevent impingement of the supporting member on the head until predetermined exhaustion of the filling, said supporting member thereupon immediately impinging upon and being moved by the head while the actuator is operatively positioned, to effect the operation of said mechanism.

29. In a loom, a shuttle to contain a filling-carrier, and means to effect a change in the operation of the loom, including a mechanical feeler device operating solely through the instrumentality of and by engagement with the filling-carrier when substantial exhaustion of the filling prevents contact between it and any part of the feeler device.

30. In a loom, a shuttle to contain a supply of filling, means within the shuttle other than the filling, and mechanical means to effect a change in the operation of the loom, including a device comprehending a governing member and an operating member, the former, through the instrumentality of the filling in the shuttle, preventing action of the latter until predetermined exhaustion of filling, the operating member acting immediately through the instrumentality of the means within the shuttle other than the filling, and never contacting with the latter.

31. In a loom, a shuttle to contain a supply of filling, means within the shuttle other than the filling, and mechanical means to effect a change in the operation of the loom, including a governing member to intermittingly contact with the filling within the shuttle until predetermined filling exhaustion, and an operating member never contacting with the filling and adapted to contact with the means within the shuttle other than the filling immediately upon failure of the latter to contact with the governing member, to thereby effect the actuation of said mechanical means.

32. In a loom, a shuttle, a filling-carrier having a head, and a filling-receiving portion, combined with mechanical means to effect a change in the operation of the loom upon predetermined filling exhaustion, said means including a member to intermittently impinge upon and be moved by the filling in the shuttle until predetermined exhaustion, and a member to impinge upon the head of the filling-carrier and restrained from so impinging until non-contaction of the filling and the first-named member, impingement of the second-named member on the head of the filling-carrier immediately causing the operation of the said mechanical means.

33. In a loom, a running shuttle, means to control the operation of the loom, including a spring-controlled reciprocating carrier, a feeler mounted on and having a limited movement relative to the carrier, the latter never contacting with the filling, a light spring to reset the feeler, the latter intermittingly engaging and being moved by the filling within the shuttle, to first compress the feeler-spring and then retract the carrier, and means within the shuttle, other than the filling and operative upon failure of the latter to move the feeler, to immediately impinge upon and retract the carrier, to cause the actuation of the loom-controlling means.

34. In a loom, a shuttle to contain a supply of filling, filling-replenishing mechanism, means to control the time of its operation, including a reciprocating carrier, never contacting with the filling, a feeler mounted thereon to intermittingly impinge on and be moved by the filling in the shuttle until predetermined exhaustion thereof, filling-induced movement of the feeler effecting movement of the carrier in one direction, a spring to effect its return movement, a light spring to reset the feeler on the carrier after filling-induced movement of the feeler, and means within the shuttle, operative only upon failure of the filling to impinge upon the feeler, to impinge upon and move the carrier against its spring, to effect the operation of the replenishing mechanism independently of the feeler.

35. 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 carrier, never contacting with the filling, a feeler and an actuator independently mounted thereon, the former controlling the latter, a light spring to reset the feeler, filling-induced movement of the feeler compressing its spring and inoperatively positioning the actuator to prevent its coöperation with the controlling means, and means within the shuttle, other than the filling, operative upon predetermined filling exhaustion to impinge upon and inove the carrier while the feeler is passive thereon and the actuator operatively positioned, to cause coöperation between the actuator and controlling means.

36. 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 reciprocating carrier on which the feeler is mounted, and never contacting with the filling, means within the shuttle other than the filling to impinge upon and move primarily the carrier when exhaustion of the filling fails to cause its impingement on the feeler, an actuator movably mounted on the carrier and governed by the feeler, a transmitter, and a cooperating, positively-connected controller therefor lying in the operative path of movement of the actuator, filling-induced feeler movement positioning inoperatively the actuator and also moving the carrier, primary movement of the latter causing the actuator to move in its operative path to engage the controller and effect therethrough the operation of the transmitter.

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

EVERETT S. WOOD.
JONAS NORTHROP.

Witnesses:
GEORGE OTIS DRAPER,
ERNEST W. WOOD.