No. 833,796. PATENTED OCT. 23, 1906.

J. NORTHROP.

FILLING REPLENISHING LOOM.

APPLICATION FILED SEPT. 16, 1905.

3 SHEETS—SHEET 1.

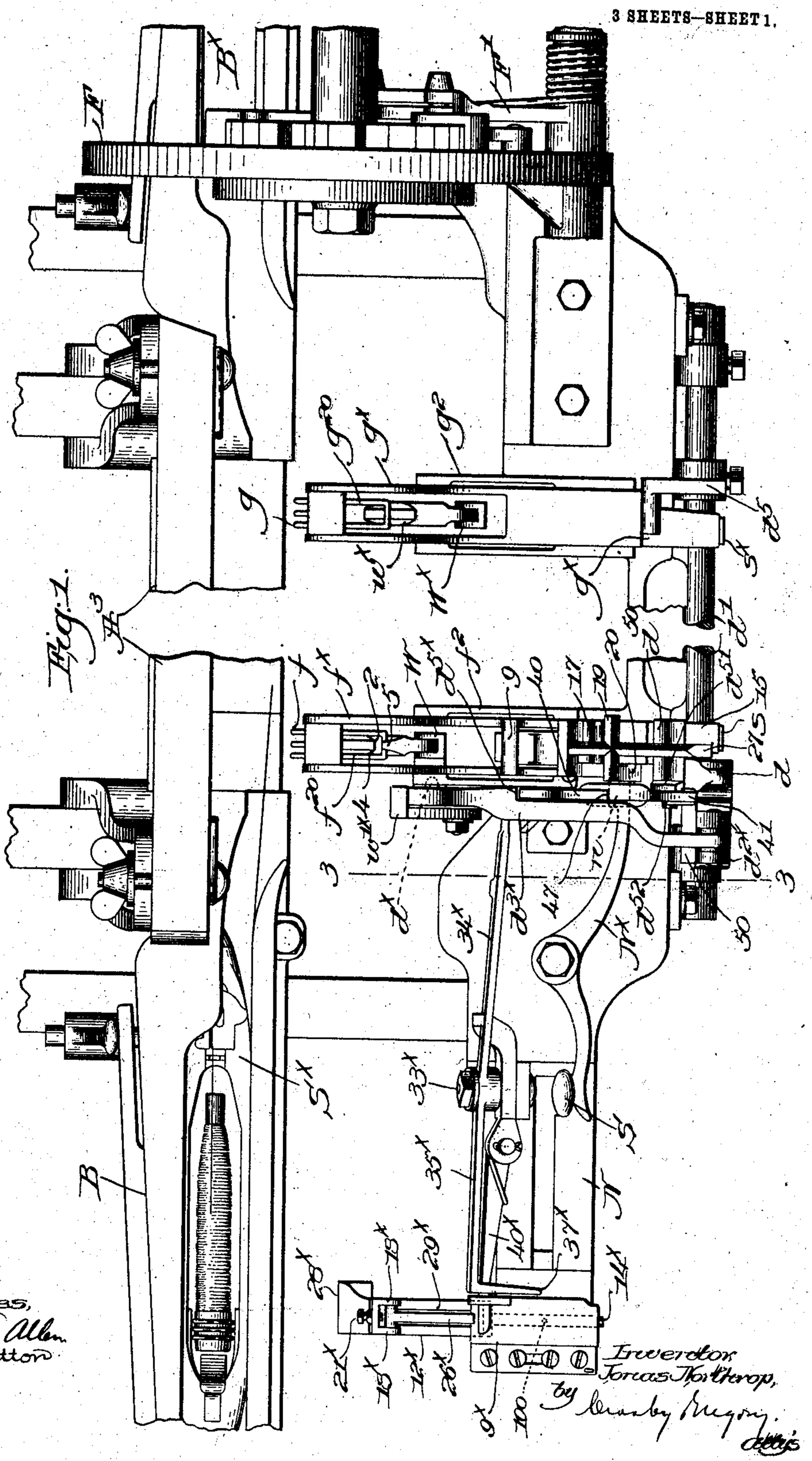


Fig. 1.

Witnesses,
Edward F. Allen
S. Wm. Lutton

Inventor
Jonas Northrop,
by Crosby Gregory
Atty's

THE NORRIS PETERS CO., WASHINGTON, D. C.

No. 833,796. PATENTED OCT. 23, 1906.

J. NORTHROP.

FILLING REPLENISHING LOOM.

APPLICATION FILED SEPT. 16, 1905.

3 SHEETS—SHEET 2.

Fig: 2.

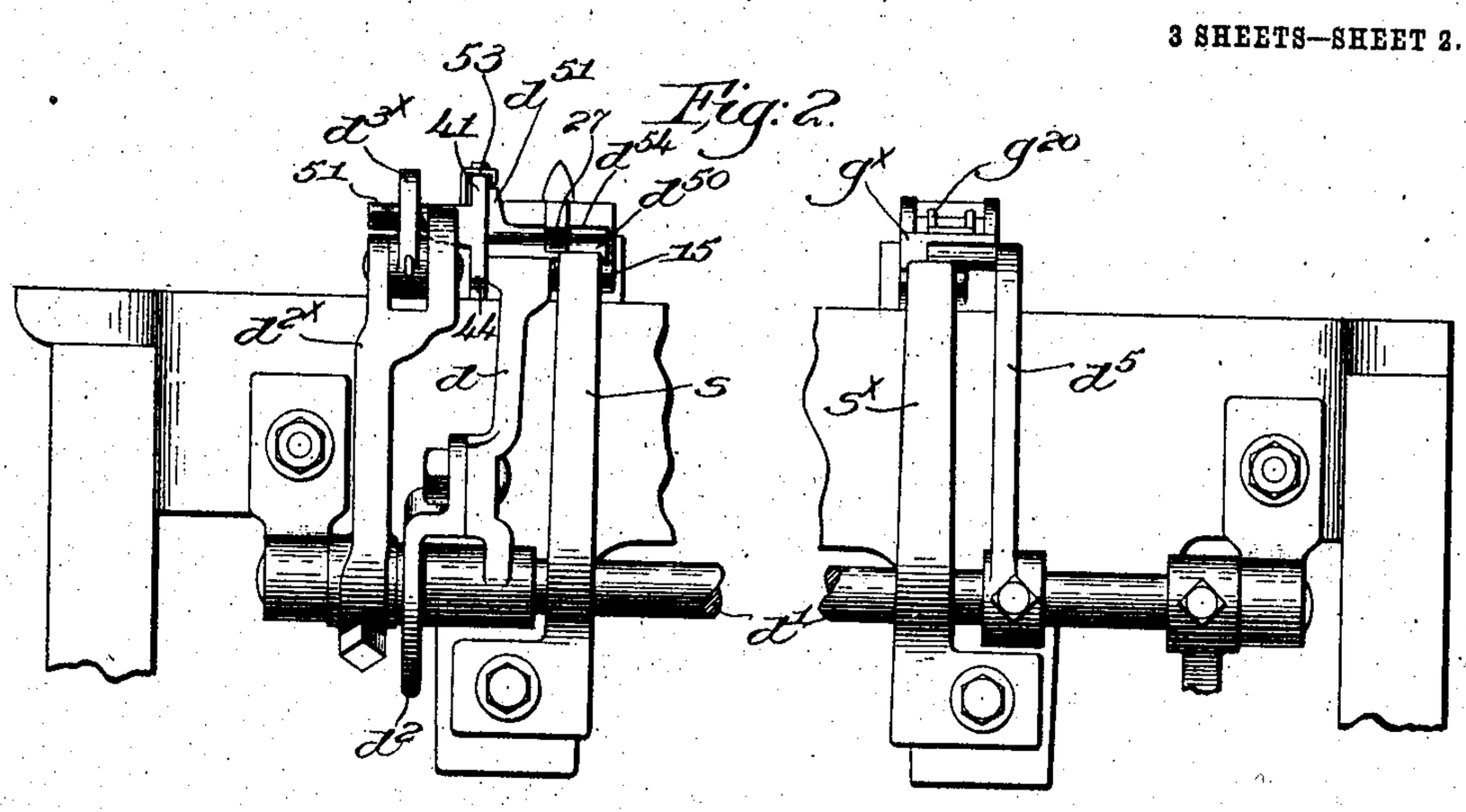


Fig: 3.

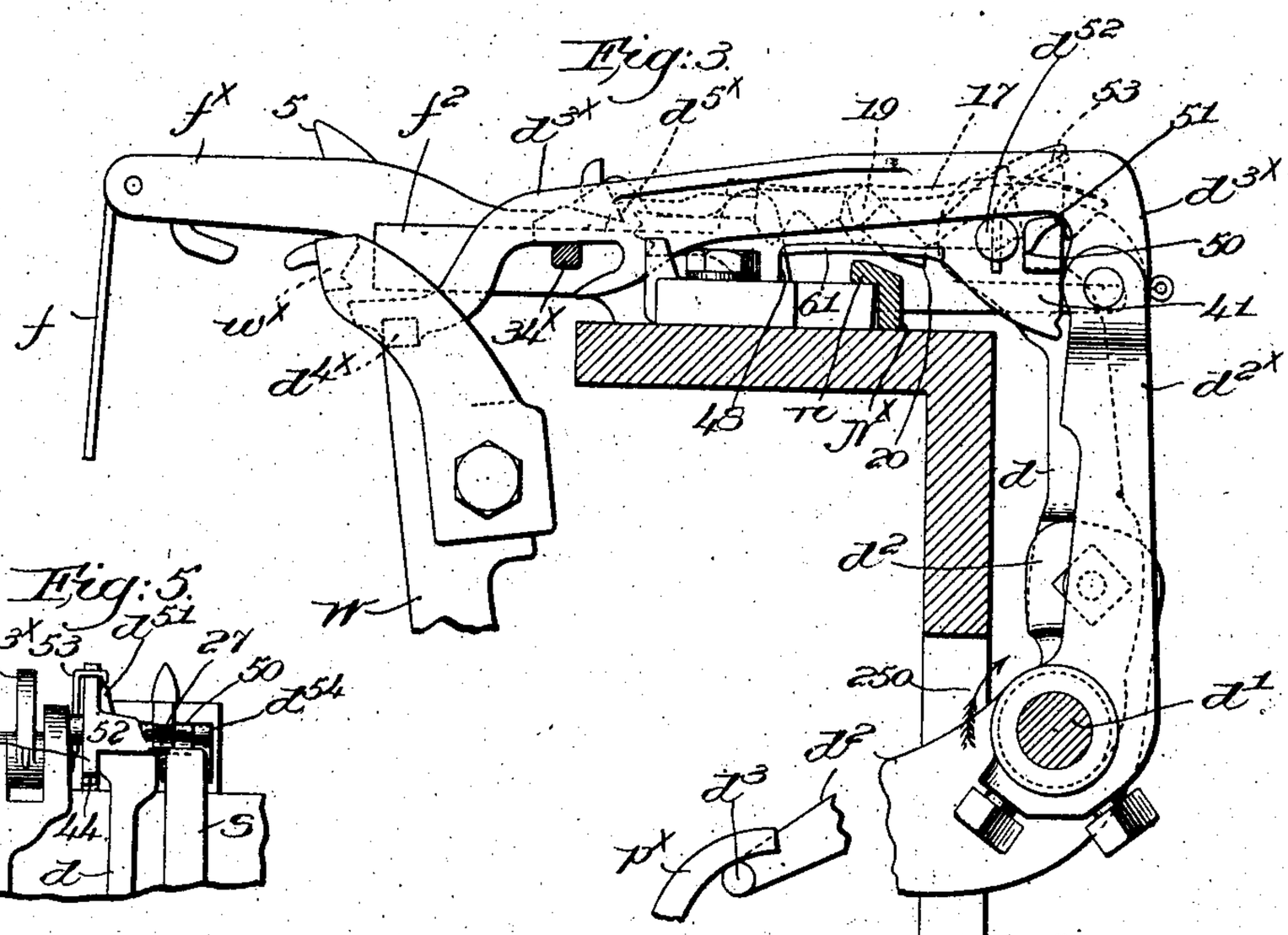
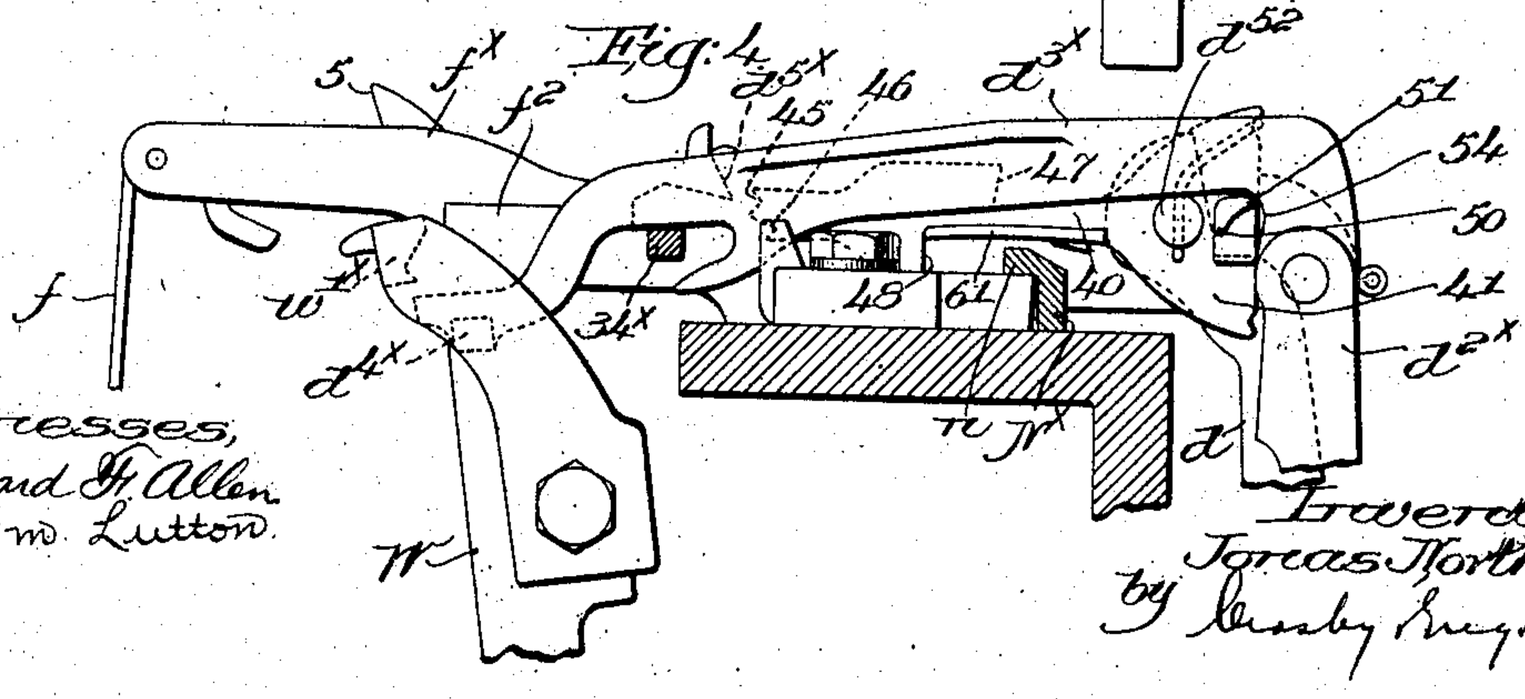


Fig: 5.

Fig: 4.



Witnesses,
Edward F. Allen
S. Wm. Lutton.

Inventor,
Jonas Northrop,
by Crosby Gregory.
Attys

No. 833,796. PATENTED OCT. 23, 1906.

J. NORTHROP.

FILLING REPLENISHING LOOM.

APPLICATION FILED SEPT. 16, 1905.

3 SHEETS—SHEET 3.

Fig: 6.

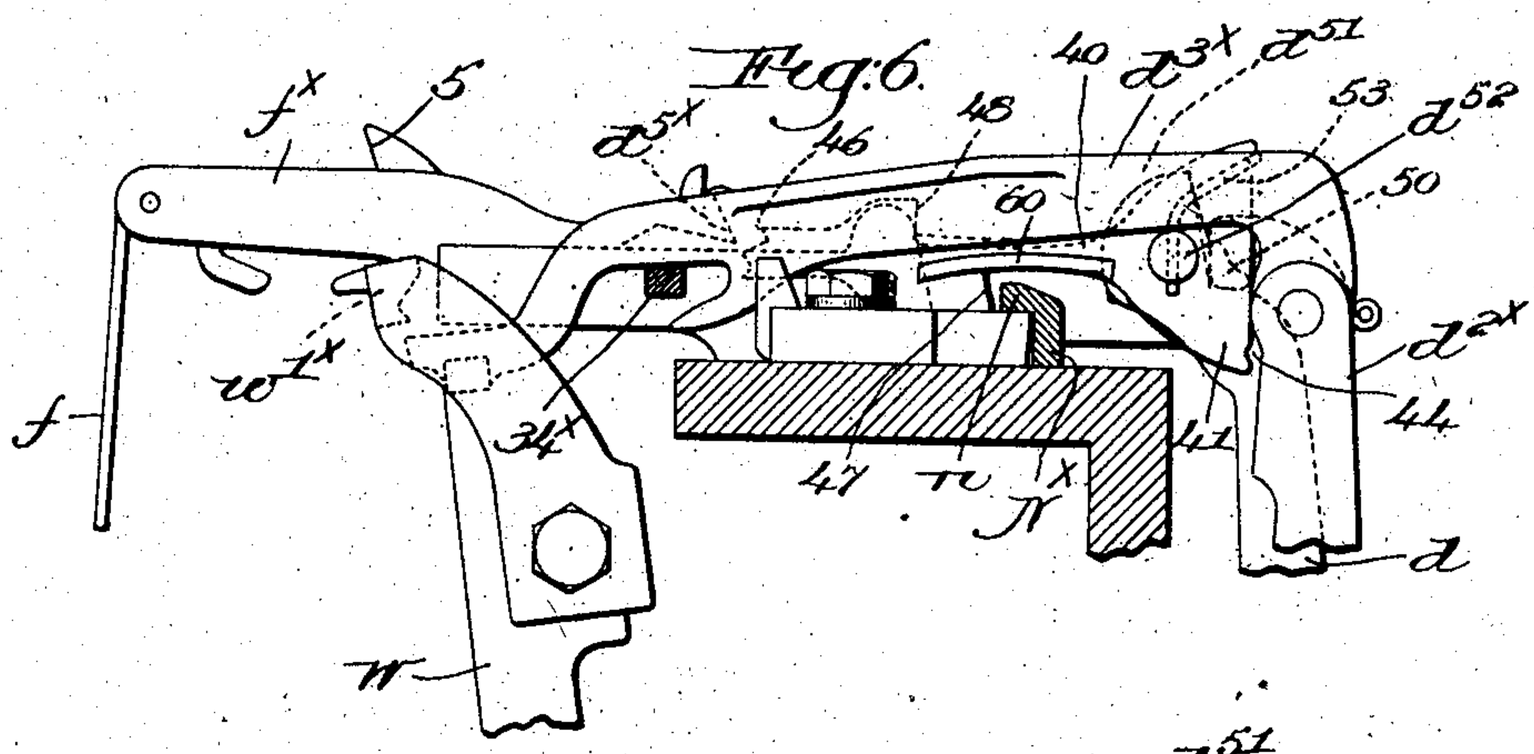


Fig: 7.

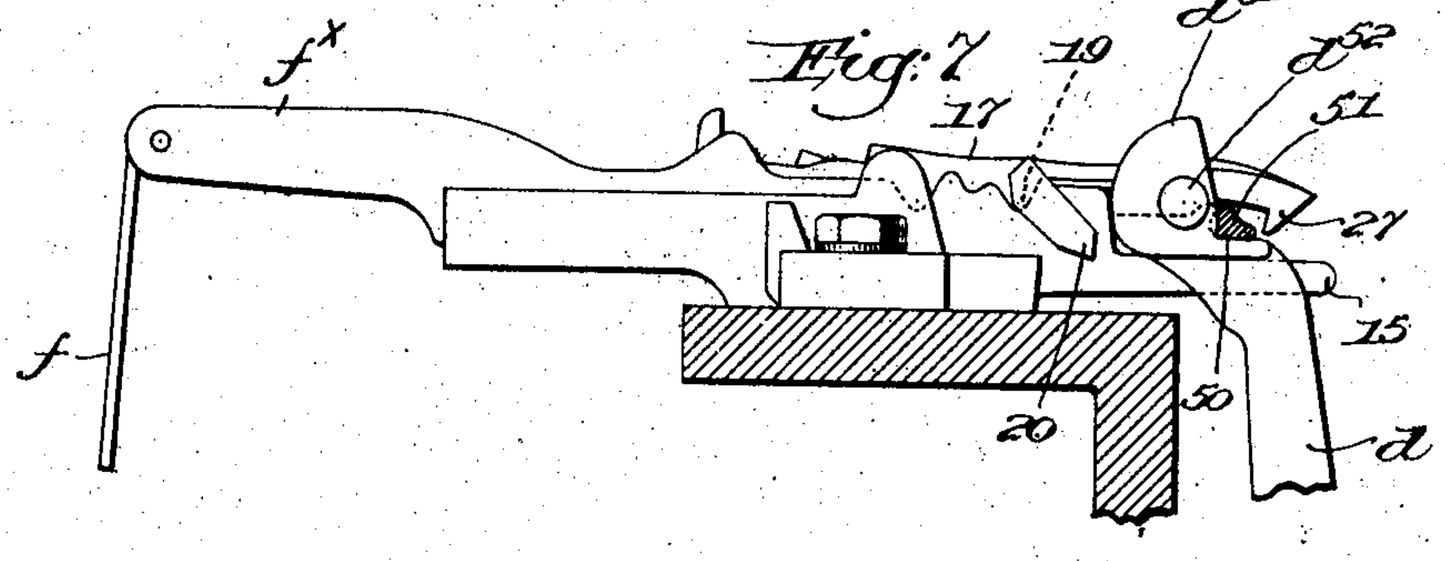


Fig: 8.

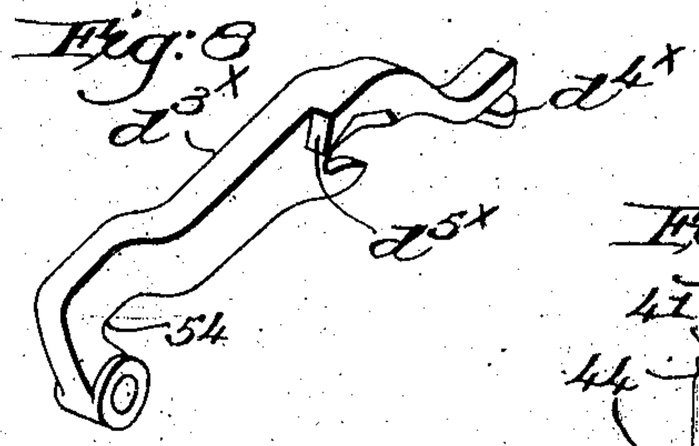


Fig: 9.

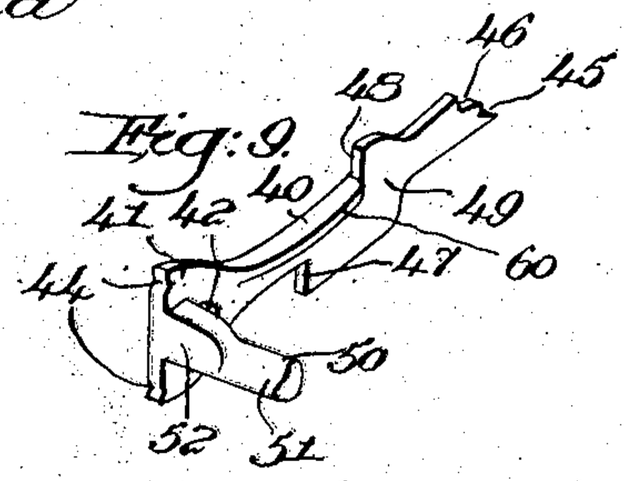


Fig: 11.

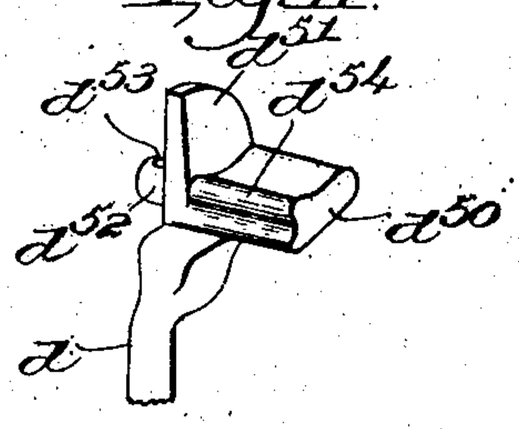


Fig: 10.

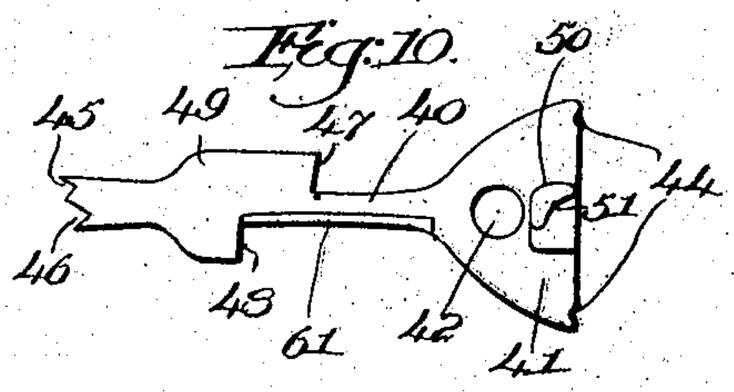
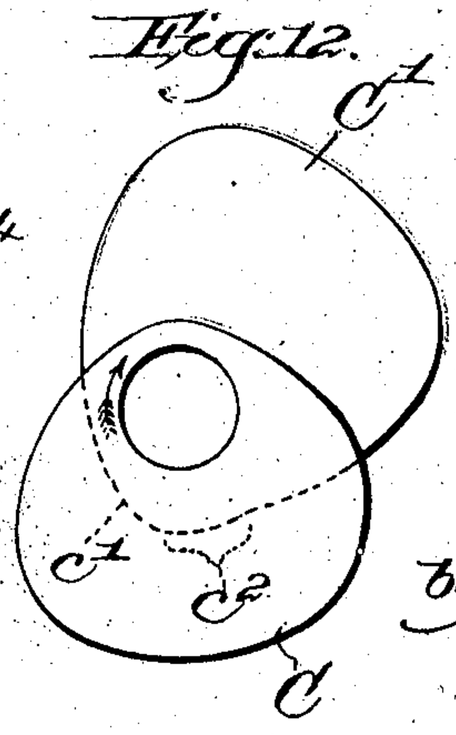


Fig: 12.



Witnesses,
Edward F. Allen
E. Wm. Lutton.

Inventor,
Joseph Northrop,
by Crosby Gregory
Atty's

UNITED STATES PATENT OFFICE.

JONAS NORTHROP, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

FILLING-REPLENISHING LOOM.

No. 833,796. Specification of Letters Patent. Patented Oct. 23, 1906.

Application filed September 16, 1905. Serial No. 278,699.

To all whom it may concern:

Be it known that I, JONAS NORTHROP, a citizen of the United States, residing at Hopedale, county of Worcester, and State of Massachusetts, have invented an Improvement in Filling-Replenishing 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 relates more particularly to looms provided with means to automatically replenish the running filling and having filling-detection mechanism to detect filling failure on each pick.

In the class of looms technically termed "feeler-looms" filling replenishment is effected prior to complete exhaustion of the supply of filling in the active shuttle to prevent the possibility of thin places being made in the cloth.

Another class of looms is provided with double filling-detecting devices to detect filling failure on each pick and with means to effect arrest of the take-up on each detection.

In United States patent to Stimpson, No. 763,441, dated June 28, 1904, a loom is shown and described provided with feeler mechanism to effect filling replenishment prior to complete exhaustion of the filling-supply in the active shuttle, two filling-detectors to detect filling failure on alternate picks and adapted to arrest take-up when filling failure is detected by either detector, and stopping means for the loom operated by or through detecting action of either detector.

United States Patent No. 789,291, granted to me May 9, 1905, has for its subject-matter a double-detection automatic filling-replenishing loom wherein filling replenishment is effected or controlled directly by one of the detectors and indirectly when filling failure (breakage or running out of the filling) is detected by the other detector, both detectors arresting take-up upon detection of filling failure by either detector.

My present invention has for its main object the production of a loom embodying the features of both of the mechanisms shown in the patents referred to—that is, an automatic filling-replenishing loom provided with a feeler and two filling-detectors, but so arranged that by a change in the position, and consequent operation, of a controlling or governing member the loom may be operated in a variety of ways, according to the character of the work to be performed. These various modes of operation may be, for convenience, classified as follows:

A. Operating as an ordinary feeler-loom, with two filling-detectors arranged to effect filling replenishment upon breakage of filling. In this case the feeler effects filling replenishment prior to complete exhaustion of filling in the active shuttle, and the detectors act to effect filling replenishment when the filling breaks.

B. Operating with the feeler mechanism inoperative, but with the two filling-detectors acting to effect filling replenishment upon failure—*i. e.*, exhaustion or breakage of the running filling. A swill appear hereinafter, the conversion from A to B involves nothing more than retaining the feeler mechanism inoperative.

C. Operating with the feeler mechanism in action, but with the two filling-detectors acting to stop the loom upon breakage of filling or if the filling runs out immediately upon the action of the feeler. The conversion of the loom to operate as in case C is effected by a change in the controlling or governing member, as will be explained.

D. By rendering the feeler inoperative when the loom is set to operate as in case C the loom will operate as a common double-fork loom, arresting take-up and stopping the loom when the filling runs out or breaks. Thus the one loom instrumentality is given a very wide range of operation to suit the various conditions arising in actual practice, so that it has the capacity of four different looms, each corresponding to one of the four cases set forth.

I have shown the filling-exhaustion-indicating mechanism herein substantially the same as that shown and described in United States Patent No. 789,472, granted May 9, 1905, to me and another; but other suitable filling-exhaustion-indicating mechanism may be employed without departing from my present invention.

The double-detector devices herein illustrated are substantially such as form the subject-matter of my Patent No. 789,291,

hereinbefore referred to, as such devices are particularly well adapted for use herein.

The various novel features of construction, arrangement and operation will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a top plan view, centrally broken out, of an automatic filling-replenishing loom embodying one form of my present invention set for operation in accordance with the provisions of case A, above referred to. Fig. 2 is a front elevation, enlarged and also broken out, of the connections between the two filling-detectors and the controlling rock-shaft for the filling-replenishing mechanism with the parts set as in Fig. 1. Fig. 3 is an enlarged transverse sectional view on the line 3 3, Fig. 1, looking toward the right. Fig. 4 is a similar view of the parts shown at the upper portion of Fig. 3, but omitting certain details shown therein by dotted lines. Fig. 5 is a detail in front elevation of the parts shown at the left, Fig. 2, but with the controlling or governing member changed in position to thereby convert the loom from operation under cases A and B to that under cases C or D. Fig. 6 is a view similar to Fig. 4, but showing the changed position of the controlling member corresponding to that shown in Fig. 5. Fig. 7 is a like view, but omitting the latch and the controlling member in order to show clearly certain details of construction obscured in Fig. 6. Fig. 8 is a perspective view of the latch detached, viewed from its inner side. Fig. 9 is a perspective view of the controlling or governing member turned as it would be for either cases C or D. Fig. 10 is a side elevation of the controlling member reversed as it appears in Figs. 3 and 4. Fig. 11 is a perspective view of the upper end of the support on which the controlling member is pivotally mounted; and Fig. 12 is an outline view, in side elevation, of the two cams which govern the weft-hammers or followers which coöperate with the two filling-detecting devices.

Referring to Fig. 1, the lay A^3, provided with suitable shuttle-boxes B $B^\times$, the automatically-self-threading shuttle $S^\times$, the filling-replenishing mechanism at the right-hand side of the loom and including the transferrer F′ and filling-feeder F, (partly shown,) the controlling rock-shaft d', which governs the operation of the replenishing mechanism, the shipper S, its notched holding-plate N, and a releasing device or knock-off lever $N^\times$ for the shipper may be and are all of well-known construction and operate in usual manner, the inner end of lever $N^\times$ having an enlargement or shelf n, as in my Patent No. 789,291.

The two filling-detectors are located at the replenishing and shipping sides of the loom, respectively, and the former detector, termed the "auxiliary" filling-detector, includes a filling-fork g and its slide $g^\times$, longitudinally movable in a fixed guide g^2, the fork-tail g^{20} being engaged by the hook $w^\times$ of an actuator or weft-hammer $W^\times$ when the fork is not tilted to thereby move the slide outward. Such movement of the slide swings out the upper end of arm d^5, fast on the rock-shaft d', turning the latter in the direction of arrow 250, Fig. 3, a spring $s^\times$ moving the slide $g^\times$ inward, as will be manifest, and, as will appear hereinafter, such turning of the rock-shaft is adapted to arrest take-up.

The cam for imparting the throw to weft-hammer $W^\times$ is of novel shape in order to secure a certain operation, as will be described hereinafter.

The main filling-detector at the shipping side of the loom includes the fork f, having a tail f^{20} and mounted on a slide $f^\times$, moved outward in a guide f^2 by the weft-hammer W when its hook engages the fork-tail, the outward movement of the slide engaging the head d^{50} of an arm d, loosely mounted on the rock-shaft d', said arm having secured to it a depending and rearwardly-projecting extension d^2, (see Fig. 3,) adapted when elevated to cause the arrest of the take-up mechanism (not shown) in substantially the manner described in my Patent No. 789,291—that is, a lug d^3 on the extension may engage the pawl-carrier $p^\times$ and move the same to disengage the pawl from the ratchet in take-up mechanism of the character shown in United States Patent No. 643,284.

As best shown in Fig. 11, the head d^{50} has an upturned ear d^{51} at its outer end provided on its outer face with a lateral lug d^{52}, having a hole d^{53} for a retaining device, and the front of the head is shaped to present a transverse lip d^{54} for a purpose to be described. A spring s moves the main slide $f^\times$ inward. The hook 2 fulcrumed on the weft-hammer W, having a shoulder 4 to coöperate with the fork-tail, and the guard 5 are shown as in my Patent No. 789,291, the slide having elevated sides connected by a stop-bar 9, with notches in the forward extensions of the sides, as in said patent, the prolongation 15 of the slide coöperating with the spring s. So, too, a dog 20, Figs. 1, 3, and 7, on a carrier comprising a body 17, having detents 19 to coöperate with the notches in the sides of the main slide, and the hooked front end 27 of the carrier are all substantially as in said patent, as are the other features of the carrier, the purposes and operation thereof being fully described in the said patent. At the proper time and under certain circumstances the dog 20 will engage the shelf n of the knock-off lever $N^\times$ and will turn the same to release the shipper, as described in my said patent.

The filling-exhaustion-indicating mechanism can now be referred to briefly, and in order to avoid confusion the reference-num-

bers relating thereto will be the same as in Patent No. 789,472, but each number will be "starred" herein.

Referring to Fig. 1, the stand 9× on the outer end of the holding-plate N supports a yieldingly-controlled slide 12×, having at its front end a shank 14×, which projects through the stand, ears 18× on the slide supporting the bunter 21× and also the actuator 26×, coöperating with the shank 29* of the feeler proper, 28×, all as in said Patent No. 789,472 and operating as therein provided. The tilting transmitter 34× 35×, fulcrumed at 33× and having its outer end bent at 37× and provided with a cam-slot (not shown) through which is extended the controller 40×, the end of the latter lying in the operative path of movement of the actuator 26×, are also as in said patent, the free end of the transmitter-arm 34× extending under the rear end of the latch $d^{3\times}$, fulcrumed at its out, end on an upturned arm $d^{2\times}$, fast on the rock-shaft d'. So long as there is more than a predetermined amount of filling in the running shuttle the feeler, which intermittingly passes through usual openings in the side wall of the shuttle and the front wall of the left-hand shuttle-box B, Fig. 1, will act to render the actuator 26× inoperative, and the transmitter will remain quiescent. When, however, predetermined filling exhaustion is reached, the actuator becomes operative, and the controller 40× is engaged and moved to tilt the transmitter, lifting the free end of its arm 34× and elevating the rear end of the latch $d^{3\times}$ into position to be engaged by a head $w'^{\times}$ on the weft-hammer W. On the forward swing of the latter the latch $d^{3\times}$ is pushed forward, acting through arm $d^{2\times}$ to rock the controlling rock-shaft d' in the direction of arrow 250, Fig. 3, and filling replenishment is effected when the shuttle reaches the replenishing shuttle-box B×, Fig. 1. A lug $d^{4\times}$ on the latch projects under the adjacent side of the guide f^2 and prevents any undue uplifting of the latch.

Referring to Fig. 12, the cams C and C′ for operating the weft-hammers W and W×, respectively, are shown in their proper relative position, cam C being of usual contour; but the cam C′ has an increased rise at c' and a short dwell c^2 succeeding it, the rotation of the cams being indicated by the arrow. When the rise c' acts on the weft-hammer W×, it gives it a rapid forward movement, followed by a rest or dwell, and this is made effective at certain times for a purpose to be referred to.

From the foregoing description it will be evident that the rocking of the controlling-shaft d' can be readily effected by or through the latch $d^{3\times}$ when the filling-exhaustion-indicating mechanism detects predetermined exhaustion of filling in the running shuttle to thereby cause filling replenishment, and it will be evident that outward movement of the auxiliary fork-slide $g^{\times}$ will through arm d^5 rock the controlling-shaft; but as the arm d is loose on the latter it remains to be described how such operation of the fork-slide $g^{\times}$ can effect arrest of take-up and filling replenishment indirectly through the main filling-detector f. It is also necessary to describe the manner in which the said main filling-detector can directly effect filling replenishment, such explanations also involving the construction and operation of the controlling member or governing device by or through which the operation of the loom is varied.

Referring to Figs. 9 and 10, the controlling member or "controller," as it may be termed, consists of an elongated body 40, having a triangular front end 41, provided with a hole 42 to loosely receive the lug d^{52} on the arm d, two notches 44 being formed in said end, the rear end of the body having notches 45 46. On the edge of the body nearest to which the notch 45 is located is a shoulder 47 and on the opposite edge another shoulder 48, the body being enlarged at 49 to provide for such shoulders, and it will be noted that the shoulder 47 is considerably nearer the enlarged end 41 of the controller. Said end 41 is provided on one face with a lateral lug 50, having one of its faces cam-shaped transversely, as at 51, the base of the lug being enlarged, as at 52. This controller is pivotally mounted on the lug d^{52} of the arm d, and it is reversible thereon to thereby determine the manner in which certain portions of the loom are to operate.

When the loom is to be run in accordance with cases A and B, hereinbefore explained, the controller is so mounted that its lug 50 will extend to the left, Figs. 1 and 2, under the latch $d^{3\times}$, with the shoulder 48 downturned, the controller being located between the latch and the adjacent side of the guide f^2 for the main fork-slide. At such time the notch 45 is in position to coöperate at times with a lateral tooth $d^{5\times}$ on the inner side of the latch. A spring-wire retainer 53 is slipped into the hole d^{53} of the fulcrum-lug d^{52}, retaining the controller thereon, and the free end of the retainer is snapped into the upper one of the notches 44 to normally depress the rear end of the controller in the position shown in Fig. 4, the shoulder 48 then resting on a part of the stand or guide f^2.

It will be understood that upon predetermined exhaustion of filling the latch $d^{3\times}$ will be raised and then moved outward to rock the controlling rock-shaft d', and thereby effect filling replenishment, the lifting of the latch raising the tooth $d^{5\times}$ above the notch 45 of the controller, so that no engagement takes place and there will be no arrest of take-up. Suppose, however, that prior to predetermined exhaustion the filling breaks and de-

tection thereof is first made by the main fork *f*. Then the slide *f'* thereof will be moved outward by or through its coöperating weft-hammer W in usual manner, and the slide will engage the head d^{50} of the arm *d*, swinging said arm outward and arresting take-up through the extension d^2. At the same time the arm *d* moves the controller outward and the lug 50 on said controller will engage the bend 54 at the front end of the latch, moving the latter outward and rocking the shaft *d'* in the direction of arrow 250, Fig. 3, to thereby effect filling replenishment. Such replenishment is thus effected directly by or through the main filling-detector, as will be obvious. Now let it be supposed that for some reason the said main detector does not detect filling breakage, but that as the shuttle is thrown to box $B^\times$ such failure is detected by the auxiliary detector *g*, and its slide $g^\times$ is moved outward by the weft-hammer $W^\times$. This slide movement operates, through arm d^5, to rock the controlling-shaft *d'* far enough to bring the latch-tooth $d^{5\times}$ into engagement with the controller-notch 45, and the controller will be moved forward, thereby swinging the loose arm *d* and arresting take-up; but on such swing of the arm the lip d^{54} on its head will engage the hooked end 27 of the carrier 17 and move the latter forward to impart what is termed the "initial" movement of the main slide $f^\times$ in my Patent No. 789,291, rendering the main fork *f* irresponsive on the next pick to the presence of filling, and consequently the operation of the replenishing mechanism will be effected when the complete outward movement of the main slide is accomplished by its actuator or weft-hammer W, all as rovided for in said patent. Thus the auxiliary detector operates upon detection of filling failure to cause filling replenishment indirectly through the main detector, substantially as in my prior patent just referred to.

By reference to Figs. 3 and 4 it will be seen that while the shelf *n* of the knock-off lever is in the path of the shoulder 48 of the controller the shoulder is so far back that forward movement of said controller, such as hereinbefore described, is insufficient to bring the shoulder into coöperative engagement with the shelf. When the loom is operating as in case A, it may sometimes happen that when the feeler mechanism has operated to effect filling replenishment the filling will break or it will run out on the flight of the shuttle to the replenishing side of the loom, (such running out being due to delayed action of the feeler,) and thereupon two successive replenishments will be effected, the first due to the feeler mechanism and the second through the filling-detection instrumentality. This is of course wholly unnecessary, for it involves two operations of the replenishing mechanism when only one is required, and as a fresh supply of filling has been provided by the first operation there is useless denudation of the replenishing-magazine by the second filling replenishment. I have provided means to prevent such an occurrence, as I will now explain. Upon such failure of the filling the fork *g* detects, and its tail is engaged by the hook of weft-hammer $W^\times$ as the latter begins its forward stroke, the rise *c'* giving a quick movement thereto at the start, while the hammer W is forward and just going back, the lifting of the latch $d^{3\times}$ having permitted the tooth $d^{5\times}$ to ride forward on the top of the controller enlargement 49. The dwell c^2 now operates to hold the rock-shaft *d'* stationary for a moment, retaining the latch from rearward movement as its weft-hammer W moves back, while the tooth $d^{5\times}$ still rests on the top of said enlargement 49, and then as the cam C' passes the dwell portion the usual forward movement of the latch $d^{3\times}$ is completed; but as the tooth has had no opportunity to drop behind the controller and into engagement with its notch 45 there is no forward movement of the controller, and hence no filling replenishment nor arrest of take-up. Were it not for such holding forward of the latch the tooth thereof would drop behind the rear end of the controller and the rocking of the shaft *d'* through movement of the slide $g^\times$ would move latch and controller forward to cause a filling replenishment by or through the main filling-detector. If the loom is to operate as in case B, with the filling-exhaustion-indicating mechanism out of action but with filling replenishment effected automatically by or through detection of filling failure by either filling-detector, the said mechanism is thrown out of action and so maintained. This is conveniently effected by pushing forward the feeler until a hole 100 (see dotted lines, Fig. 1) in its shank $14^\times$ is exposed at the front end of the stand $9^\times$ and a cotter-pin or other suitable pin is dropped into the hole, maintaining the feeler device retracted and inoperative.

Of course there can be no control of the latch $d^{3\times}$ by the feeler so long as it is held inactive, and consequently the loom will operate to all intents and purposes as in my Patent No. 789,291, the filling replenishment being effected through the double-detecting devices.

To change from case B back to case A, all that is necessary is to throw into operation the filling-exhaustion-indicating mechanism, which in the construction thereof shown in Fig. 1 is attained by releasing the feeler-shank $14^\times$.

It will be understood that in both case A and case B there is no objection to the presence of an occasional pick in which the filling is more or less incomplete, such picks occurring when a break in the filling occurs or when the filling breaks or runs out imme-

diately after the action of the feeler, as has been explained. There are certain classes of goods, however, which must not contain such incomplete picks of filling, and when the loom is weaving such goods provision must be made for automatic stoppage whenever from any cause or at any time the filling fails, replenishing being effected solely through the filling-exhaustion-indicating mechanism.

When the loom is operating as thus set forth, the mode of operation comprehended in case C pertains, and this requires a change in the position of the controller or governing member, with a consequent change in its mode of operation. Heretofore the controller has been operating in the position shown in Figs. 1 to 4, inclusive, with its lateral lug 50 extending back of the bend 54 in the latch $d^{3\times}$; but to change to case C the operative removes the spring-retainer 53, slips the controller 40 from the fulcrum-lug d^{52}, and reverses the controller, replacing it on the fulcrum-lug with the lug 50 projecting to the right (see Fig. 5) in front of the head d^{54} on the arm d, the extremity of the lug lying beneath the hook 27 of the carrier 17, as shown in Figs. 6 and 7. The retainer 53 is then replaced in the hole d^{53} of the fulcrum-lug and its free end snapped into the then uppermost one of the notches 44 of the controller. Now by reference to Fig. 6 it will be seen that the shoulder 47 of the controller is quite near the shelf n of the knock-off lever $N^{\times}$ and also that the tooth $d^{5\times}$ of the latch $d^{3\times}$ is adapted to coöperate with the controller-notch 46 unless the latch is lifted prior to forward movement thereof.

When the running filling is exhausted to a predetermined point, the filling-exhaustion-indicating mechanism operates, the transmitter-arm $34^{\times}$ lifting the latch into engagement with the head $w'^{\times}$ of the weft-hammer W, and on the forward movement of the latch the controlling rock-shaft d' is rocked and filling replenishment is effected. If the filling fails, however, and it is detected by the main detector f, the slide $f^{\times}$ thereof will be moved outward, acting upon the head d^{50} to rock the arm d and arrest take-up, and at the same time the controller 40 is moved outward, bringing the shoulder 47 against the shelf n, thereby rocking the releasing-lever $N^{\times}$ and throwing the shipper out of its holding-notch to stop the loom. If filling failure is detected by the auxiliary detector g, its slide is moved outward, and through the arm d^5 the rock-shaft d' is turned, such turning acting through the arm $d^{2\times}$ to move forward the latch $d^{3\times}$, and as its tooth $d^{5\times}$ is then in operative position it engages the notch 46 and moves the controller forward, the shoulder 47 operating as before to effect shipper release. Such forward movement of the controller acts through the arm d to arrest take-up, as previously explained. When the controller is moved forward, the cam-face 51 on its lug 50 acts upon the hook 27, lifting it above and out of engagement with the lip d^{54} on the head d^{50}, and thereby obviating any movement of the carrier 17 on the main slide $f^{\times}$.

Referring to Figs. 9 and 10, it will be seen that there are two longitudinal ledges 61 62 on opposite sides of the controller 40 and adjacent its upper and lower edges, respectively, one or the other ledge projecting beneath the latch $d^{3\times}$ to prevent any accidental jumping up of the rear end of the controller. Suppose that the feeler has operated to effect filling replenishment (the loom operating under the provisions of case C) and the filling breaks or runs out on the shot of the shuttle to the replenishing side of the loom. If no provision be made to guard against this occurrence, a mispick will be made, as the loom would continue to run after replenishment and a pick would be made with only a partial filling laid therein. As the latch $d^{3\times}$ has been lifted and moved forward through the feeler action, its tooth $d^{5\times}$ is above the controller 40, and upon filling failure the auxiliary detector g detects the failure, the tail g^{20} being caught by the hook $w^{\times}$ of weft-hammer $W^{\times}$ while the weft-hammer W is forward and just about to go back. The quick movement given by the rise c' of the cam C' acts, through the arms d^5 and $d^{2\times}$ and the shaft d', to move the latch $d^{3\times}$ forward a corresponding distance, while the dwell c^2 holds the latch stationary as the weft-hammer W moves back out of coöperative engagement with the rear end of the latch, so that when the latch drops its tooth $d^{5\times}$ will drop behind the controller-notch 46. Now the cam C' takes up again the forward movement of the weft-hammer $W^{\times}$ and the rock-shaft d' is turned further to move the latch forward far enough to act through the controller to release the shipper by or through engagement of the shoulder 47 with the shelf n of the knock-off lever $N^{\times}$. The notch 46 is somewhat nearer the front of the controller than the notch 45, so that the peculiar action of the cam C' is helped or assisted by the position of the notches in the one instance to operate the controller through the latch and in the case previously described to prevent operation of the controller by the latch. The principal function of the rise c' is to compensate for the rest c^2, so that the timing for the parts during the complete revolution of cam C' will not be changed. There remains to be considered only the operation of the loom as in case D, and this is effected (when the loom is set for operation as in case C) merely by withholding the filling-exhaustion-indicating mechanism from operation by retracting the feeler, as in case B. Now the loom will run simply as a double-fork loom,

arresting take-up and stopping the loom on either breakage or running out of the filling.

In order to change the loom to operate in the several ways hereinbefore described, it will be manifest that very little manipulation is required, the change from cases A and B to C and D being effected by a reversal of the controller—that is, in cases A and B the controller is in one position, and the difference between such cases is due to the action or inaction of the filling-exhaustion-indicating mechanism, while in cases C and D the controller is in reversed position, and the difference in operation between cases C and D is due to action or inaction of the said indicating mechanism. With respect to the latter it should be stated that when the same is withheld from operation (see cases B and D) the transmitter is in normal position with its arm 34× lowered.

My invention is not restricted to specific details of construction such as herein shown and described, as the same may be varied or modified by those skilled in the art without departing from the spirit and scope of my invention.

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

1. In a loom provided with filling-replenishing mechanism, and with means to cause the operation thereof prior to complete exhaustion of the running filling, in combination, two filling-detectors to detect filling failure on alternate picks, a stopping instrumentality for the loom, and governing means, including a member manually changeable as to its position, to cause the operation of the replenishing mechanism or of the stopping instrumentality, by or through detecting action of either detector, according to the position of said member.

2. In a loom provided with filling-replenishing mechanism, and with means to cause the operation thereof prior to complete exhaustion of the running filling, in combination, two filling-detectors to detect filling failure on alternate picks, a device adapted to arrest the operation of a take-up instrumentality, operated upon detection of filling failure by either detector, a stopping instrumentality for the loom, and means, including a reversible controlling member, to effect the operation of the replenishing mechanism or of the stopping instrumentality, by or through detecting action of either detector, according to the position of said controlling member.

3. In a loom provided with filling-replenishing mechanism, and with means to cause the operation thereof prior to complete exhaustion of the running filling, in combination, two filling-detectors to detect filling failure on alternate picks, and adapted to arrest the operation of a take-up instrumentality upon detection of filling failure by either detector, and means, including a manually-reversible controller, to effect the operation of the replenishing mechanism or of the stopping instrumentality, by or through detecting action of either detector, in accordance with the position of the controller.

4. In a loom provided with mechanism to furnish fresh filling prior to complete exhaustion of the running filling, two filling-detectors to detect filling failure on alternate picks and adapted to arrest the operation of a take-up instrumentality when filling failure is detected by either detector, a stopping instrumentality for the loom, connections between the stopping instrumentality and the detectors and between the latter and the replenishing mechanism, and a controller adapted to form a part of either of said connections, whereby filling replenishment or loom stoppage will be effected upon detecting action of a detector, according to the setting of said controller.

5. In a loom provided with filling-replenishing mechanism, and with means to cause the operation thereof prior to complete exhaustion of the running filling, in combination, two filling-detectors, located at opposite sides of the loom and adapted to arrest the operation of a take-up instrumentality upon detection of filling failure by either detector, a stopping instrumentality for the loom, means to cause filling replenishment by or through said filling-detectors, and a controller manually changeable as to its position, to cause either filling replenishment or loom stoppage by or through said detectors in accordance with the position of the controller.

6. In a loom provided with filling-replenishing mechanism, in combination, separate controlling means adapted respectively to effect the operation of said mechanism prior to complete exhaustion, and upon failure, of the running filling, a stopping instrumentality for the loom, and adjustable governing means to cause either filling replenishment or the operation of said stopping instrumentality, by or through the latter of said controlling means, in accordance with the adjustment of the governing means.

7. In a loom provided with filling-replenishing mechanism, in combination, means to effect the operation of said mechanism prior to complete exhaustion of the running filling, means to effect filling replenishment upon failure of the running filling, a stopping instrumentality for the loom, a reversible controller to cause, by its position, either filling replenishment or loom stoppage upon filling failure, and a device to maintain inoperative, in either position of the controller, the means which normally effect filling replenishment prior to complete exhaustion of the running filling.

8. In a loom, in combination, means to cause filling replenishment prior to complete

exhaustion of the running filling and adapted to be maintained inoperative at will, separate means adapted to either cause filling replenishment or to stop the loom upon failure of filling, and a manually-set controller to determine by its position whether said second-named means shall cause filling replenishment or loom stoppage, irrespective of the operation or non-operation of the first-named means.

9. In a loom, in combination, filling-replenishing mechanism, means to cause the operation thereof prior to complete exhaustion of the running filling, a shipper, a releasing device therefor, means to cause the operation of the replenishing mechanism or of the releasing device upon filling failure, and a reversible controller provided with a shoulder, said controller when in one position causing said second-named means to effect the operation of the replenishing mechanism, and when in its reversed position acting through its shoulder to operate the releasing device.

10. In a loom, in combination, filling-replenishing mechanism, means to cause the operation thereof prior to complete exhaustion of the running filling, a shipper, a releasing device therefor, means to cause the operation of the replenishing mechanism or of the releasing device upon filling failure, a device adapted to arrest the operation of a take-up instrumentality, and a controller adapted to be mounted reversibly on said device and provided with a shoulder, the controller when in one position causing said second-named means to effect the operation of the replenishing mechanism and also operating said device to arrest take-up, and when in its reversed position acting through its shoulder to operate the releasing device and also operating the take-up-arresting device.

11. In a loom, in combination, means to replenish filling prior to complete exhaustion of the running filling, separate means adapted to either cause filling replenishment or to stop the loom upon failure of filling and adapted to arrest the operation of a take-up instrumentality, and a manually-reversible controller to determine by its position whether the second-named means shall cause filling replenishment or loom-stoppage.

12. In a loom, in combination, filling-replenishing mechanism, means to cause the operation thereof prior to complete exhaustion of the running filling, filling-detectors at opposite sides of the loom, a shipper, a releasing device therefor, a rocking member extended across the loom, and operatively connected with the replenishing mechanism, a device loosely mounted on said member to arrest the operation of a take-up instrumentality, a controller carried by and reversible upon said device and having a shoulder, and operating connections between the controller and the filling-detectors, to turn said rocking member and effect filling replenishment upon detection of filling failure, and also arrest take-up, when the controller is in one position, and to operate the releasing device by the shoulder of the controller when the latter is reversed, the controller at such time also operating the device which arrests take-up.

13. In a loom, in combination, filling-replenishing mechanism at one side of the loom, means intermittingly coöperating with the filling in the running shuttle to effect filling replenishment prior to complete exhaustion of the filling in the running shuttle, two filling-detectors to detect filling failure on alternate picks and adapted to arrest the operation of a take-up instrumentality, a stopping instrumentality for the loom, operating connections between the detectors and said instrumentality and the replenishing mechanism, including a controller which by its position determines whether filling replenishment or loom stoppage shall be effected upon detection of filling failure, and means acting in conjunction with the controller to prevent a second operation of the replenishing mechanism if the filling fails immediately after substantial exhaustion of the filling in the running shuttle has been indicated.

14. In a loom, provided with filling-replenishing mechanism, and a controlling rock-shaft therefor, in combination, means to turn said shaft and effect filling replenishment upon substantial exhaustion of the filling in the running shuttle, two filling-detectors at opposite sides of the loom, means to turn said rock-shaft directly by one of the detectors, and indirectly by the other detector, upon detection of filling failure, a device loosely mounted on the rock-shaft adapted to arrest the operation of a take-up instrumentality, a stopping instrumentality for the loom, and a controller reversibly mounted on said device, to operate it by bodily movement of the controller, the latter when in one position being so moved by or through the detectors upon detection of filling failure, with corresponding turning of the rock-shaft, filling replenishment and arrest of take-up being effected, and when the controller is in its reversed position acting, upon detection of filling failure, to operate the stopping instrumentality and also cause arrest of take-up.

15. In a loom provided with filling-replenishing mechanism, in combination, means, including a latch, to effect the operation of said mechanism prior to complete exhaustion of the running filling, a vibrating weft-ham mer to at times coöperate with and operate the latch, two filling-detectors each having a slide and adapted to detect filling failure on alternate picks and also adapted to arrest the operation of a take-up instrumentality upon detecting action of either detector, means to effect operation of the replenishing mechanism upon the detection of filling failure by either

detector, a shipper, a releasing device therefor, a reversible controller having a notched inner end and a shoulder, a tooth on the latch, detection of filling failure acting, when the controller is in one position, to effect filling replenishment through such controller, reversal of the controller causing its shoulder to operate the shipper-releasing device upon detection of filling failure, and means, operating upon filling failure immediately following replenishment, to hold the latch forward when released by its coöperating weft-hammer, to thereby prevent engagement of the latch-tooth with the notched end of the controller, thus preventing a second filling replenishment through the detectors.

16. In a loom provided with filling-replenishing mechanism, in combination, means, including a latch, to cause the operation of said mechanism when substantial exhaustion of the running filling is indicated, two filling-detectors to detect filling failure on alternate picks, a weft-hammer to coöperate with each detector, a stopping instrumentality for the loom, means, including a manually-reversible controller having a shoulder and a lateral lug, to effect filling replenishment or loom stoppage upon detection of filling failure, the controller, when in one position, acting through its lug upon the latch to operate the replenishing mechanism, and when in reversed position acting through its shoulder to operate the stopping instrumentality, and weft-hammer-operating cams one of which operates, when the filling-exhaustion-indicating means is operative and the controller is in its first position, to prevent a second filling replenishment upon filling failure following filling-exhaustion indication, said cam acting, when the controller is reversed and the filling-detectors are operative to stop the loom, to effect coöperation of the latch and controller and cause loom stoppage upon detection of filling failure immediately following the operation of the exhaustion-indicating means, to thereby prevent a mispick.

17. In a loom, in combination, filling-replenishing mechanism, two filling-detectors to detect filling failure on alternate picks and adapted to arrest the operation of a take-up instrumentality by detecting action of either detector, a stopping instrumentality for the loom, a controller manually changeable as to its position and when in one position causing filling replenishment, and when in its other position causing loom stoppage, upon detection of filling failure, whereby the loom will operate to replenish the running filling or will be stopped upon failure of such filling, filling-exhaustion-indicating means, including a feeler, to normally effect the operation of the replenishing mechanism prior to complete exhaustion of the running filling when the controller is in either position, retraction of the feeler rendering said indicating means inoperative, and means to prevent a double action of the replenishing mechanism when said indicating means is operative and filling fails immediately after exhaustion indication, with the controller in its first position, said means also acting to prevent a mispick and insuring loom stoppage upon similar filling failure when the controller is in its reversed position.

18. In a loom, in combination, means to cause filling replenishment prior to complete exhaustion of the running filling and adapted to be maintained inoperative at will, separate means adapted to either cause filling replenishment or to stop the loom upon failure of filling, and a controller to determine by its position whether said second-named means shall cause filling replenishment or loom stoppage, irrespective of the operation or non-operation of the first-named means.

19. In a loom, in combination, means to replenish filling prior to complete exhaustion of the running filling, separate means adapted to either replenish filling or to stop the loom upon failure of filling and adapted to arrest the operation of a take-up instrumentality, and a controller to determine by its position whether the second-named means shall cause filling replenishment or loom stoppage.

20. In a loom provided with filling-replenishing mechanism, and means to cause the operation thereof prior to complete exhaustion of the running filling, in combination, means to detect filling failure, a stopping instrumentality for the loom, and means to at will cause the operation of either the replenishing mechanism or of the stopping instrumentality on detection of filling failure.

21. In a loom, provided with filling-replenishing mechanism, and means to cause the operation thereof, prior to complete exhaustion of the running filling, in combination, means to detect filling failure on every pick, a stopping instrumentality for the loom, and means to at will cause the operation of either the replenishing mechanism or of the stopping instrumentality on detection of filling failure.

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

JONAS NORTHROP.

Witnesses:

GEORGE OTIS DRAPER,

ERNEST W. WOOD.