No. 692,933. Patented Feb. 11, 1902.

H. W. SMITH.

WEFT REPLENISHING MECHANISM FOR LOOMS.

(Application filed May 19, 1900.)

(No Model.) 2 Sheets—Sheet 1.

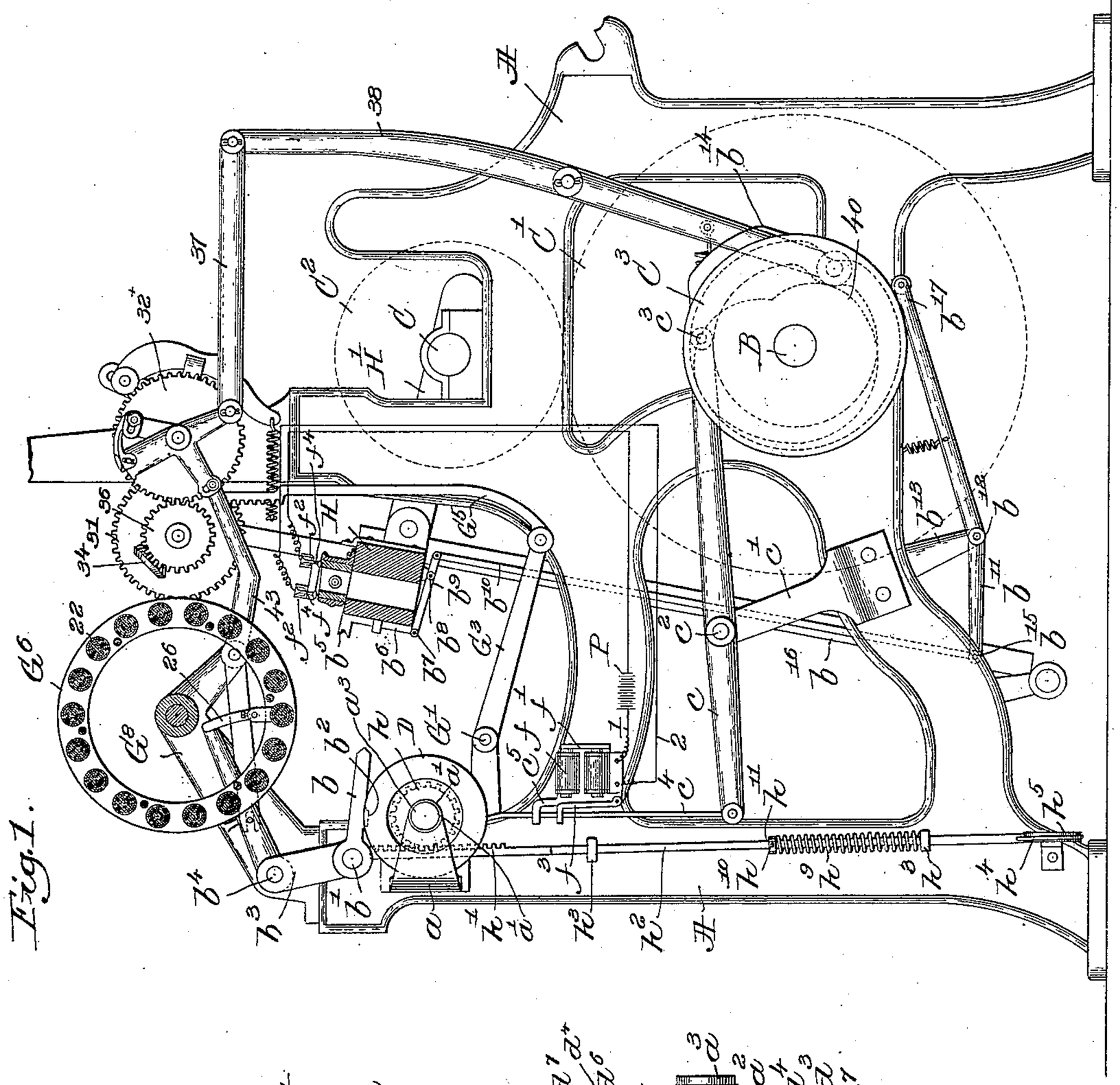

Fig. 1.

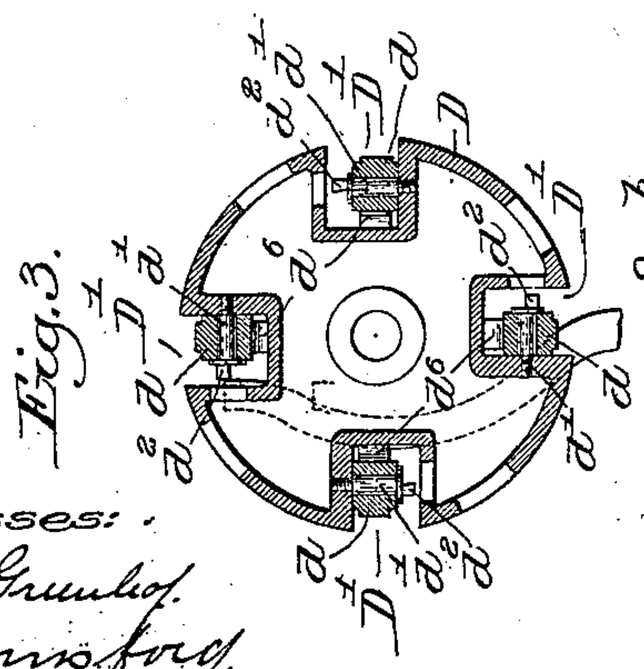

Fig. 3.

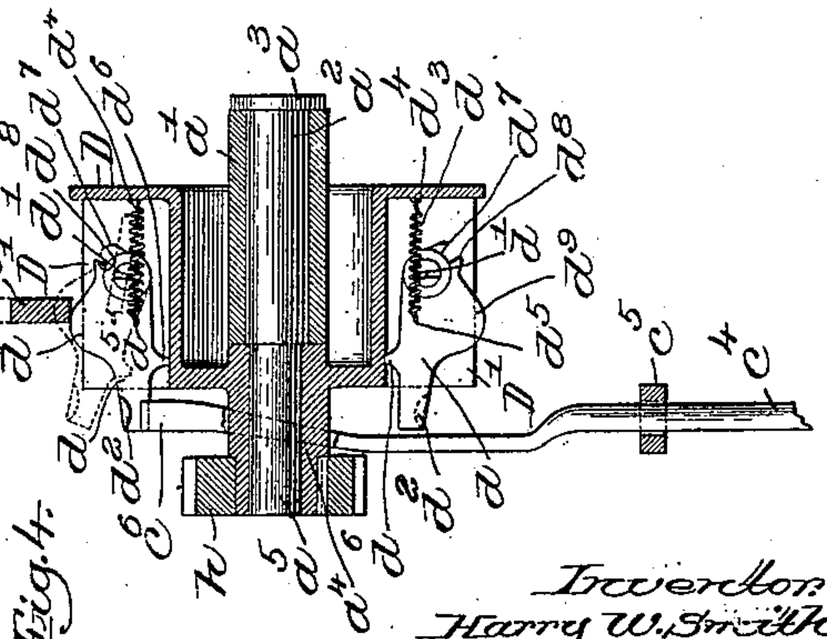

Fig. 4.

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WEFT REPLENISHING MECHANISM FOR LOOMS.

(Application filed May 19, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

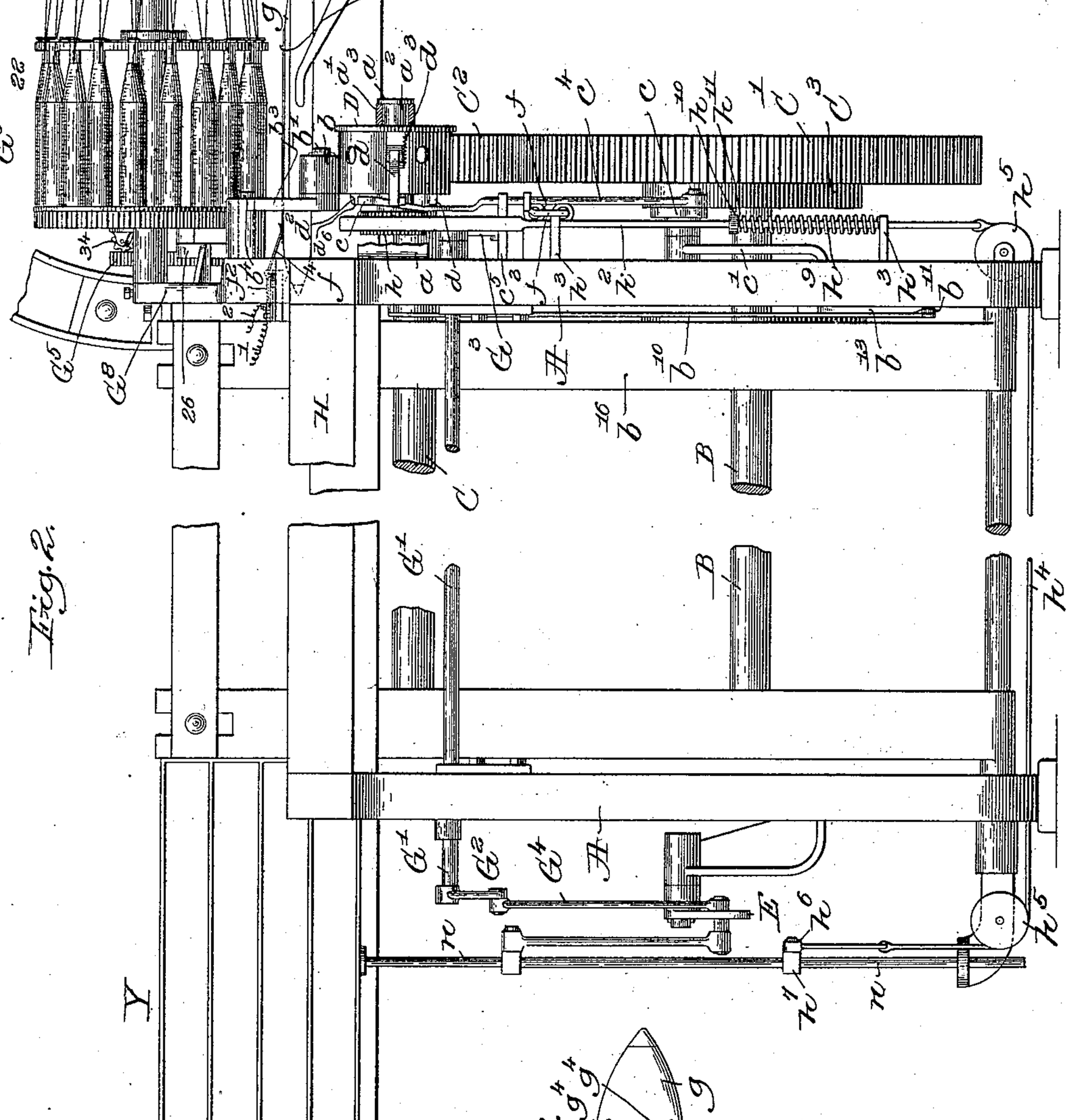

Fig. 5.

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UNITED STATES PATENT OFFICE.

HARRY W. SMITH, OF WORCESTER, MASSACHUSETTS.

WEFT-REPLENISHING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 692,933, dated February 11, 1902.

Application filed May 19, 1900. Serial No. 17,252. (No model.)

To all whom it may concern:

Be it known that I, HARRY W. SMITH, a citizen of the United States, and a resident of Worcester, county of Worcester, State of Massachusetts, have invented an Improvement in Weft-Replenishing Mechanism for Looms, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

The invention to be hereinafter described relates to looms wherein filling-changing mechanism is employed to effect a change of filling when that in an active shuttle has become practically exhausted, and more particularly to such type of loom embodying shifting or drop boxes supplying different characters or colors of filling.

In the class of looms referred to it is desirable that the change of filling shall not take place on the same pick or beat of the lay in which the practical exhaustion of filling is detected, since the quick operation necessary is liable to cause uncertainty of action and probable breaking of parts. In a shifting or drop box loom, however, if the indicating or practically exhausted shuttle is permitted to make one or more picks it may reach the shifting or drop boxes at a time when the latter are to be moved under the call of the pattern to bring a shuttle having a different character or color of filling into play, in which event the next pick will fail to bring the practically exhausted or indicating shuttle into position to have its filling changed. Under these circumstances it becomes necessary to suspend the action of the filling-changing mechanism until the practically exhausted or indicating shuttle has been brought into action again and arrived in position adjacent the said mechanism and to then cause the said mechanism to act to effect the change of filling in a manner as if the shifting movement of the shuttle-boxes had not occurred between the picks of the practically exhausted shuttle.

With these and other objects in view I have devised means whereby a condition of practical exhaustion of filling in an active shuttle sets devices in position and maintains them in such position to cause the operation of the filling-changing mechanism on the pick that returns a shuttle to the changing side of the loom, provided in the meantime the shifting or drop boxes are not moved to bring a different shuttle into action; but should the boxes be so moved under the call of the pattern to bring another shuttle into action then said devices are adapted to suspend the action of the filling-changing mechanism until a subsequent return of the practically exhausted shuttle to the box adjacent the said mechanism.

In the present embodiment of my invention I have shown and described a loom employing a drop-box for four shuttles; but it is evident that a drop-box for any desired number of shuttles may be used. Likewise I have chosen to illustrate a loom wherein the filling-carriers are adapted to be changed in the shuttles to supply fresh filling; but it is equally apparent and I desire it to be understood that my invention is not limited in this respect, and when in the specification and claims I refer to a "filling-changing mechanism" I mean mechanism that will either eject the practically exhausted carrier from the shuttle and supply a filled carrier or will effect a change of shuttles.

In the drawings, Figure 1 is a side elevation of a loom embodying my invention. Fig. 2 is a front view thereof with the central portion of the loom broken away. Fig 3 is a detail side sectional view of the indicating device. Fig. 4 is a detail sectional view thereof. Fig. 5 is a detail of one form of shuttle and detecting devices that may be employed.

The invention to be described may be applied to any form of drop-box loom provided with a filling-changing mechanism; but in the present instance and as illustrating the application of my invention I have selected the type of loom disclosed in the patent to Wyman and Crompton, No. 600,053, dated March 1, 1898. The loom-frame A, crank-shaft C, cam-shaft B, lay H, connecting-rod H′, filling-feeder G^6, supporting-arm G^8, transferrer 26, the rock-shaft G′, extending across the loom-frame and having the arm G^2 connected to the main shuttle-box lever E by the connecting-rod G^4, the shuttle-box rod *n*, also connected to the main shuttle-box lever E, the arm G^3, having pivoted thereto the rack-bar G^5, the series of gears 31 34 36 32+ and connected parts, some

of which are not shown, and operated from the rack-bar G^5 to move the filling-feeder in unison with the shuttle-boxes to maintain the proper filling-carrier in proper relation to the transferrer 26, the arm 43, the lever 38, rod 37, cam 40, and operating connections are and may be all as shown in the said Patent No. 600,053.

The filling-feeder G^6, as set forth in the patent referred to, is provided with a series of filling-carriers 22, arranged in groups corresponding to the arrangement of the filling in the shuttle-boxes, and is connected to the shuttle-boxes in a manner to be moved in unison therewith. When a change of filling takes place, the filling-feeder is given another movement independent of the motion of the shuttle-boxes to bring another group of filling-carriers in position opposite or adjacent to the filling-transferrer. As means for effecting these movements are fully set forth in the patent referred to, as above set forth in general terms, and form no part of my invention, I have not deemed it necessary or essential to a full understanding of my improvements to describe or illustrate the same in detail except in so far as my improvements are connected thereto. Neither have I shown and described herein the mechanism for shifting the drop-boxes, as any well-known form of such mechanism may be employed—as, for instance, that disclosed in Patent No. 600,053, to which reference has been made.

Secured to the loom-frame is a bracket a, provided with a sleeve or bearing a' for the support of what I term the "indicating device." In said bearing is fitted to turn a stud or shaft a^2, having an enlarged or flanged end a^3. The opposite end of the stud or shaft a^2 has secured thereto, preferably on the extension a^5, the hub a^4 of an indicator D, preferably of circular form, as shown in Fig. 3, and having disposed about its periphery a series of depressions D'. In the particular character of indicator shown these depressions are formed as a part of the casting; but it is obvious that such construction may be varied within wide limits, it being only essential, as far as my invention is concerned, that depressions be provided on the periphery or outer surface of the indicator.

Pivoted at d' within each depression D' is a dog or lifter d, one end of which projects beyond the face of the indicator D and is preferably flattened or provided with a lip d^2. A spring d^3, secured at one end to the wall of the depression D', as at d^4, and at its other end to the dog or lifter at d^5, is so disposed with relation to the pivot d' of the dog or lifter as that it will act on either side thereof, according as the dog or lifter is contained within the depression, as shown by full lines, Fig. 4, or in raised position, as shown by dotted lines of said figure, and thus maintain said dog or lifter by a yielding force either in such lowered or raised position.

A stop d^6, formed upon each dog, limits its movement into the depression under the action of spring d^3, while a stop d^7, formed as a part of or projecting from the wall of the depression D' and contacted by a shoulder d^8 on the dog or lifter, determines the limit of outward movement of the dog or lifter, as will be readily apparent from Figs. 3 and 4.

Each dog or lifter between its ends is preferably provided with a raised portion or cam d^9, upon which the dagger b, pivoted at b' to the downward-extending arm b^3, secured to move in unison with the transferrer pivoted at b^4, is adapted to rest. The dagger b is also provided with a raised portion or projection b^2, located at a point in its length, as shown, with its highest part just beyond or inward of the raised portion or cam d^9, for a purpose that will presently appear.

When the dog or lifter, located for the time being beneath the dagger b, is in its lowered position within the depression D', the said dagger is permitted to rest with its end out of the path of a bunter b^5, carried by the lay H; but should said dog or lifter be raised it will carry the said dagger into position to be struck by the bunter and cause a transfer of filling, as will be obvious. As the bunter pushes the dagger forward to operate the transferrer through the connecting-arm b^3 the raised portion or projection b^2 on the dagger will ride over the raised portion or cam d^9 on the dog or lifter and in turn depress the same against the action of its spring d^3 until the movement of the dog or lifter has carried the spring past its pivot d', when the spring will assert its force in completing the movement of the dog or lifter about its pivot and hold the same in its position within the depression.

Pivoted at c^2 to a bracket c', secured to the loom-frame, is a lever c, one end of which has a pin or roller c^3, traveling in the groove of a cam C^3, and to the other end of which is pivotally connected an actuator or rod c^4, passing loosely through a guide-arm c^5, secured to the loom-frame, with its upper end c^6 adjacent to the projecting end or lip d^2 of the dog or lifter d which for the time being is uppermost, as will hereinafter more fully appear.

By virtue of the cam C^3 the rod or actuator c^4 is given a reciprocating movement in a substantially vertical direction, the path traveled by the end c^6 of the rod or actuator c^4 being normally such that the said end will pass but not contact with the projecting end or lip of the dog or lifter. It is evident, however, that should the actuator or rod c^4 be moved so as to place its end beneath the lip of the uppermost dog or lifter then said dog or lifter will be turned about its pivot by the actuator or rod c^4 and be held in raised position by the spring d^3 to thereby position the dagger to be struck by the bunter b^5, and such movement of the rod or actuator c^4 is secured on a practical exhaustion of the filling in an active shuttle, as will now be described.

Secured to a bracket f', carried on the loom-

frame, is an electromagnet f, the armature f^3 of which loosely embraces by the free end the actuator or rod c^4, which is free to reciprocate vertically through said end. Preferably adjacent the single shuttle-box X are the two terminals f^2 f^2 of an electric circuit connected by the wires 1 and 2 and the usual binding-posts to the electromagnet f, as shown in Figs. 1 and 2, and to which electric energy is supplied from any suitable source—as, for instance, the battery P. One form of shuttle adapted to be employed in this embodiment of my invention is shown in detail in Fig. 5, wherein the shuttle g, open from top to bottom, is provided with the usual holding-clamps g^2 g^2 for the filling-carrier and has preferably extending lengthwise thereof the contact-strips g^4 g^4 in electric connection with the detectors g^3 g^3, formed as spring-arms to normally press upon the filling on the carrier g'. The carrier g' is provided at a convenient point in its length with a conductor or metal band g^5, which is normally covered by the filling when the carrier is provided with a working supply; but should the filling approach exhaustion then the conductor or band g^5 is exposed and will be contacted by the detectors g^3 g^3 to establish an electric connection between the contact-strips g^4 g^4 on the shuttle, said strips being normally insulated from each other.

The terminals f^2 f^2 are preferably formed as spring-fingers f^4, normally pressed with their free ends into the path of the shuttle as it enters the box X and adapted to contact at such times with the strips g^4 g^4 of the shuttle. From the construction thus described it will be evident that as long as the active shuttle that enters the box X carries a working supply of filling the detectors g^3 g^3 will be held out of contact with the conductor or ring g^5; but should the filling in an active shuttle become so far exhausted as to expose or uncover the ring or conductor g^5 then the detectors g^3 g^3 will be joined in electric connection and a current will be established through the strips g^4, terminals f^2 f^2, wires 1 and 2, and electromagnet f, which being thus energized will attract its armature f^3 and move the actuator or rod c^4 into position beneath the projecting end or lip d^2 of the upper dog or lifter of the series carried by the indicator D and on its upward movement will raise said dog or lifter to position the dagger b to effect a change of filling in the manner already explained.

It will be noticed in the present embodiment of my invention I have located the filling-changing and detecting mechanisms adjacent that end of the lay carrying the single shuttle-box, and while it is desirable to thus locate the filling-changing mechanism it is evident, of course, that the detecting mechanism may be located at either end of the lay. When these mechanisms are located as indicated in the preferred embodiment of the invention, the shuttle after having indicated a condition of practical exhaustion of filling through the detecting mechanism, as explained, is picked on the next back stroke of the lay to the opposite box—in this case the drop-boxes Y. The timing of the reciprocations of the actuator or rod c^4 by the cam C^3 is such that the actuator or rod c^4 on each alternate pick completes its upward movement on the back stroke of the lay. Therefore when an indication of practical exhaustion of filling has been made the actuator does not set the dog or lifter to position the dagger to be struck by the bunter on that beat-up in which the indication was made; but as the dog or lifter is left raised and held raised by its spring d^3 the bunter b^5 would strike the dagger b on the next beat-up, a time when there is no shuttle in the single box, unless provisions were made to obviate such action, and this I do in the following manner: The bunter b^5 is mounted on an arm b^6, pivoted at b^7 to an arm b^9, pivoted at b^8 to the lay H and connected at its opposite end with a rod b^{10}, extending the length of the lay-swords b^{16} and connected at b^{15} to the end of a lever b^{11}, pivoted at b^{12} to bracket b^{13}. The end b^{17} of the lever b^{11} rides on the cam b^{14}, carried by the cam-shaft B and timed to move the bunter through the described connections out of position to engage the dagger each time a shuttle is picked to the drop-box side of the loom, but to return said bunter to its engaging position when a shuttle is in the single-box side. From this it will be understood that should a shuttle become practically exhausted on reaching the single-box side of the loom an electric circuit will be completed through the means described and set the actuator or rod c^4 to completely raise the dog or lifter, as explained, on the back stroke of the lay. The practically exhausted shuttle will then be picked to the drop-box side and the lay will again be moved forward, at which time the bunter through its connections with the cam b^{14} will be lifted, so as not to strike the dagger, which is now in held-up position. On the next pick should the drop-boxes be not moved by the call of the pattern the practically exhausted shuttle will be returned to the single-box side of the loom, and as the bunter b^5 is now moved to position to strike the dagger b, which is still held raised by the raised dog or lifter, the filling-changing mechanism will be operated in the usual manner to effect a transfer of the carriers in the shuttle. Should the drop-boxes be moved, however, to bring another shuttle into play after the practically exhausted shuttle has been picked to the drop-box side, it then becomes necessary to provide means to suspend the action of the filling-changing mechanism until the said practically exhausted shuttle is returned to the single-box or changing side of the loom, and this I do by the following-described devices:

Secured to the hub a^4 of the indicator D is

a pinion h, which is engaged by the teeth h' of a sliding rack h^2, movable in guides h^3 h^3 and joined at its lower end to a flexible connection, as a cord, rope, or chain h^4, passing over suitable guide-pulleys h^5 and suitably joined to the shuttle-box motion in a manner such that movement of the shuttle-boxes to bring different shuttles on a line with the race will move said cord, rope, or chain h^4 and through it the rack h^2. In the form of connection herein illustrated between the shuttle-box motion and cord, rope, or chain h^4 the latter is secured at one end to the shuttle-box rod, as at h^6, by the collar h^7; but it is evident that it might be secured to any portion of the box-motion, the only requisite being that it shall be moved in unison with the boxes and transmit such movement to the sliding rack h^2. A spring h^9, surrounding the sliding rack h^2 and interposed between the guide h^3 and a collar h^{10}, secured to the sliding rack by a screw or pin h^{11}, is preferably employed to raise the rack h^2 when the falling movement of the shuttle-boxes gives slack to the flexible connection h^2. From this construction it will be seen that as the shuttle-boxes rise and fall under the call of the pattern to bring shuttles having different characters and colors of filling into action such movement will be transmitted by the flexible connection h^4 and spring h^9 to the sliding rack h^2 and by it transmitted to the pinion h, which in turn rotates the indicator D.

The indicator D is provided, preferably, with a number of depressions D' and dogs or lifters d corresponding to the number of shuttles adapted to be employed by the drop-boxes, and as the indicator and the dogs or lifters rotate by the action of the rack h^2 in unison with the rise and fall of the shuttle-boxes each dog or lifter in effect maintains a relation to one of the boxes in the series of drop-boxes such that as said box is brought onto the line of the race the indicator is rotated to bring its corresponding dog or lifter in position beneath the dagger b, and when the said box is moved out of line of the race its dog or lifter is, by the rotation of the indicator D, removed from beneath the dagger. It will thus be seen that should a shuttle become practically exhausted of filling as it enters or reaches the single box X it will, through the detectors and adjuncts described, move the actuator or rod c^4 into position to lift the dog or lifter corresponding to the shuttle in play and which is at that time uppermost and directly beneath the dagger b, and the spring d^3 will retain said dog or lifter raised. Should the drop-boxes be not changed when the exhausted shuttle reaches that side of the loom, the indicator D will not be moved, and consequently the dog or lifter corresponding to the exhausted shuttle will remain raised and hold the dagger b in position to be struck by the bunter on the next pick, which will carry the exhausted shuttle to the single box and to thereby effect a change of filling. Should the drop-boxes be changed, however, on the arrival of the practically-exhausted shuttle to that side of the loom, the indicator will be rotated by the rack-slide h^2, carrying the dog or lifter, which has been raised by the actuator, from beneath the dagger b, so that on the next pick there will be no change of filling, yet the dog or lifter corresponding to the exhausted shuttle will remain in raised position by virtue of its spring d^3, and in the subsequent operation of the loom whenever the drop-boxes move to bring the exhausted shuttle into play again the indicator will likewise bring the raised dog or lifter into position to hold the dagger b in the path of the bunter to effect a change of filling in the exhausted shuttle when it is picked into the single box.

It will be noticed that whenever an active shuttle becomes practically exhausted in the single or detecting box X the dog or lifter corresponding thereto is set to put the dagger in position to effect a change of filling and that the dog or lifter remains set even though the drop-boxes change, so that whenever the exhausted shuttle returns to the changing side of the loom the filling thereof is at once changed without the necessity of another indication of its exhausted condition by the indicating devices. In other words, when a shuttle has become practically exhausted of filling devices are set to effect a change of filling at any time said shuttle returns to the changing side of the loom, and I have therefore designated the indicator D, its dogs or lifters, and generally coacting parts a "held-up indication" for suspending the action of the filling-changing mechanism until a subsequent arrival of the shuttle to the changing side of the loom.

While I have shown special forms of detecting mechanism, as the electric contacts, electric circuit, special form of shuttle, detectors and actuator for the dogs and lifters, it is to be understood that my invention is not limited thereto, as the held-up indication device can be used with any electrical, mechanical, or other form of detecting mechanism.

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

1. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism, means for operating the latter to effect a change of filling when that in an active shuttle has become nearly exhausted, and devices for suspending the action of said means until a subsequent arrival of the nearly-exhausted shuttle in the box adjacent the filling-changing mechanism.

2. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism, means for operating the latter to effect a change of filling when

that in an active shuttle has become practically exhausted, and devices connected to the shifting or drop shuttle-boxes for suspending the action of said means until a subsequent arrival of the practically-exhausted shuttle in the box adjacent the filling-changing mechanism.

3. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism, an indicator provided with devices for controlling the operative condition of said mechanism, filling-detecting mechanism operative on a practical exhaustion of filling in an active shuttle to position said devices, and connections between said indicator and shuttle-boxes.

4. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism, an indicator provided with devices for controlling the operative condition of said mechanism, electrically-controlled filling-detecting mechanism operative on a practical exhaustion of filling in an active shuttle to position said devices, and means to cause said indicator to move in unison with the shuttle-boxes.

5. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism, means for operating the same to effect a change of filling, devices for placing said means in operative position controlled by the condition of the filling in an active shuttle, and connections between said devices and the drop-boxes to suspend the effective action of said devices when the shuttle-boxes are moved after an indication by the active shuttle.

6. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism including a transferrer, a dagger connected to the latter, devices controlled by the condition of filling in the active shuttle for placing said dagger in operative position to effect a change of filling, and connections between said devices and the shuttle-boxes to suspend the effective action of said devices until a subsequent return of the practically-exhausted shuttle to the filling-changing side of the loom.

7. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism including a transferrer, a dagger connected to the latter, an indicator provided with means controlled by the condition of filling in the active shuttle for placing said dagger in operative position to effect a change of filling, and connections between said indicator and shuttle-boxes for moving the former in unison with the latter to carry the said means from operative engagement with said dagger.

8. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism including a transferrer, a dagger connected to the latter, an indicator carrying a series of dogs or lifters, connections between said indicator and drop-boxes to move the former in unison with the latter and an actuator controlled by the condition of filling in the active shuttle to raise a dog or lifter.

9. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism including a transferrer, a dagger connected to the latter, an indicator carrying a series of dogs or lifters, connections between said indicator and drop-boxes to move the former in unison with the latter, an actuator controlled by the condition of filling in the active shuttle to raise a dog or lifter, and means to maintain the latter in such position.

10. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism, an indicator provided with devices for controlling the operative condition of such mechanism, means for moving the indicator in unison with the shuttle-boxes, an electric circuit, including an electromagnet, completed by a condition of practical exhaustion of filling in an active shuttle, and an actuator for said devices under control of the electromagnet.

11. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism, means for rendering said mechanism operative to effect a change of filling when that in an active shuttle has become practically exhausted, and devices for suspending the effective condition of said means when the shuttle-boxes are changed after the entrance thereinto of the practically-exhausted shuttle and to restore said effective condition on the return of said shuttle to action.

12. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism including a transferrer, a dagger connected to said transferrer, an indicator provided with a series of dogs or lifters, connections between the shuttle-boxes and indicator to move the latter in unison with the former, an actuator for said dogs or lifters, means for reciprocating said actuator, an electric circuit including an electromagnet controlling the path of movement of said actuator, and devices for closing said circuit on the practical exhaustion of filling in an active shuttle whereby the actuator is caused to raise a dog or lifter to place the dagger in operative position.

13. In a loom the following instrumentalities, viz: shifting or drop shuttle-boxes, a filling-changing mechanism including a transferrer and dagger, means for positioning the latter to cause a change of filling when that in an active shuttle has become practically exhausted, the lay, a bunter carried by the lay, and devices for moving the bunter so as not to contact with the dagger under normal working conditions of the loom.

14. In a loom the following instrumentali-

ties, viz: shifting or drop shuttle-boxes, a filling-changing mechanism including a transferrer and dagger, means for positioning the latter to effect a change of filling when that in an active shuttle has become practically exhausted, connections between said means and shuttle-boxes to cause said means and shuttle-boxes to move in unison, the lay, a bunter carried by the lay and devices for moving the bunter so as not to contact with the dagger.

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

HARRY W. SMITH.

Witnesses:

GRACE I. BEMIS,

CHARLES F. ALDRICH.