

No. 692,934.

Patented Feb. 11, 1902.

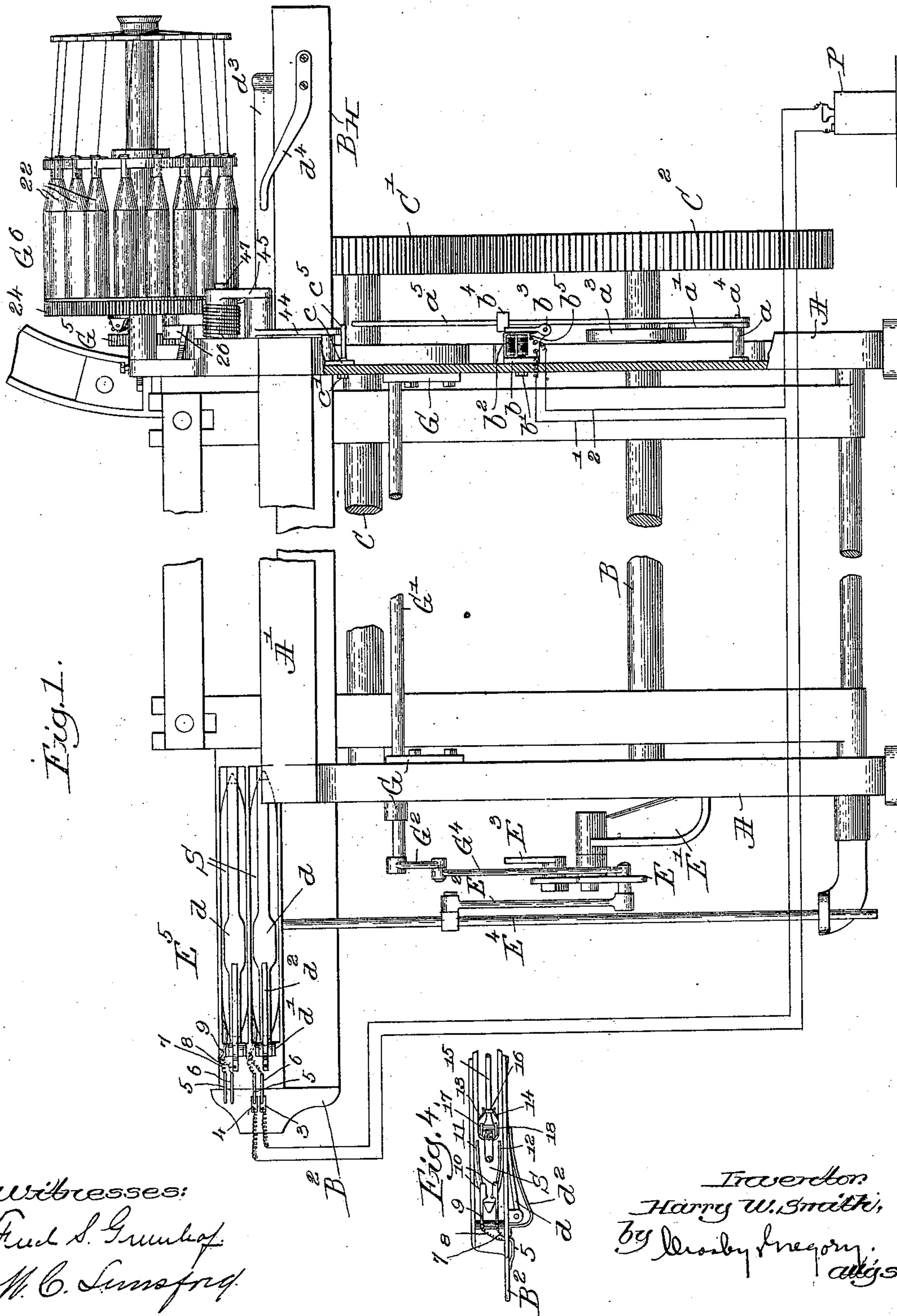
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WEFT REPLENISHING MECHANISM FOR LOOMS.

(Application filed Oct. 22, 1900.)

No Model.)

3 Sheets—Sheet I.



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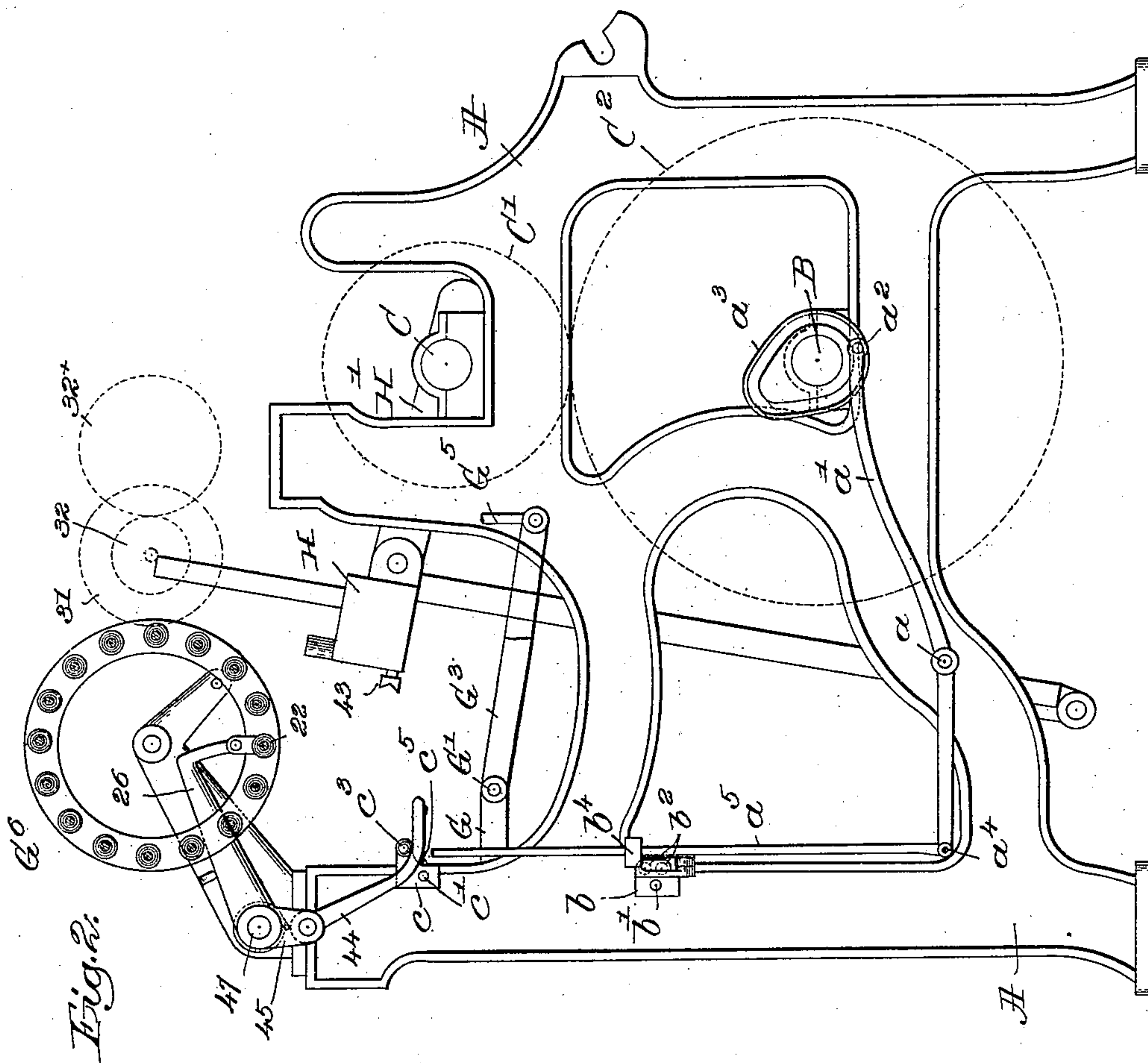
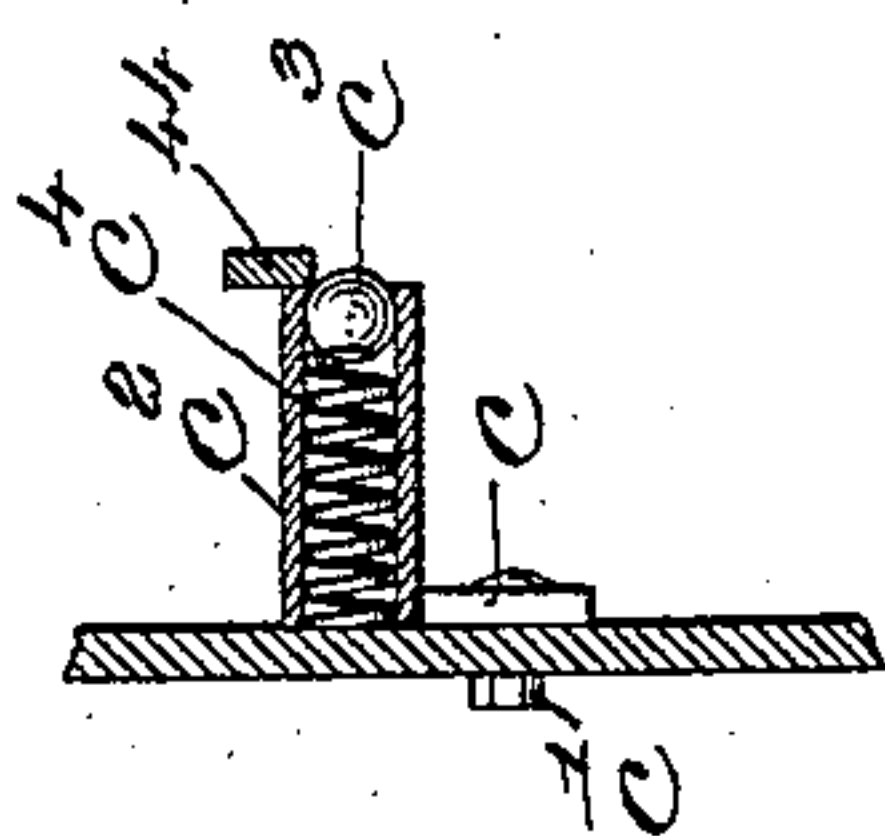


Fig. 5.



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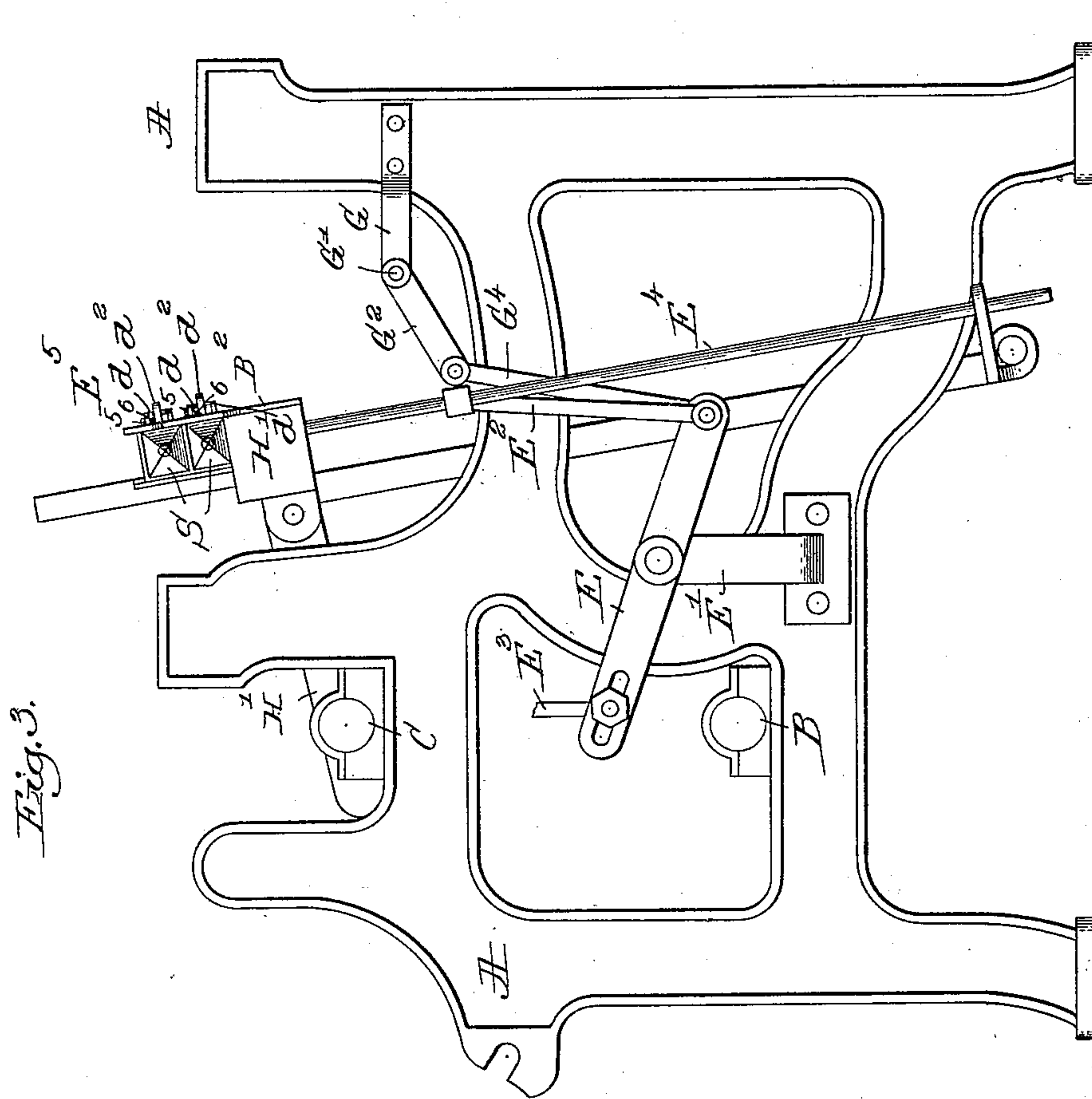
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(No Model.)

3 Sheets—Sheet 3.



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# UNITED STATES PATENT OFFICE.

HARRY W. SMITH, OF NORTH GRAFTON, MASSACHUSETTS.

## WEFT-REPLENISHING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 692,934, dated February 11, 1902.

Application filed October 22, 1900. Serial No. 33,799. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY W. SMITH, a citizen of the United States, residing at North Grafton, 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 that general class of looms wherein filling changing or replenishing mechanism is employed to supply fresh filling at desired times without stopping the loom, and more particularly to such type of looms employing drop or shifting shuttle-boxes for furnishing different characters or colors of filling under the call of pattern mechanism.

It has heretofore been proposed in the class of looms employing drop or shifting shuttle-boxes to effect a change in the filling when that in an active shuttle has become broken or exhausted, in which event mechanically-operated means were set in action to eject the filling carrier or shuttle the filling of which had become broken or exhausted and to replace it by a filled carrier or shuttle. It has also been proposed in a single-shuttle-box loom or one using only one character or color of filling to employ devices to effect a change of the filling when that in an active shuttle has approached exhaustion to a predetermined amount.

In my present invention I have sought to improve upon that type of loom wherein drop or shifting shuttle-boxes are employed and to provide in such type of loom means whereby a fresh supply of filling may be effected when that in any of the shuttles becomes exhausted to any determined amount. In adapting such means to the character of loom specified I have found it desirable to effect the change of filling at one side and to detect the condition of the filling on the opposite side of the loom, to thereby permit the shuttle to make at least one pick between the instant of detection of a practical exhaustion of filling and the operation of the filling-changing mechanism, thus obviating the objections of quick and sudden action of mechanical parts. It is more advantageous in

the type of loom using drop or shifting shuttle-boxes at one side and a single box at the other side to locate the filling-changing mechanism on the single-box side, and I have therefore devised a form of detecting mechanism adapted for location at the drop or shifting shuttle-box side of the loom, it being understood, of course, that this same detecting mechanism may be used as well in a loom having drop or shifting shuttle-boxes on both sides thereof as one; but herein I have shown my invention as embodied in a loom having shuttle-boxes at one side only.

In the exemplification of my invention as herein illustrated I have selected a loom having drop or shifting shuttle-boxes provided with two cells on one side of the loom and a single shuttle-box on the other side; but it is to be understood that my invention is not limited in this respect and that a drop or shifting shuttle-box provided with any number of cells may be employed, and while I have illustrated my invention as applied to a loom having the filling changing or replenishing mechanism for ejecting a practically exhausted filling-carrier from the shuttle and placing therein a filled carrier it is to be understood that such change of carriers is not essential and that the fresh supply of filling may be secured by any of the well-known means, as by changing the shuttle.

Since the drop or shifting shuttle-boxes contain different characters or colors of filling, it is essential that the filling-carriers in the hopper or feeder shall be arranged in groups to correspond therewith, and as the said boxes rise and fall or change under the call of the pattern being woven the feeder is given a motion in unison with said boxes to always maintain the proper filling in position to be placed in its proper shuttle, and in case of a practical exhaustion of the filling in an active shuttle and upon the operation of the filling-changing mechanism to supply fresh filling the feeder is automatically moved a distance sufficient to bring into operative position a new group of filling-carriers in a manner similar in general operation to that set forth in the patent to Wyman and Crompton, No. 600,053.

My invention comprehends, broadly, in a loom provided with drop or shifting shuttle-boxes and filling changing or replenishing



mechanism provisions, such as detecting mechanism adjacent the drop or shifting shuttle-boxes, for determining when the filling in any of the shuttles is to be changed; and the invention consists of the parts and combinations, as will be hereinafter more fully described, and definitely pointed out in the claims.

In the drawings, Figure 1 is a front elevation, partly in section and with portions removed, of a loom embodying my invention, many of the parts constituting the usual adjuncts of an ordinary loom being omitted in order to better disclose the invention. Fig. 2 is a side elevation of the same, sufficient only of the old structure being illustrated to disclose the connection and relation of cooperating parts pertaining to my invention. Fig. 3 is a like side elevation on the opposite side of the loom. Fig. 4 is a detached detail of one end of the drop or shifting shuttle-box, showing parts of the detecting mechanism; and Fig. 5 is a detailed view of the dagger-catch, to be described.

Referring to the drawings, the loom-frame A, breast-beam A', lay H, driven from the crank-shaft C' by the pitman H', the cam-shaft B, the gears C' C<sup>2</sup>, connecting the crank and cam shafts, the filling-feeder G<sup>6</sup>, the filling-carriers 22 therein arranged in groups corresponding to the number of shuttle-boxes being used, the transferrer 26, pivoted at 47, the rock-shaft G', mounted in suitable brackets G, carrying the arm G<sup>3</sup>, to which is connected the rack-bar G<sup>5</sup> and actuated from the shuttle-box motion through the arm G<sup>2</sup>, connecting-rod G<sup>4</sup>, and shuttle-box lever E, the gearing 31 32 32<sup>x</sup>, shown in part by dotted lines, Fig. 2, and deriving motion from the rack-bar G<sup>5</sup>, and the other adjuncts of said mechanism, whereby the requisite movement is given to the filling-feeder to constantly maintain a filling-carrier of the same character or color as that in the active shuttle below the transferrer and to move the filling-feeder the distance necessary to bring another group of filling-carriers into required position after a change of filling has taken place, all as very fully set forth and described in the Letters Patent, No. 600,053, granted to Wyman and Crompton, are and may be of the same character and construction as similar parts in said patent, to which reference may be had. It is not deemed necessary to more fully elucidate the construction of filling-feeder and its actuating mechanism, as they form no part of my present invention and are explained at length in the patent referred to.

Pivotaly mounted on the bracket E' is the shuttle-box lever E, which is actuated from any usual or well-known form of shuttle-box motion through the rod E<sup>3</sup>, one form of such box-motion that may be used in this connection being disclosed in Patent No. 600,053, above referred to, and forming no essential part of my invention it is not deemed necessary to illustrate further. The shuttle-box lever E,

through the rod E<sup>2</sup>, pivotaly connected to said lever and to the shuttle-box rod E<sup>4</sup>, imparts the necessary rising-and-falling movement to the shuttle-boxes E<sup>5</sup> under the call of the usual pattern mechanism of the shuttle-box motion, as disclosed in the patent above referred to.

Pivotaly connected to the arm 45, depending from the transferrer 26, is a dagger 44, the end of which is normally below the path of movement of a bunter 43, secured to the lay H. It will be evident by reference to Fig. 2 that if the dagger is put in position to be struck by the bunter 43 it will cause the transferrer 26 to turn upon its pivot 47 and push a filling-carrier 22 from the feeder, and since the lay is in its forward or beat-up position at the time contact can be made between the bunter and dagger, and the feeder is located above the single shuttle-box B'. It is also evident that a shuttle in the single box will be in position to have the filling-carrier transferred from the feeder into the shuttle and the carrier then in the shuttle pushed therefrom. Such position of the dagger to effect the above results is secured by the following mechanism at the desired times:

Pivotaly secured to the main frame A at a is an actuating-lever a', carrying at one end a pin or roller a<sup>2</sup>, which engages a cam a<sup>3</sup> on the cam-shaft B. At the opposite end a<sup>4</sup> of the actuating-lever there is pivotaly connected an actuator a<sup>5</sup>, which under normal working conditions of the loom is reciprocated by the lever and cam referred to in proximity to the dagger 44. Carried by a bracket b, secured to the loom-frame by a bolt or pin b', is an electromagnet b<sup>2</sup>, the armature of which is pivoted at b<sup>3</sup> and has at its free end a guide b<sup>4</sup>, through which the actuator a<sup>5</sup> passes. A spring b<sup>5</sup> normally presses the armature from the electromagnet, and in this position of the armature the path of reciprocation of the actuator a<sup>5</sup> is such that the end of said actuator does not contact with the dagger 44; but when the electromagnet is energized and the armature drawn into contact therewith the actuator a<sup>5</sup> is moved so that in its further reciprocations the end thereof will contact with and lift the dagger 44 into position to be struck by the bunter 43, the actuator a<sup>5</sup> having sufficient play at its pivotal connection a<sup>4</sup> with the lever a' to permit such movement of the actuator under the impulse of the armature.

Connected to the electromagnet b<sup>2</sup> are the electric conductors 1 and 2, which are connected in any usual manner to a source of electric supply, shown in the present instance as batteries P; but it is evident that the said conductors 1 and 2 may be joined in any form of electrical connection with any usual source of electric energy—as a dynamo, for instance—and said wires are carried, as appears in Fig. 1, to the drop or shifting shuttle-box side of the loom, where, as at 3 and 4, they are connected to the drop or shifting shuttle-box guide B<sup>2</sup>.



In order that the quick and sudden action of the parts incident to the simultaneous detection of filling exhaustion and operation of the filling-changing mechanism may be avoided, I have located the filling-changing mechanism at one side of the loom and the detecting mechanism at the opposite side, the former, as shown in Fig. 1, being located adjacent the single-box side of the loom. It has therefore become necessary to devise a form of detecting mechanism to cooperate with the shifting shuttle-boxes on the opposite side of the loom to feel for and detect the condition of filling in any of the shuttles carried by the shifting shuttle-boxes, and such detecting mechanism as I have chosen to illustrate as the embodiment of my present invention consists as follows: Secured to the shuttle-box guide or stand  $B^2$  are the contacting plates or terminals 3 and 4 in electrical connection with the conductors 1 and 2. Mounted upon the shifting shuttle-boxes, adjacent each cell thereof, are the contact-strips 5 and 6, which, by means of conductors 7 and 8, are in electrical connection with contacts 9 and 10, preferably in the form of spring-fingers, as shown in Figs. 1 and 4, said fingers being preferably bent near their outer ends so as to be in the path of the end of the shuttle as it comes in the cell. Extending from near the end of the shuttle  $S$  for some distance along the top on either side thereof are the contact-strips 11 and 12, which are in electrical connection with the fingers 13 and 14, preferably spring-pressed toward the filling-carrier 15, which is provided with a conductor 16, preferably in the form of a metal ring or band. Under normal working conditions the filling-carrier 15 in the shuttle  $S$  is provided with filling, which covers the conductor or metal ring, and thus prevents electric junction between the spring-fingers 13 and 14, and under these conditions, therefore, when the shuttle enters one of the cells of the drop or shifting shuttle-boxes the contact-strips 9 and 10 will contact with the strips 11 and 12, but by reason that the fingers 13 and 14 are separated from electric connection with the conductor 16 by the filling on the filling-carrier 15 the electric circuit will not be closed. If, however, the filling on the carrier should become exhausted sufficient to expose the conductor 16 to contact with the fingers 13 and 14, then the electric circuit through the contacts 9 and 10, 11 and 12, fingers 13 and 14, and conductor 16 will be established and completed through the fingers 5 and 6 and the contacting plates or terminals 3 and 4, which are in connection with the wires 1 and 2. Under these conditions the electromagnet  $b^2$  becomes energized and the armature, with its guide  $b^1$ , is drawn to the magnet, carrying the end of the actuator  $a^5$  below the dagger and in position to engage the same on the next upward stroke of the actuator.

Since the drop or shifting shuttle-boxes may

contain any number of cells, it becomes necessary to provide contact-fingers 5 and 6 for each one of the cells, and such contact-fingers are preferably, as shown in Fig. 4, spring-pressed, so as to force the ends thereof which project over the guide or stand  $B^2$  upon the face of the said guide or stand, so that as the said drop or shifting shuttle-boxes rise and fall under the call of the pattern through the shuttle-box motion said fingers 5 and 6 will slide over the said contacts or terminals 3 and 4, leaving the fingers 5 and 6 of that cell which is on a line with the race in electrical connection with the contacts 3 and 4, at which time, if the active shuttle is practically exhausted of filling, the electric circuit will be closed, the magnet energized, and the actuator placed in position for raising the dagger to be struck by the bunter on the next forward movement of the lay to thereby cause a change of filling by actuation of the transferrer, as will be understood.

The filling-carrier 15 is preferably held in the shuttle by the spring-fingers 17 and 18, and said shuttle is open at its top and bottom, so that when the transferrer 26 moves a filling-carrier from the feeder into the shuttle it at the same time forces the previously-contained carrier out of the shuttle, substituting therefor the filled carrier.

The actuator being driven from the cam-shaft  $B$ , as shown in Fig. 2, makes one complete reciprocation to each two beats of the lay, and said actuator is caused to have its rising movement by the mechanical proportion of parts at the time the active shuttle reaches its cell at the drop or shifting-shuttle-box side of the loom, so that should the filling become practically exhausted at this time the detecting mechanism above described would operate to energize the magnet  $B^2$  and place the actuator in position to raise the dagger 44 as the said actuator starts on its upward movement. Since, however, the actuator at once descends after having made its upward stroke, it becomes necessary to provide some means for holding the dagger in its raised position to be struck by the bunter 43 after the said actuator has started on its downward movement, and to this end the following has been devised: Carried by a bracket  $c$ , secured to the loom-frame by any form of suitable connection  $c'$ , is a tubular socket-piece  $c^2$ , slightly contracted at its outer end and containing loosely therein a ball or roller  $c^3$ , the latter being normally pressed toward the open end of the socket-piece by a spring  $c^4$ . From this construction it will be obvious that when the dagger 44 has been raised by the actuator  $a^5$  above the roller or ball  $c^3$  in position to be struck by the bunter 43 the ball or roller  $c^3$  will maintain the dagger in such raised position while the actuator descends, and on the forward beat of the lay the said dagger being struck by the bunter will cause the transferrer to change the filling in the shuttle that has arrived in the single



shuttle-box below the transferrer, and such forward movement of the lay to effect the transfer of filling will also force the dagger backward and by the action thereof against the ball or roller will cause the latter to retreat within the tubular socket  $c^2$  and permit the dagger to again resume its lowered position below the roller or ball  $c^3$ , where it is normally supported by a projection  $c^5$ .

While I have herein illustrated and described a detecting mechanism in the form of contacts adapted for mutual electrical connection under the conditions of practical exhaustion of the filling in an active shuttle, yet I do not restrict my invention in this respect, as any form of detecting mechanism which will feel for the filling in the drop or shifting shuttle-boxes and detect a condition of filling which renders a change thereof desirable is within the scope of my invention, and I believe I am the first to provide a filling-detector to detect the condition of practical exhaustion of filling in the drop or shifting shuttle-boxes of a loom.

It will be noted that each cell of the drop or shifting shuttle-box  $E^5$  is provided with the usual binder  $d$ , pivoted at  $d'$  and normally pressed toward the shuttle in the cell by the spring  $d^2$  and that likewise the single box adjacent the filling-feeder may be provided with the usual or any desired form of binder, as  $d^3$ , and spring  $d^4$ .

In the present form of my invention the contact-fingers 5 and 6, one pair for each cell in the drop or shifting shuttle-box, project over the drop-box guide  $B^2$  and make contact with the terminals 3 and 4 as the adjacent cell passes on to the line of the race, so that the detection of practical exhaustion of the filling takes place only in the shuttle that is for the time being active, or, in other words, about to be picked to the single-box side of the loom. It is evident that the details of structure may be varied between wide limits without departing from the spirit of my invention and that the character and form of my detecting device may be changed, the essential being that such detecting device shall detect the condition of the filling in the shuttles on the drop or shifting shuttle-box side of the loom and in case of substantial exhaustion thereof in any active shuttle will cause the operation of the filling-changing mechanism to effect a change of filling either by substituting a filled carrier in the shuttle for that practically exhausted or it may be by changing the shuttles.

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

1. In a loom the following instrumentalities, viz: a lay, shifting shuttle-boxes, a filling-changing mechanism, and provisions for rendering the filling-changing mechanism operative to effect a change of filling on the practical exhaustion of the filling in any of the shuttles.

2. In a loom the following instrumentalities, viz: a lay, shifting shuttle-boxes, a filling-changing mechanism, and provisions adjacent the shifting shuttle-boxes for detecting the condition of filling in the shuttles and rendering the filling-changing mechanism operative to effect a change of filling when that in any shuttle has become practically exhausted.

3. In a loom the following instrumentalities: a lay, shifting shuttle-boxes, a filling-changing mechanism, and detecting mechanism adjacent the shifting shuttle-boxes to feel for and detect the condition of the filling in the shuttles and means operative through the detecting mechanism on practical exhaustion of filling in an active shuttle to operate the filling-changing mechanism.

4. In a loom the following instrumentalities, viz: a lay, shifting shuttle-boxes at one end of the lay, detecting mechanism adjacent the same end of the lay, and a filling-changing mechanism adjacent the opposite end of the lay.

5. In a loom the following instrumentalities: a lay, shifting shuttle-boxes, a filling-changing mechanism, electrically-controlled means for detecting the condition of practical exhaustion of filling in any of the shuttles and rendering the filling-changing mechanism operative to effect a change of filling.

6. In a loom the following instrumentalities, viz: a lay, shifting shuttle-boxes at one end of the lay, a detecting mechanism at the end of the lay adjacent the shifting shuttle-boxes for detecting the condition of the filling in any of the shuttles, a filling-changing mechanism adjacent the opposite end of the lay, and electrically-controlled devices for operating the filling-changing mechanism to effect a change of filling when that in an active shuttle has become practically exhausted.

7. In a loom the following instrumentalities: a lay, shifting shuttle-boxes, a filling-changing mechanism, an electric circuit including an electromagnet, means under control of the electromagnet for rendering the filling-changing mechanism operative to effect a change of filling, and detecting mechanism adjacent the shifting shuttle-boxes for completing the circuit on the practical exhaustion of the filling in an active shuttle.

8. In a loom the following instrumentalities, viz: a lay, shifting shuttle-boxes, a filling-changing mechanism, an electric circuit including an electromagnet, electric terminals or contact-plates adjacent the shifting shuttle-boxes, means for completing the circuit through said terminals on the practical exhaustion of the filling in a shuttle, and devices under control of the electromagnet for rendering the filling-changing mechanism operative to effect a change of filling.

9. In a loom the following instrumentalities, viz: a lay, shifting shuttle-boxes carried at one end thereof, a filling-changing mechanism at the opposite end thereof, an electric de-



tecting device at the end of the lay adjacent the shifting shuttle-boxes and devices movable to operate the filling-changing mechanism.

5 10. In a loom the following instrumentalities: a lay having shifting-shuttle boxes, electrically-actuated detecting means occupying a position adjacent said shifting shuttle-boxes and substantially in line with the raceway  
10 of the lay, said detecting means cooperating with the shuttle in any cell of the shuttle-boxes as that cell is brought on the line of the race.

15 11. In a loom the following instrumentalities, viz: a lay, shifting shuttle-boxes at one end thereof, a filling-changing mechanism adjacent the opposite end of the lay, detecting mechanism to detect the condition of filling

in the shuttles including an electric circuit, said detecting mechanism comprising a pair 20 of terminals adjacent the shifting shuttle-boxes, pairs of contact-fingers on said boxes adjacent the cells in said shuttle-boxes, means in the shuttles for completing the circuit through the fingers and terminals on a practical exhaustion of filling in a shuttle, and 25 means under control of the electric circuit for operating the filling-changing mechanism when the filling in a shuttle is to be changed.

In testimony whereof I have signed my 30 name to this specification in the presence of two subscribing witnesses.

HARRY W. SMITH.

Witnesses:

GEO. W. GREGORY,  
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