No. 666,729. Patented Jan. 29, 1901.

H. WYMAN.

ELECTRIC WARP STOP AND FILLING CHANGING MECHANISM FOR LOOMS.

(Application filed Mar. 5, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

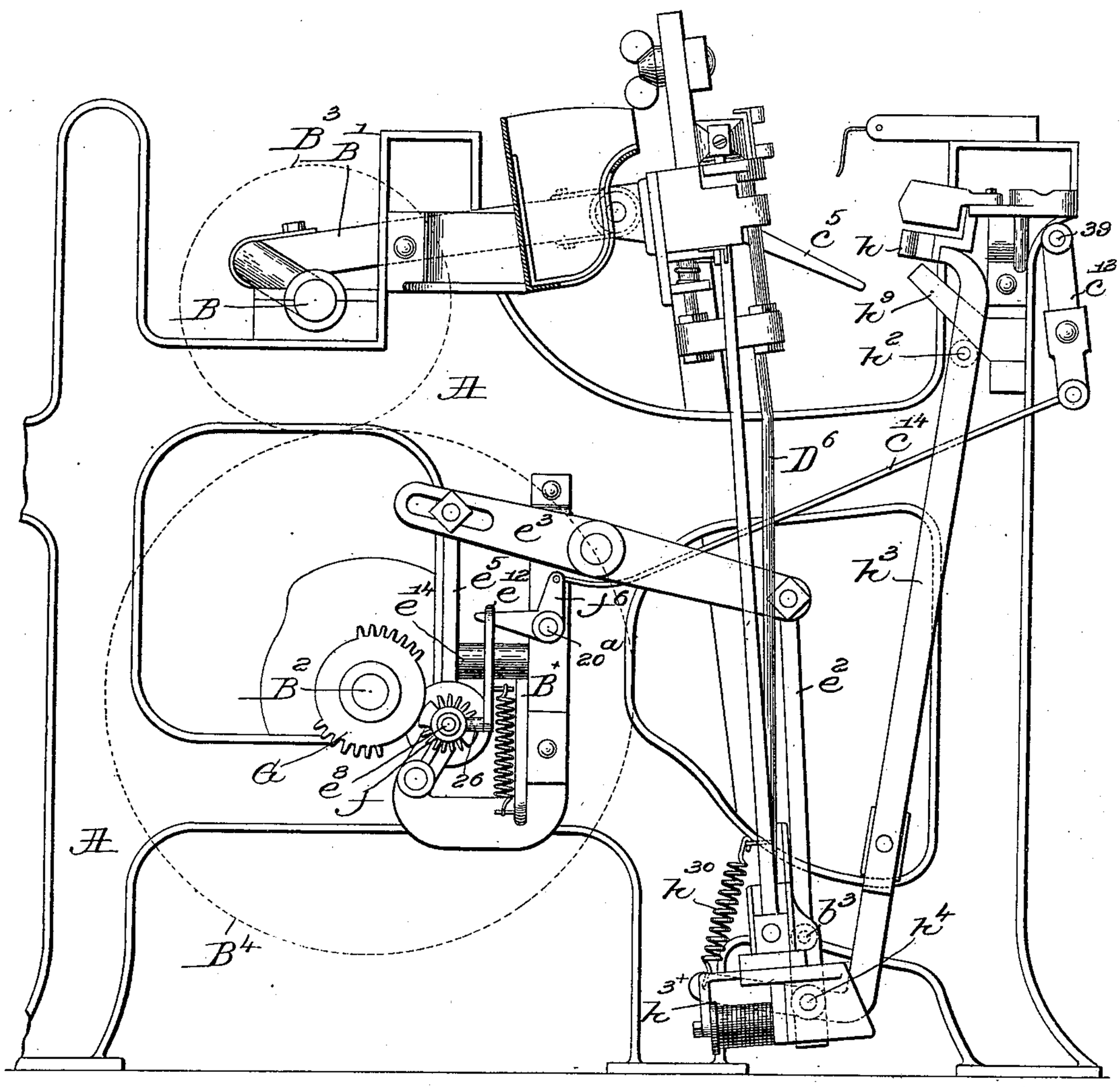

Fig. 5.

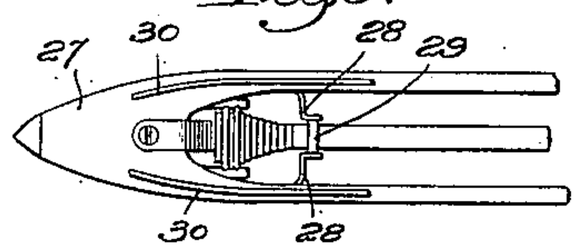

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Fig. 2.

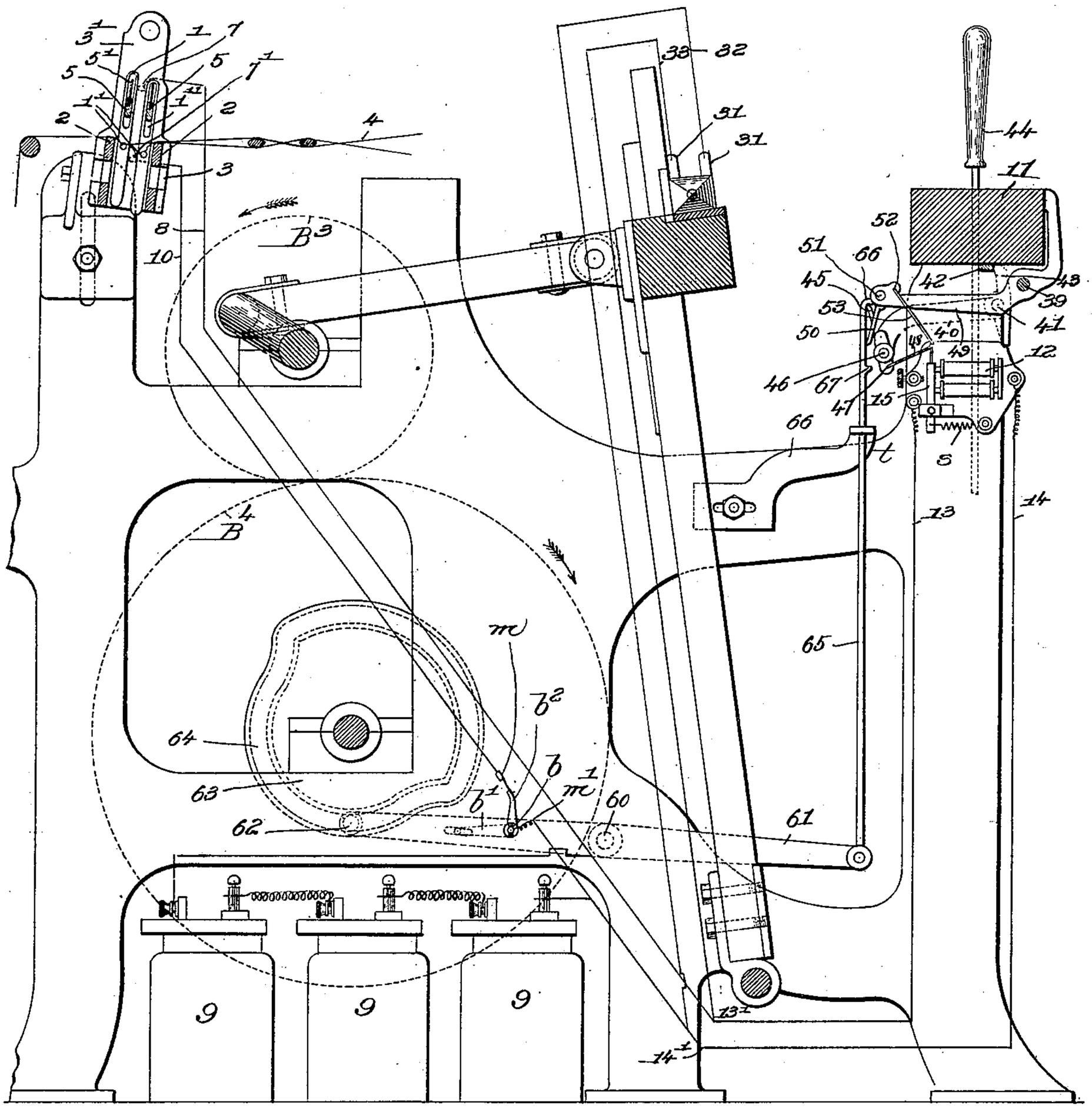


Fig. 3.

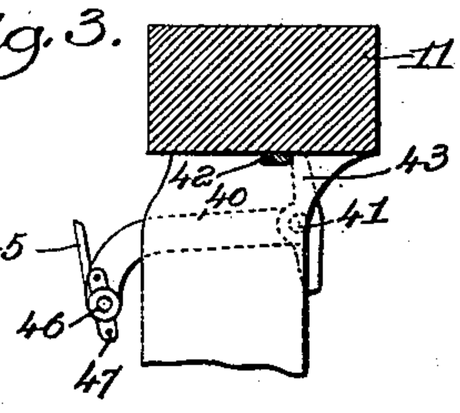
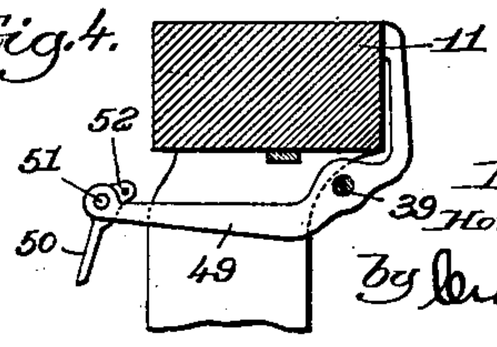


Fig. 4.



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UNITED STATES PATENT OFFICE.

HORACE WYMAN, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE CROMPTON & KNOWLES LOOM WORKS, OF SAME PLACE.

ELECTRIC WARP-STOP AND FILLING-CHANGING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 666,729, dated January 29, 1901.

Application filed March 5, 1900. Serial No. 7,348. (No model.)

To all whom it may concern:

Be it known that I, HORACE WYMAN, of Worcester, county of Worcester, State of Massachusetts, have invented an Improvement in Electric Warp-Stop and Filling-Changing Mechanisms 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 class of looms in which are provided warp-stop and filling-changing mechanisms of any usual or preferred construction, the object being to effect the stopping of the loom in case of a defective condition of the warp and to change the filling when that in the active shuttle becomes exhausted to a predetermined amount, the operation of the warp-stop and filling-changing mechanisms being preferably under control of electric devices, the electric condition of which is changed whenever a warp-thread breaks or becomes unduly slack or whenever the filling becomes nearly exhausted in an active shuttle.

In the form in which it has been herein chosen to illustrate the invention the arrival of a warp-controlled device, herein termed a "detector," into an abnormal position occasioned by the breaking or slacking of a warp-thread or the exhaustion of the filling in an active shuttle to a predetermined amount causes a magnet to become energized, which in turn puts into operative position suitable intermediate devices which may be engaged, as hereinafter disclosed, by a moving actuator, the time of such engagement with reference to the movement of the actuator determining whether the stopping or filling-changing mechanism shall be operated.

In the present form of my invention I have connected the warp and the filling-detectors in the same electric circuit with an electromagnet, whose armature is connected to the movable engaging devices of the stopping and filling-changing mechanisms, which on the completion of the circuit by the abnormal condition of a warp-thread or the practical exhaustion of the filling in the shuttle are brought into the path of movement of the actuator, which will engage one or the other of said devices, according to the direction of movement of the actuator at that time. Should the warp-detectors indicate an abnormal condition of a warp-thread during that movement of the actuator calculated to operate the filling-changing mechanism, it is evident that such filling-changing mechanism would be made operative to supply fresh filling when no indication had been given that such change was desirable, to obviate which I have provided means whereby that part of the circuit including the warp-detectors is interrupted or cut out during such movement of the actuator, all as will hereinafter more fully appear.

In the drawings and following description I have disclosed my invention as preferably applied to a shuttle-changing loom of the character set out in United States Letters Patent No. 614,369, dated November 15, 1898; but it is to be understood that my invention is equally applicable to any other type of loom having a filling-changing mechanism—such, for instance, wherein the filling or filling-carrying bobbin is changed in the shuttle when the filling is practically exhausted—and I desire it to be understood in the following description and claims when reference is made to a "filling-changing" mechanism that I mean to include thereby any form of such mechanism which serves to supply the loom with either a fresh shuttle or the same shuttle with a fresh or filled bobbin or carrier.

In the drawings, Figure 1 is an end view of a loom, showing the shuttle-changing mechanism and corresponding to Fig. 2 in Patent No. 614,369, above referred to, with some of the parts omitted. Fig. 2 is a sectional elevation through the loom, showing my improvements applied thereto. Fig. 3 is a sectional detail through the breast-beam, showing the stopping mechanism or means for knocking off the shipper. Fig. 4 is a like section showing the means for operating the filling-changing mechanism, and Fig. 5 is a detail view of a portion of one form of shuttle that may be used, showing the electric contacts or detectors carried thereby.

The loom-frame A, crank-shaft B, pitman B′, the under or cam shaft B^2, the gears B^3

and B⁴, the mutilated gears G, shaft e^8, link e^5, lever e^3, link e^2, stud b^3, shuttle-box rod D⁶, mutilated gear *f*, shaft 39, arm c^{13}, link c^{14}, joined to the elbow-lever f^6, pivoted at 20^a on a stand B×, the elbow-lever e^{12}, mounted on stud e^{14} and having stud or roll 26, the shuttle-feeder *h*, mounted on lever or bar h^3, pivoted on a stud h^4, arm $h^{3\times}$, spring h^{30}, inclined guides h^9 and c^5, and roller h^2 are and may be all as fully set forth in Letters Patent No. 614,369 and need not be further described.

Preferably attached to the frame of the loom subjacent to the breast-beam 11 is an electromagnet 12, having an armature 15, normally held away from the magnet 12 by the spring *s* and which controls the operation of the warp-stop and filling-changing mechanisms through the movable engaging devices, as will be hereinafter more fully described. The electromagnet 12 has connected thereto the wires 13 and 14 of an electric circuit, the electric energy whereof is derived from any suitable source—as, for instance, a series of jars 9, which constitutes a battery. It is to be understood, of course, that such electric energy may be taken from a dynamo or any convenient electrically-charged conductor. In the electric circuit thus formed is interposed the devices for detecting any abnormal condition of the warp-threads and the means for detecting a practical exhaustion of the filling in the active shuttle in a manner that should a warp-thread break or become unduly slack or should the filling become nearly exhausted the circuit will be closed, thereby energizing the magnet 12, which in turn will attract and move the armature 15, and through the movable or intermediate devices, to be described, will cause either the warp-stopping mechanism to be actuated to stop the loom or the filling-changing mechanism to be set in action to supply fresh filling, according as to whether the indication has been caused by defects in the warp or filling.

In the rear of the lay I provide any suitable form of devices to detect an abnormal condition in the warp-threads or any of them, and in the present instance such devices preferably consist of two series of detectors or drop devices 1, Fig. 2, extending vertically between two sets of bars 2, supported at their ends on stands 3, secured to the loom-frame. Each drop-wire has a hole 1′ therein, through which a warp-thread 4 passes, and an elongated slot 1″, through which a guiding and supporting bar 5 extends, said warp-threads resting on the upper set of bars 2. The bars 5 are secured at their ends to the stands 3′, and each bar 5 is made in two parts, each of electrical conducting material. The part 5′ of the bar in this instance extends into a longitudinal slot in the upper part of the bar 5 and is insulated therefrom. A binding-post 7 is connected with the two parts 5′, and a second binding-post 7′ is connected with the stand 3′, and a wire 8 leads from the post 7 to one pole of a battery made up of jars 9 or other suitable source of electric energy, and a wire 10 leads from the post 7′ to the other pole of the battery, (see Fig. 2,) the said wire being also connected to the wires 13 and 14 at 13′ and 14′, leading to the electromagnet 12.

In its normal position each drop device or detector 1 is suspended on its warp-thread 4 and held out of contact with the part 5′ of the bar 5; but upon the breaking or undue slacking of a warp-thread its detector will fall and rest upon the part 5′ of the bar 5 and establish an electrical connection through the detector or drop device and part 5 and 5′, stand 3′, and binding-post 7 to complete the circuit through wires 8 10 and the electromagnet.

In the form of electric filling-detector mechanism shown in the drawings the shuttle is provided with a detector or feeler bearing upon the filling, preferably near or at the base of the bobbin, and adapted upon the withdrawal of the filling to a predetermined point, usually to that of leaving only a few picks prior to complete exhaustion, to make an electric connection and close a circuit by contact with insulated plates attached to the shuttle-box and connected by wires—in this instance to the circuit including the warp-detectors above described.

As shown by the drawings, the shuttle-body 27 is or may be provided with spring-detectors 28, normally tending toward each other and bearing upon the filling on the bobbin or carrier in a manner such that on the exhaustion of the filling to an amount sufficient to expose a conductor or metallic ring 29 on the bobbin or carrier electrical connection will be established between the detectors. Contact-plates 30 are in electrical connection with the detectors, so that as the shuttle enters the detecting-box they will be engaged by the contacts 31 31 carried on said box, as will be evident. From the contacts 31 31 wires 32 and 33 lead to and connect with the wires 13 and 14, respectively, as shown in Fig. 2, from which it will be apparent that should the filling in an active shuttle become practically exhausted a circuit will be completed through the filling-detectors 28 28, conductor 29, contacts 30 and 31, wires 32 33, wires 13 and 14, and electromagnet 12.

Subjacent the breast-beam 11 are parts of the stopping and the filling-changing mechanisms, the former of which comprises a lever 40, pivoted at 41 and having a toe 43, which when the arm 40 is turned in a downward direction contacts with and moves an arm 42, bearing upon the shipper-handle 44, to thereby disengage said shipper-handle from its usual retaining-notch and stop the loom. On the free end of the lever 40 is the movable engaging device, preferably comprising a pawl 45, pivoted to the lever 40 at 46 and having its lower end 47 extending beyond its pivot, joined to the armature 15 by a link or connection 48, from which it will be evident that motion given to the armature will be imparted to the movable engaging de-

vice to move its free end. To the shaft 39 of the filling-changing mechanism and from which said mechanism is operated is secured the arm 49, carrying at its free end a movable engaging device, preferably in the form of a pawl 50, pivoted at 51 and having its upper end 52 extending beyond the pivot 51, connected to the armature 15 by the link or connection 53, whereby motion imparted to the armature will move the lower free end of the movable engaging device, as will be evident. From the construction thus described it will be apparent that a downward impulse given to the movable engaging device 45 will cause the arm 40, through the toe 43, to disengage the shipper and cause the loom to stop, while an upward impulse given to the movable engaging device 50 will, through the arm 49, shaft 39, and connections, cause the filling-changing mechanism to be actuated to supply fresh filling, and these impulses and movements are imparted to the said movable engaging devices by mechanism that will now be described.

Pivoted to the loom-frame at 60 is an actuating-lever 61, carrying at one end a roll or pin 62, which engages and travels in the groove 64 of a cam 63, secured to the cam-shaft B^2, while to its opposite end is pivotally or otherwise connected the actuator 65, which passes through and is guided in its reciprocations by a bracket-arm 66, secured to the loom-frame. At its upper end the actuator 65 is provided with a hook 66, which on the downward movement of the actuator is adapted to engage the movable pawl 45, carried by the stopping-arm 40, provided the upper end of said pawl has been projected into the path of movement of the actuator by movement of the armature 15 on its pivot *t* toward the magnet to thereby stop the loom. Some distance below the hooked end the actuator is provided with a projecting lug 67, adapted on the upward movement of the actuator to engage the lower end of the pawl 50, provided it has been moved into the path of the lug by the armature, and thereby raise the filling-changing arm 49 to effect a change of filling. The character of the cam 63 and its timing with respect to the crank-shaft is such that the actuator 65 will be caused to rise during the time the shuttle is in the indicating-box, the crank-shaft making two revolutions to one of the cam and its shaft, and as in the present instance the filling-changing mechanism is on the side of the lay opposite the indicating-box the actuator will have moved the filling-changing arm upward sufficiently to cause the filling-changing mechanism to operate on the arrival of the shuttle at the changing end of the lay, provided the filling has become practically exhausted. It is evident, however, that the warp-detectors might indicate a defective condition of the warps during such upward movement of the actuator, in which event since both the movable engaging devices or pawls 45 and 50 are connected to the same armature they would both be thrown into operative position by the movement of said armature toward the magnet on the completion of the circuit, and if at this time the actuator 65 was rising its projection 67 would engage the movable engaging device or pawl 50, pivoted to the filling-changing arm 49, and cause a change of filling. To obviate this, I have provided a switch or make-and-break in the circuit of the warp-detectors, whereby on the upward movement of the actuator the circuit through the warp-detectors is interrupted, so that should a defective condition of the warps or any of them occur at this time no circuit would be established until upon the downward movement of the actuator. This switch or make-and-break consists of an arm or bell-crank pivoted to the loom upon properly-insulated journals at *b* between the terminals *m m'* in one of the circuit-wires 10, including the warp-detectors. One arm *b'* of said switch is connected to and properly insulated from the actuating-lever 61 to be operated thereby, while its other end b^2 is in proximity to the terminal *m*, the other terminal being connected to the switch, as usual in such structures. From this it will be apparent that an upward movement of the actuator 65 through the lever 61 will cause the switch to break the wire circuit through the warp-detectors, for which reason should a warp-thread break or become slack no current would be established until on the downward movement of the actuator the switch is moved to connect the terminals *m m'*.

It is to be understood, of course, that I do not regard my invention as limited to the details of structure set forth, which merely indicates one form of its embodiment, nor to the particular character of switch or the means for operating it.

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

1. In a loom the following instrumentalities, viz: a series of warp-detectors, a filling-detector, a stopping mechanism, a filling-changing mechanism, means under the control of said warp and filling detectors for operating said mechanisms, and provisions for freeing said means from the control of one of said detectors at predetermined times.

2. In a loom the following instrumentalities, viz: a series of warp-detectors, a filling-detector, a stopping mechanism, a filling-changing mechanism, means electrically controlled from said warp and filling detectors for operating said mechanism, and provision for freeing said means from the control of one of said detectors at predetermined times.

3. In a loom the following instrumentalities, viz: a series of warp-detectors, a filling-detector, a stopping mechanism, a filling-changing mechanism, an electric circuit including an electromagnet and said warp and filling detectors, means under control of said circuit for operating said mechanisms, and a make-

and-break in said circuit for freeing said means from the control of one of said detectors at predetermined times.

4. In a loom the following instrumentalities, viz: separate warp and filling detectors, a stopping mechanism, a filling-changing mechanism, an electric circuit including an electromagnet and said warp and filling detectors, means under control of said circuit for operating said mechanisms, a make-and-break in the circuit of the warp-detectors and operated from a moving part of the loom to free said means from control of the warp-detectors at predetermined times.

5. In a loom the following instrumentalities, viz: separate warp and filling detectors, a stopping mechanism, a filling-changing mechanism, an electric circuit including an electromagnet and said warp and filling detectors, an actuator, movable engaging devices connected respectively to said stopping and filling-changing mechanisms and adapted to be moved into the path of said actuator on the completion of the circuit, and a make-and-break in the circuit for interrupting the circuit at predetermined times.

6. In a loom the following instrumentalities, viz: separate warp and filling detectors, a stopping mechanism, a filling-changing mechanism, an electric circuit including a single electromagnet and the warp and filling detectors, an actuator, movable engaging devices connected respectively to said stopping and filling-changing mechanisms and adapted to be moved into the path of the actuator on completion of the circuit, and a make-and-break in the circuit operated by a movable part of the loom for interrupting the warp-detecting circuit at predetermined times.

7. In a loom the following instrumentalities, viz: separate warp and filling detectors, a stopping and a filling-changing mechanism, an electric circuit including an electromagnet, and the warp and filling detectors, an actuator, movable engaging devices connected respectively to said stopping and filling-changing mechanisms and to the armature of the electromagnet adapted to be thus moved into the path of the actuator on completion of the circuit, and a make-and-break in the circuit of the warp-detectors for interrupting the circuit through the warp-detectors at predetermined times.

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

HORACE WYMAN.

Witnesses:

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SAMUEL B. SCHOFIELD.