No. 652,223. Patented June 19, 1900.

H. I. HARRIMAN.

ELECTRICAL WARP STOP MOTION FOR LOOMS.

(Application filed June 14, 1899.)

(No Model.) 2 Sheets—Sheet 1.

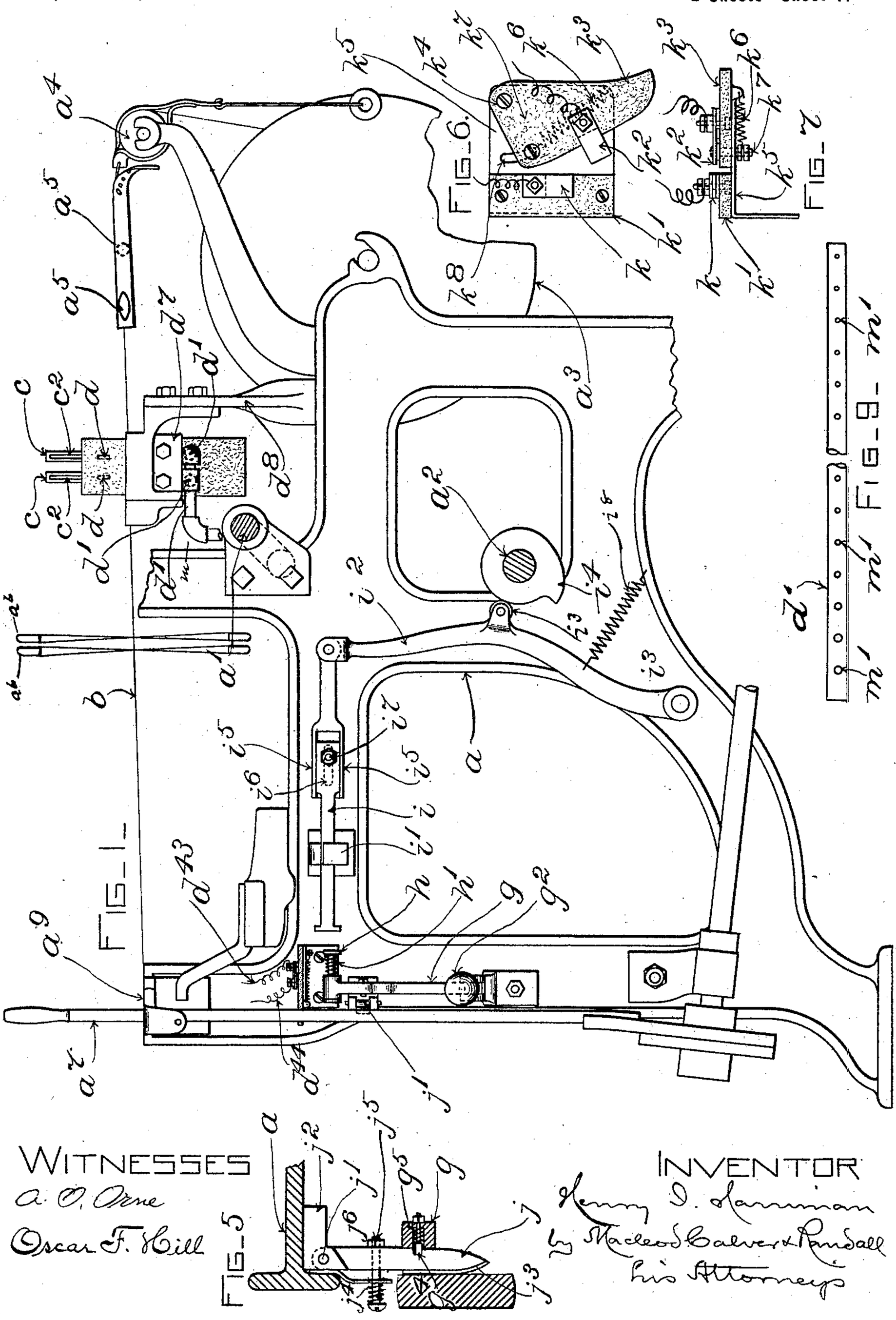

FIG. 1.

FIG. 2.

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FIG. 4.

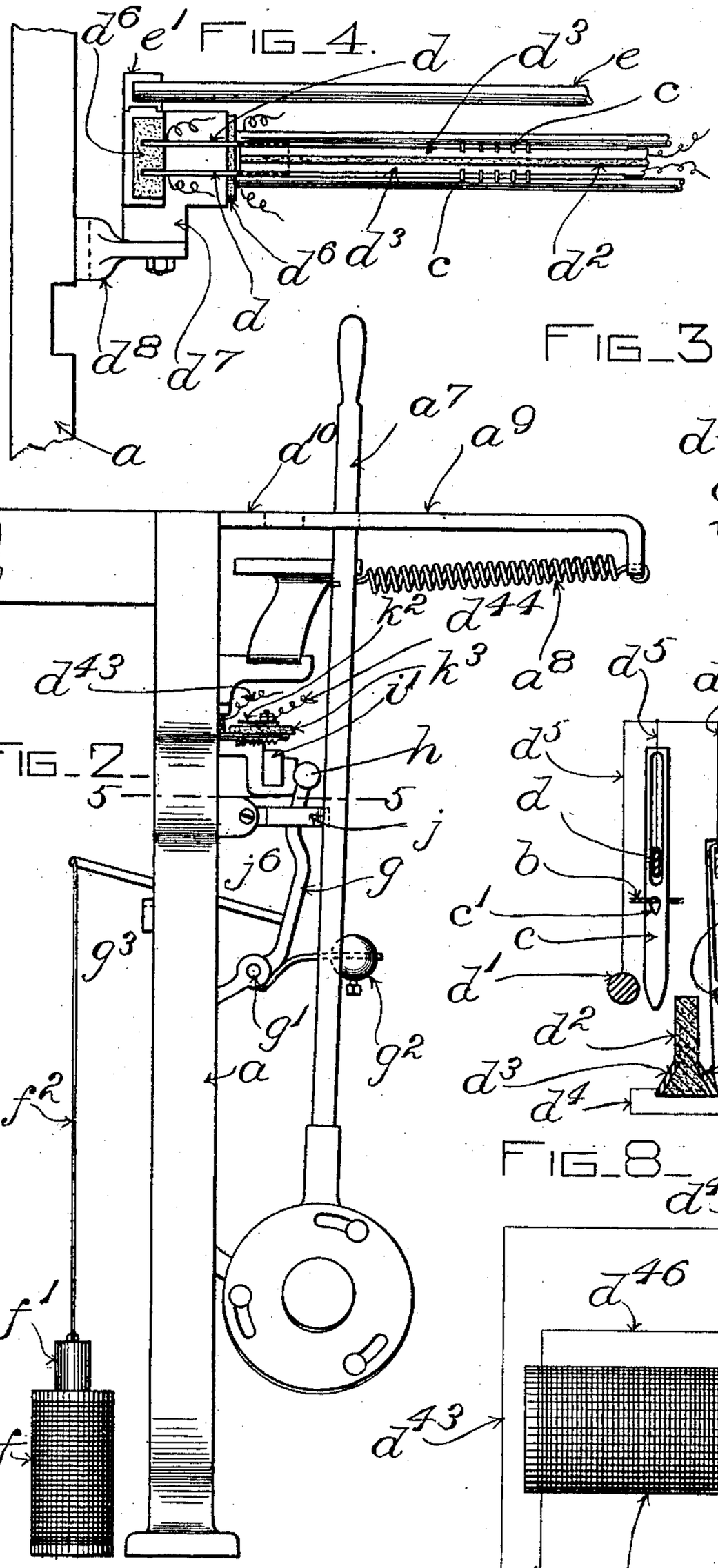


FIG. 3.

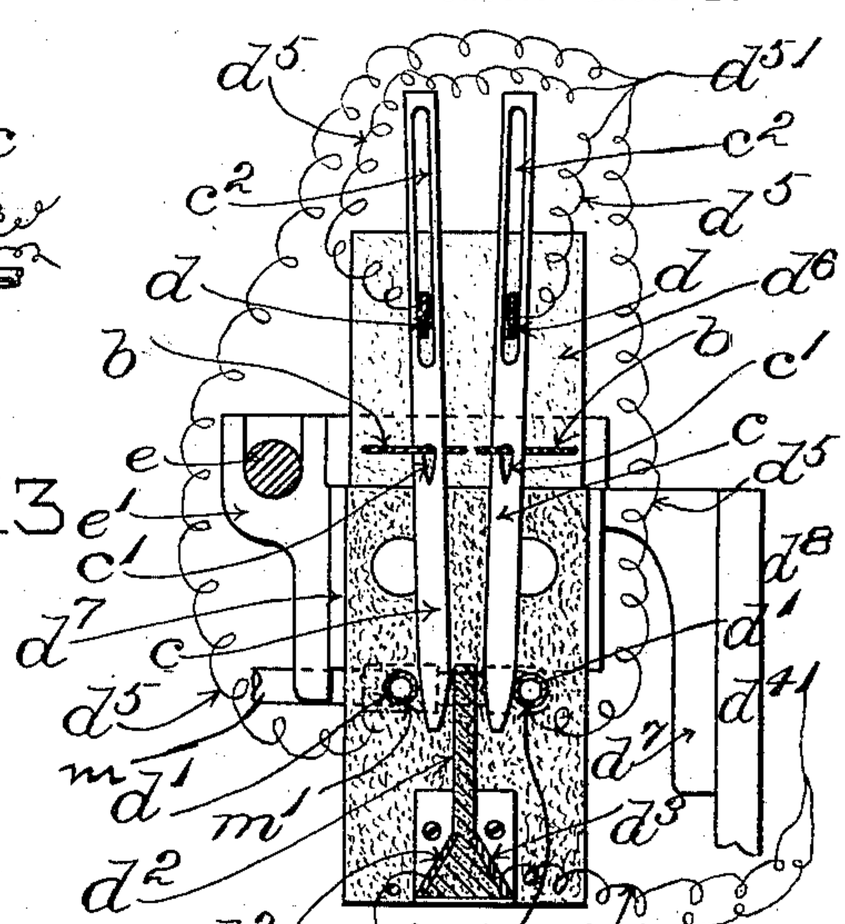
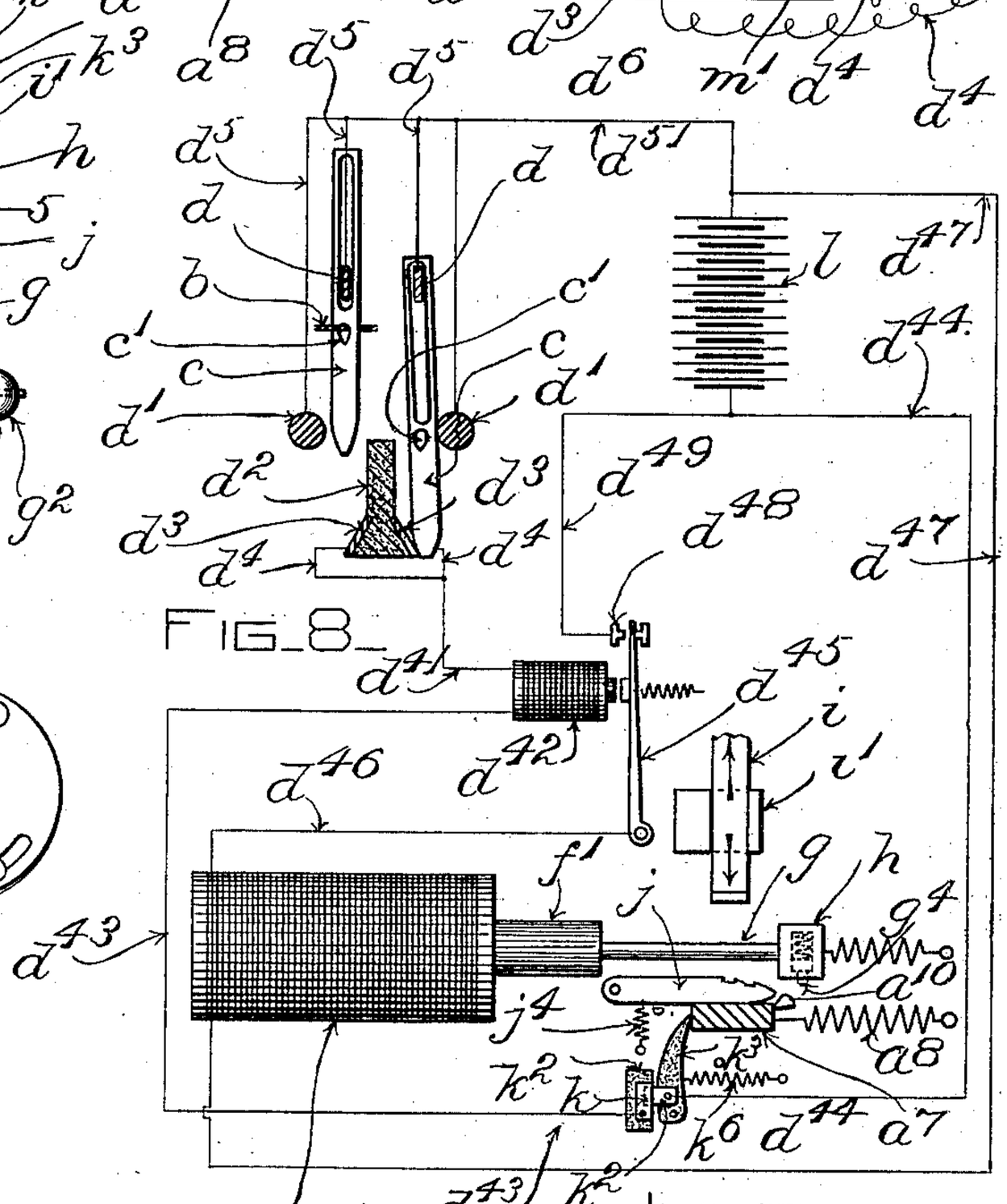


FIG. 2.

FIG. 8.



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UNITED STATES PATENT OFFICE.

HENRY I. HARRIMAN, OF NEW YORK, N. Y.

ELECTRICAL WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 652,223, dated June 19, 1900.

Application filed June 14, 1899. Serial No. 720,477. (No model.)

To all whom it may concern:

Be it known that I, HENRY I. HARRIMAN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electrical Warp Stop-Motions for Looms, of which the following is a specification, reference being had therein to the accompanying drawings.

In the reduction of the invention to practice I utilize detectors in the form of flat strips of sheet metal having slots or eyes for the passage of the warp-threads with which the detectors respectively coöperate. These detectors are sustained in working position in the loom with the aid of guide rods or strips, which latter also constitute terminals of one polarity pertaining to a normally-broken electrical circuit. Below the detectors are employed plates constituting the terminals of opposite polarity of the said normally-broken circuit. These plates are disposed obliquely with relation to the length of the detectors in order that when breakage or excessive slackness of a warp-thread permits the corresponding detector to descend the contact of the lower end of the descending detector with the surface of the corresponding oblique or inclined plate may result in a deflection of the said detector edgewise, thereby securing firmer and more certain lateral bearing of the detector against the respective terminals. An electromagnet is arranged to be excited by the closing of the aforesaid electrical circuit and also is arranged to operate a movable controller for a disengager. When the said electromagnet is excited, the said controller is moved into a position which places the disengager in position to be operated by a going part of the loom. A latch retains the controller in this position. When next the said going part of the loom advances, it operates the said disengager to effect the release of the shipper-handle, and thereby brings about the stoppage of the loom. The unshipping action causes the latch to assume an inoperative position and release the controller, enabling the latter and the disengager to return to their normal inoperative positions. When, however, the shipper-handle is restored to working position, the latch is rendered capable of acting again. The unshipping action also operates a switch to open the circuit, while when the shipper-handle is restored to working position the said switch is operated to close the circuit again.

In order to avoid certain disadvantages which are incident to the use of an ordinary electromagnet, I prefer to utilize a solenoid for actuating the controller.

In order to lessen the intensity of the sparking at the places of contact of the detectors with the terminals, I prefer to operate the circuit in which the detectors and terminals are placed with a current of low electromotive force and to include also in the said circuit a relay-magnet. I place in the relay-circuit the electromagnet which operates the controller, the said relay-circuit being operated with a current of any required increased electromotive force suitable for securing the desired action of the parts.

In the accompanying drawings I have illustrated the invention in the best form in which it has yet been embodied.

In the drawings, Figure 1 shows in side elevation part of an ordinary loom and also represents certain features of the invention applied thereto. Only such portions of the loom are indicated as will assist in making disclosure of the manner of reducing the invention to practice. Fig. 2 is a view showing in front elevation—that is, looking from the left-hand side in Fig. 1—certain of the parts which are illustrated in the latter. Fig. 3 is a sectional view on a somewhat-enlarged scale, showing two detectors, the terminals and their supports and wiring, and a warp-rest. Fig. 4 is a plan view of the parts which are shown in Fig. 3 on the same scale as Figs. 1 and 2. Fig. 5 is a view in horizontal section on the plane indicated by the dotted line 5 5 in Fig. 2 on the enlarged scale. Fig. 6 is a plan view of the switch on the enlarged scale. Fig. 7 is a front view of the switch on said scale. Fig. 8 is a diagram of the essential working parts and the electrical connections. Fig. 9 is a view showing one of the tubular guide-rods.

The frame of the loom is designated a, the crank-shaft a', the cam-shaft a^2, the warp-beam a^3, the whip-roll a^4, the lease-rods a^5, the harness-frames a^6 a^6, the shipper-handle a^7, the usual shipper-handle-actuating spring

a^8, and the notched shipper-handle holding-plate a^9.

Warp-threads are indicated at b b.

The warp-detectors are shown at c c. They are formed in any suitable manner for connection with the warp-threads to enable them to be hung upon the latter. In the form shown they have warp-thread-receiving slots or eyes c' c'. They also are formed with elongated slots c^2 c^2 to enable them to be threaded upon a guide-rod.

The warp-detectors may in practice be arranged in any required number of ranks or lines extending crosswise of the loom. They may all be placed in one rank or line or in two ranks or lines, as shown. The guide-rods, upon which the warp-detectors c c of the said two ranks or lines are threaded or strung in the manner represented in Figs. 3, 4, and 8, are designated d d. These guide-rods d d act not only to hold the warp-detectors from movement in the direction of the length of the warp-threads and to guide them in their vertical movements, but also to prevent the warp-detectors from dropping too far in the loom in case of breakage or excessive slackness of the warp-threads. The said guide-rods d d are arranged above the warp-threads. The said lower ends of the warp-detectors pass down between other guide-rods d' d'. A third guide-rod, similar to those designated d', may be interposed between the two ranks of warp-detectors, at the lower ends thereof, if desired; but I usually interpose a division-strip, as at d^2, Figs. 3, 4, and 8.

Below the lower ends of the warp-detectors c c I locate narrow plates d^3 d^3, extending crosswise of the loom. The said plates are placed in position to be struck by the said ends when the warp-detectors descend in consequence of breakage or excessive slackness of their warp-threads. The said plates are at opposite sides of the division-strip d^2.

The plates d^3 d^3 constitute the terminals of one polarity of a normally-broken electric circuit, the wires connecting with the said plates being designated d^4 d^4 and being united in one branch, as d^{41}, of the circuit. The terminals of opposite polarity of the said electric circuit are constituted by one or both pairs of the guide rods or strips d d and d' d'. The wires connecting with these are designated d^5 d^5, &c., and are united in the branch d^{51} of the circuit.

The plates d^3 d^3 are placed in oblique or inclined positions with reference to the length of the warp-detectors in order that as a warp-detector descends and strikes against the surface of the corresponding plate the engaging end of the same may be deflected outward, so as to slightly cant the warp-detector edgewise. Thereby a firmer and more certain lateral bearing of the edges of the warp-detector against the respective terminals with which it makes contact is secured. There is also a slight tendency on the part of the dropped warp-detector to become wedged in place between the opposite terminals, whereby in a measure the tendency of the said warp-detector to break and again make connection with the said terminals in consequence of the jar and vibration due to the continued working of the loom, with accompanying sparking, is obviated. This improves the operation of the stop-motion devices, rendering the same more efficient by securing prompter and more certain action of the electromagnet that controls the mechanical devices by which the unshipping of the loom is effected. In cases where the electrical current is continually broken, as in consequence of frequently-interrupted contact due to jar and vibration of a loom, it is difficult or impossible to secure in the said electromagnet a magnetic field of sufficient strength to perform the allotted work. The lower end of each warp-detector preferably is made somewhat pointed in order to facilitate the movement of such end upon the surface of the oblique or inclined plate d^3, with which it coacts.

The preferred arrangement of the oblique or inclined plates d^3 d^3 is as shown in the drawings—that is to say, the upper edges thereof are presented toward each other, the plates diverging from each other downwardly.

The plates d^3 d^3 rest against the opposite diverging sides of an interposed backing and support, which may be constituted of the lower edge portion of division-strip d^2, or a separate strip may be provided for the purpose.

With the described arrangement of the terminals there is very little opportunity or tendency for lint to lodge or accumulate where it will interfere with perfect contact between the respective warp-detectors and the respective terminals. This is particularly true of the plates d^3 d^3.

The various terminals are insulated properly both with reference to those of opposite polarity and with reference to the loom-frame. Herein the ends thereof are supported by blocks or plates, as d^6 d^6, of what is known commercially as "fiber," it being a chemically-treated form of paper and being in general use in many connections in which its electrically-insulating properties are useful. The division-strip d^2, with the flaring portion at the lower edge thereof, is composed of such material or of wood and also is supported from the said blocks or plates. The blocks or plates d^6 d^6 in the present instance are applied to the opposite sides of stands d^7, which are bolted to uprights d^8, secured to loom-frame a.

The warp-detectors may be applied to the warp-threads at any suitable place in the loom. Herein they are applied thereto between the lease-rods and the harness.

For the purpose of preventing the movements of the warp-threads at the time of the shed formations from affecting to too great an extent the position of the warp-detectors when the latter are located between the lease-rods and the harness I provide a warp-rest in front of the warp-detectors and between the

same and the harness. The warp-threads bear upon the top of this warp-rest, and consequently the depression of the warp-threads going to the bottom planes of the respective sheds has no effect in changing the positions of the warp-detectors. The said warp-rest, however, is at an intermediate height, so that as each harness-frame rises the threads controlled thereby raise the corresponding warp-detectors slightly above the common height of the warp-detectors, thereby preventing the accumulation of sufficient lint and fluff among the warp-detectors to interfere with the free descent of the warp-detectors when breakage of warp-threads occurs. The warp-rest consists of a rod or roll, as *e*, seated in supports or bearings, as *e'*, attached to the stands d^7.

The solenoid which is employed for the purpose of operating the controller is designated *f*. (See Figs. 2 and 8.) It is mounted on a fixed support, which in practice may be attached to the loom-frame. Herein for convenience of illustration the solenoid is shown in Fig. 2 standing on the same floor with the loom.

The controller is designated *g*. The said controller is movably mounted. Herein it is represented as pivoted at *g'* to a fixed support that is constituted by a bracket on the loom-frame *a*. It also is represented as weighted, as at g^2, to cause it to gravitate normally into its inoperative position. (Represented in Fig. 2.) The core *f'* of the solenoid is connected with the said controller *g*—as, for instance, by a rod or wire f^2, joined to the said core and to an arm g^3 of the controller. The passage of an electric current through the solenoid *f* causes the core *f'* to be drawn down, and thereby swings the controller *g* from its outer inoperative position (represented in Fig. 2) into its inner or operative position.

The use of a solenoid enables me to secure the desired extent of movement of the controller without the loss in efficiency that ordinarily is due to the use of levers to increase the extent of the motion that is derived from the armature of an ordinary electromagnet. It also enables a more convenient construction and arrangement of the parts to be secured. Less delicacy of adjustment is necessary than in the case of an ordinary electromagnet. In the latter case, as is well known, the armature must never be permitted to pass more than a very short distance away from the poles of the magnet, while with a solenoid the core may have a very considerable range of movement without interfering with the working.

The disengager is designated *h*. The inward movement of the controller *g* places the said disengager *h* in its operative position, while the return of the controller *g* to its outer inoperative position (shown in Fig. 2) places the disengager also in an inoperative position. Herein for convenience in construction the controller *g* is made as a support and carrier for the disengager, which is in the form of a sliding pin fitted to a socket with which the controller is provided. A spring *h'*, acting upon the said disengager, acts to hold the latter normally in a rearwardly-retracted position in the said socket.

The going part, which in the present case coacts with the disengager to occasion the unshipping and stopping of the loom, is designated *i*. It consists of a slide-bar, which is supported by resting on a guide *i'*, over which it is free to reciprocate, the said slide being connected to a lever i^2, carrying a roll i^3, bearing against a cam i^4 on the cam-shaft a^2. The said lever and connected slide-bar are moved in one direction by the action of the said cam and may be returned in the other direction by the gravity of the lever, although such return may be effected with the aid of a spring i^8, if desired. Ordinarily the slide *i* moves forward and back in the working of the loom without acting upon the disengager. When, however, the controller is actuated to place the disengager in its operative position, the slide *i* in its forward movement encounters the disengager and acts to move the same to effect the unshipping and stopping of the loom. When forced forward by the slide *i*, the disengager *h* presses against the shipper-handle a^7 and bears the latter forward a distance sufficient to dislodge it from its holding-notch a^{10} at one end of the slot in the plate a^9. As soon as the shipper-handle is dislodged from the said notch the spring a^8 throws the shipper-handle over to the inoperative position, thereby unshipping the loom in a well-known manner.

For convenience in setting up the parts for operation and in making compensation for wear the slide *i* is made in two parts, as shown in Fig. 1. One of the said parts is formed with opposite parallel flanges, as i^5 i^5, receiving between them the meeting end of the other of the parts, a slot i^6 and bolt i^7 being provided to enable one part to be secured to the other with capacity for lengthwise adjustment.

In order that the controller *g* may be held in operative position after it has once been moved there by the action of the solenoid *f* and described intermediate parts regardless of fluctuations in the electric current and in the action of the solenoid, a latch is provided for the same.

The latch for the controller is shown at *j*. (See Figs. 1, 2, and 5.) It is pivoted at *j'* to a block j^2, made fast to the loom-frame *a*, and occupies a position at the forward side of the controller. The controller carries a pin g^4, the said pin having a head working in a cavity in the front side of the controller. A spring g^5, seated in the said cavity behind the said head, acts with a tendency to project the head toward the rear face of the latch *j*. The said rear face is notched, (see Fig. 5,) and when the controller is caused to assume its operative position the notch of the latch receives

the head of pin g^4, the controller thereby being locked mechanically for the time being in its said operative position. For the purpose of freeing the controller after the slide i has acted upon the disengager h to dislodge the shipper-handle, and thereby allowing the controller to assume again its inoperative position, the latch is placed under the control of the shipper-handle, as follows: The latch has a cam-shaped forward face, as at j^3, and when the shipper-handle is forced inward into its working position it presses against the said cam-shaped face, (see Fig. 5,) thereby forcing the latch back slightly into position to allow the head of pin g^4 to enter the notch of the rear face of the latch. When, however, the shipper-handle is disengaged and allowed to assume its inoperative position, as it passes outward from the latch the latter is freed and allowed to move forward under the influence of a spring j^4. The spring j^4 surrounds the stem of a bolt j^5, extending through latch j and also through a plate j^6, applied to a fixed support. The spring is compressed between the said plate j^6 and the head of the bolt j^5. The said forward movement of the latch removes it out of the reach of the head of pin g^4, and thereby releases the controller, so as to permit it to move to its inoperative position under the influence of weight g^2.

The switch by which the circuit is automatically controlled is composed of contact plate or plates k, mounted upon a suitable fixed or stationary support k' and contact plate or plates k^2, mounted upon a movable support k^3. The movable support k^3 is shown pivoted at k^4, Fig. 6, to the bracket k^5, which carries the two supports k' k^3. The movable support k^3 is acted upon by a spring k^6, which holds the same normally in the inoperative position in which it is shown in Figs. 6 and 7, the contact-plates k and k^2 thereby being separated. The screw k^7, projecting from the movable support k^3, enters a slot k^8 in the bracket k^5, and by contact of the said screw with an end of the said slot the extent of the movement of the movable support k^3 is determined.

For convenience in construction and in order to secure the required insulation of the contact-plates k k^2 the supports k' and k^3 are composed of "fiber" or the like material.

The free end of the movable support k^3 projects into the path of movement of shipper-handle a^7. Consequently when the shipper-handle is forced inward into its operative position in shipping on the power it acts against the movable support k^3 and moves the same to close the switch. When, however, the shipper-handle is moved into inoperative position for the purpose of unshipping the driving power, the movable support is left free and spring k^6 is permitted to act to open the switch.

The wires connected with the respective contact-plates k k^2 of the switch are designated, respectively, d^{43} and d^{44}. The wiring is shown in full in the diagram, Fig. 8. The wire d^{43} is in electrical connection with the coil of the relay-magnet d^{42}, and so is also the wire d^{41}, connecting with lower terminals d^4 d^4 for the warp-detectors. The wire d^{44} is in electrical connection with one pole of a battery or other generator l, while the wire d^{51}, connecting with the upper terminals d and d', is in electrical connection with the other pole of the said generator.

The relay armature-lever is designated d^{45}. A wire d^{46} extends from the same to the solenoid f, and from the latter a wire d^{47} extends to one pole of the generator. The contact-piece with which the said armature-lever coacts is designated d^{48}, and from the same a wire d^{49} extends to the other pole of the generator.

In Fig. 8 the mechanical arrangements have been simplified somewhat for convenience in illustration.

The relay-magnet is capable of being made sensitive and capable of responding to an electric current of great delicacy transmitted through the warp-detectors and terminals, whereas the solenoid is capable of being made substantial and strong in proportion to the work that it is required to perform, and a current of any degree of electromotive force requisite for the proper action thereof may be furnished by means of the relay-circuit.

In some cases the lower guide-rods d' d' are made tubular to serve as conduits for compressed air, the latter being supplied thereto by means of pipes m m, Figs. 1, 3, and 4. The said tubular guide-rods are perforated on their under sides, as at m', Figs. 3 and 9, to direct jets of air against the contact-plates d^3 d^3 for the purpose of blowing fluff and lint off the same. Thereby the said contact-plates are kept clean of any accumulation which might operate to prevent good metallic contact between the same and the warp-detectors when the latter descend. The perforations are smallest adjacent to the ends of the said tubular guide-rods, where the compressed air is supplied thereto, and gradually increase in size in proceeding away from the said end. In this manner in proportion as the pressure within the tubular guide-rods decreases in consequence of the escape of the compressed air the increased size of the perforations facilitates the outflow of the air. Thereby the action of the jets of escaping air is rendered substantially uniform from end to end of each tubular guide-rod.

I claim as my invention—

1. In an electrical warp stop-motion for looms, in combination, the warp-detectors, guide-rods holding the said warp-detectors in two ranks or lines and in whole or in part constituting terminals of one polarity of a normally-broken electrical circuit, and the downwardly-diverging oblique or inclined plates in line with the ends of the respective ranks

or lines of warp-detectors and constituting terminals of the opposite polarity of the said circuit.

2. In an electrical warp stop-motion for looms, in combination, the warp-detectors having the elongated slots, supporting guide-rods passing through the said slots and sustaining the warp-detectors in two ranks or lines, guide rods or strips for the other extremities of the said detectors, some or all of the said guide-rods constituting terminals of one polarity of a normally-broken electrical circuit, and the downwardly-diverging oblique or inclined plates in line with the ends of the respective ranks or lines of the warp-detectors, the said plates constituting terminals of the opposite polarity of the said circuit.

3. In an electrical warp stop-motion for looms, in combination, the warp-detectors having the elongated slots, supporting guide-rods passing through the said slots and sustaining the warp-detectors in two ranks or lines, guide-rods at opposite sides of the lower extremities of the said warp-detectors, one or both pairs of the said guide-rods constituting terminals of one polarity of a normally-broken electrical circuit, a division-strip between the two ranks or lines, and the downwardly-diverging oblique or inclined plates on opposite sides of the said division-strip in line with the ends of the respective ranks or lines of the warp-detectors, the said plates constituting terminals of opposite polarity of the said circuit.

4. In an electrical warp stop-motion for looms, in combination, the warp-detectors, the terminals coöperating with the warp-detectors, an electromagnet in circuit with the said terminals, a controller normally occupying an inoperative position and adapted to be actuated by the excitation of the said electromagnet, an independently-movable disengager adapted to be placed in operative position by the said movement of the controller, a going part of the loom to actuate the said disengager when the latter is in its operative position, and a shipper device to be operated from the said disengager.

5. In an electrical warp stop-motion for looms, in combination, the warp-detectors, the terminals coöperating with the warp-detectors, an electromagnet in circuit with the said terminals, the swinging controller normally occupying an inoperative position and adapted to be actuated by the excitation of the said electromagnet, the disengager mounted to slide on the said controller and provided with a spring to hold it retracted, a going part of the loom to actuate the said disengager when placed in operative position by the movement of the controller, and a shipper device to be operated from the said disengager.

6. In an electrical warp stop-motion for looms, in combination, the warp-detectors, the terminals coöperating with the warp-detectors, a solenoid in circuit with the said terminals, the solenoid-core, the disengager movably mounted and positively shifted into operative position by the movement of the said core, a going part to actuate the disengager, and a shipper device to be operated from the said disengager.

7. In an electrical warp stop-motion for looms, in combination, the warp-detectors, the terminals coöperating with the warp-detectors, a solenoid mounted upon a fixed support and in circuit with the said terminals, the solenoid-core, the controller mounted on the loom-frame and positively shifted into operative position by the movement of the said core, the disengager placed in operative position by the said shift of the controller, a going part to actuate the disengager, and a shipper device to be operated from the said disengager.

8. In an electrical stop-motion for looms, in combination, the shipper device, a going part of the loom, an electromagnet, the disengager under operative control of the said electromagnet and adapted to be placed by the action thereof in position to be actuated by the going part and caused to effect unshipping, and a latch controlled in its operation by the shipper device and operating to hold the disengager in its operative position.

9. In an electrical stop-motion for looms, in combination, the shipper device, a going part of the loom, an electromagnet, the controller moved by the said electromagnet, the disengager placed by the movement of the said controller in position to be actuated by the going part and thereby caused to effect unshipping, and a controller-latch governed in its operation by the shipper device.

10. In an electrical stop-motion for looms, in combination, the shipper device, a going part of the loom, an electromagnet, the controller moved by the said electromagnet, the disengager placed by the movement of the said controller in position to be actuated by the going part and thereby caused to effect unshipping, and the spring-actuated movable controller-latch normally occupying an inoperative position and moved into position for engaging the controller by the shipper device when the latter is set.

11. In an electrical stop-motion for looms, in combination, the shipper-handle, the movable controller mounted on an independent support, the disengager movably supported by the controller, a reciprocating going part to engage said disengager when the latter is in operative position, and an electromagnet to move the said controller to place the same and the disengager in operative position.

12. In an electrical stop-motion for looms, in combination, the shipper-handle, the movable controller mounted on an independent support, the disengager movably supported by the controller, the reciprocating going part to engage said disengager when the latter is in operative position, an electromagnet to

move said controller to place the same and the disengager in operative position, and the controller-latch normally occupying an inoperative position and held in its operative position by the shipper-handle when the latter is set.

13. In an electrical stop-motion, in combination, detector devices to detect breakage of a thread being woven, a shipper-handle, electromechanical disengaging devices in circuit with said detector devices and coöperating with the said shipper-handle to effect the unshipping thereof in case of such breakage, and a switch to control said circuit comprising the fixed support and contacts carried thereby, the movable support carrying other contacts and mounted in the path of the shipper-handle, to be operated to close the switch by the movement of the shipper-handle in being set, and a spring operating upon the said movable support to open the switch and break the circuit when the shipper-handle is unshipped.

14. In an electrical warp stop-motion for looms, in combination, warp-detectors, terminals of opposite polarity with which said warp-detectors coact, a relay-magnet in circuit with the said terminals, a relay-circuit embracing an electromagnet, and stop-motion devices operatively controlled by the said electromagnet.

15. In an electrical warp stop-motion for looms, in combination, warp-detectors, terminals of opposite polarity with which the said warp-detectors coact, a relay-magnet in circuit with the said terminals, a relay-circuit embracing an electromagnet, a controller operated by the said electromagnet, a disengager placed in operative position by the said controller, a going part to engage with the said disengager, and a shipper device with which such disengager coacts.

16. In a loom, in combination, the lease-rods, the harness, the stop-motion mechanism having the warp-detectors thereof located intermediate the lease-rods and the harness, and the warp-rest located in advance of the warp-detectors at an intermediate height, whereby the rising warp-threads are permitted to elevate the corresponding portion of the warp-detectors a short distance to prevent accumulation of fluff and lint.

17. In an electrical warp stop-motion, in combination, the warp-detectors, a tubular guide-rod therefor constituting a terminal of one polarity of a normally-broken electrical circuit, the said tubular guide-rod constituting also a conduit for compressed air and having holes for the escape of the latter, and a contact-plate in line with the ends of said warp-detectors and constituting a terminal of the opposite polarity of the said circuit, the escaping air operating to remove fluff and lint from the surface of the said contact-plate.

18. In an electrical warp stop-motion, in combination, the warp-detectors, a tubular guide-rod therefor constituting a terminal of one polarity of a normally-broken electrical circuit, the said tubular guide-rod constituting also a conduit for compressed air and having holes for the escape of the latter, and an oblique or inclined contact-plate in line with the ends of said warp-detectors and constituting a terminal of the opposite polarity of the said circuit the escaping air operating to remove fluff and lint from the surface of the said oblique or inclined contact-plate.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY I. HARRIMAN.

Witnesses:
CHAS. F. RANDALL,
LEPINE HALL RICE.