No. 624,154. Patented May 2, 1899.

W. H. BAKER & F. E. KIP.

ELECTRICAL WARP STOP MOTION FOR LOOMS.

(Application filed Sept. 7, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

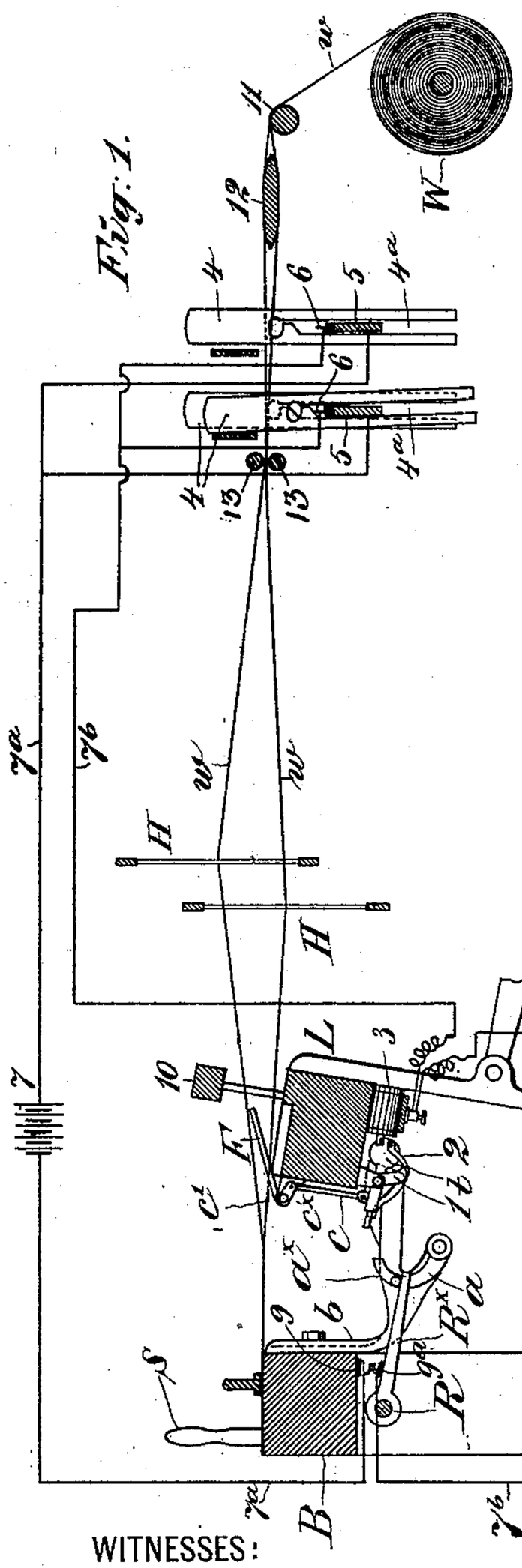

Fig. 3.

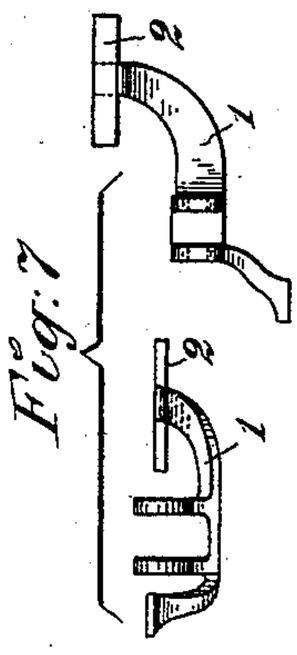

Fig. 2.

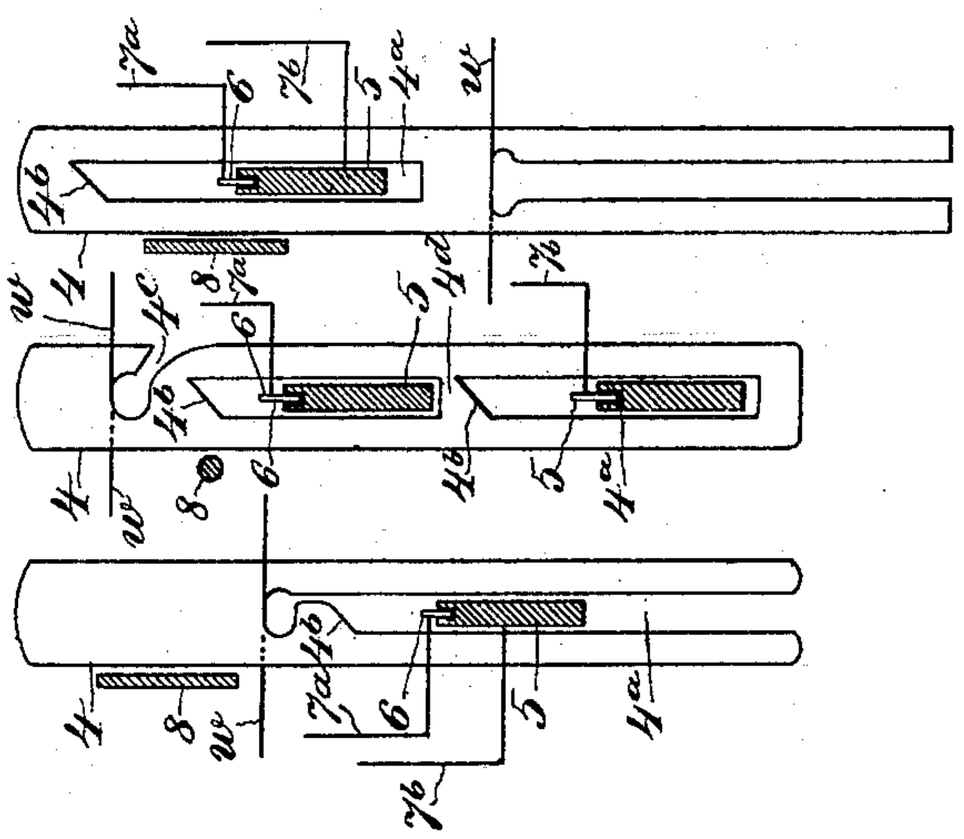

Fig. 4.

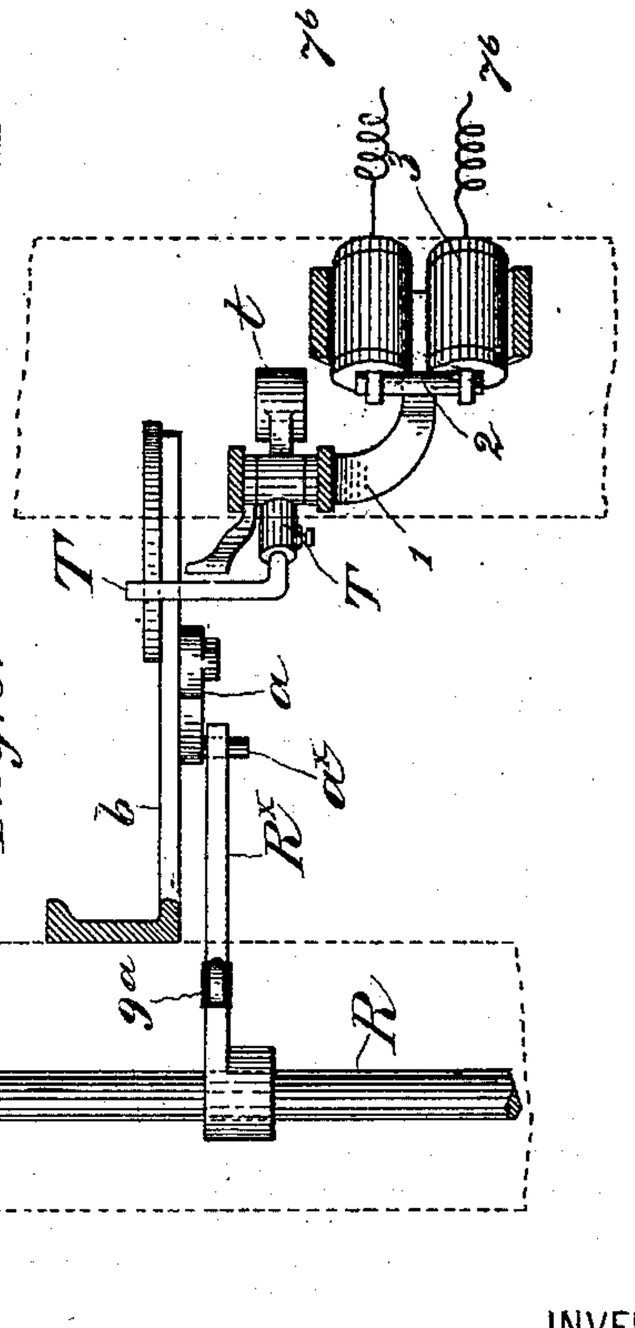

Fig. 5.

Fig. 6.

WITNESSES:

J. H. Kinnan

Peter A. Ross

INVENTORS.

William H. Baker

Frederic E. Kip

BY

Henry Connett

ATTORNEY

No. 624,154. Patented May 2, 1899.

W. H. BAKER & F. E. KIP.

ELECTRICAL WARP STOP MOTION FOR LOOMS.

(Application filed Sept. 7, 1898.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

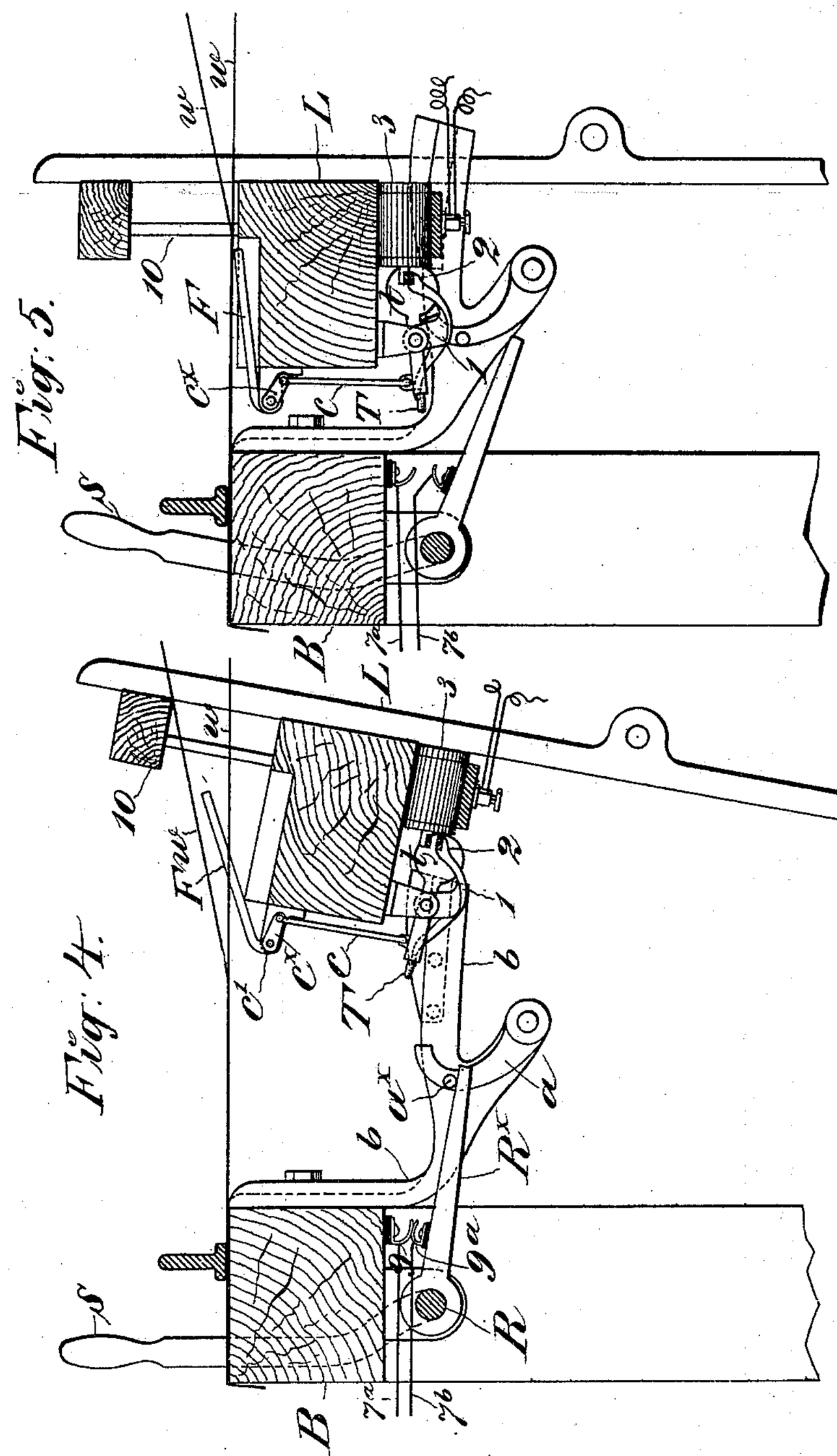

Fig. 4.

WITNESSES:

T. W. Wiman

Peter A. Ross

INVENTORS.

William H. Baker

Frederic E. Kip

BY

Henry Connett

ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM H. BAKER, OF CENTRAL FALLS, RHODE ISLAND, AND FREDERIC E. KIP, OF MONTCLAIR, NEW JERSEY, ASSIGNORS TO THE KIP-ARMSTRONG COMPANY, OF NEW YORK.

ELECTRICAL WARP STOP-MOTION FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 624,154, dated May 2, 1899.

Application filed September 7, 1898. Serial No. 690,398. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. BAKER, residing at Central Falls, Providence county, Rhode Island, and FREDERIC E. KIP, residing at Montclair, Essex county, New Jersey, citizens of the United States, have invented certain new and useful Improvements in Electrical Warp Stop-Motions for Looms, of which the following is a specification.

This invention relates to the class of devices employed on looms for automatically stopping the loom when a warp-thread breaks, the object being in part to provide an improved form of circuit-closer in the nature of a contact-drop supported by the warp-thread and in part to provide a magneto-mechanical device mounted on the going part or lay and adapted to release the shipper-lever when an electric circuit is closed by the breaking of a warp-thread.

In the drawings which illustrate an embodiment of the invention, Figure 1 is a diagrammatic view in the form of a sectional side elevation illustrating the stop-motion as applied to a known form of loom. Figs. 2 and 3 illustrate forms of the drop having inside electrical contacts, but differing somewhat from that form of drop shown in Fig. 1. Figs. 4 and 5 are detail side views of the magneto-mechanical devices for stopping the loom when a warp-thread breaks, showing the parts in two positions. Fig. 6 is a plan view taken from below the head of the lay, showing the tripping-lever of the magneto-mechanical device and its relation to the tripping-lever of the weft stop-motion of this special kind of loom. Fig 7 shows the tripper-lever 1 detached in front view and plan, and Fig. 8 shows the drop 4 of Fig. 1 on a large scale.

In the drawings the warp stop-motion is illustrated as applied to a known kind of loom where the weft-fork of the weft stop-motion is at the middle of the warp and is carried by the lay, as distinguished from those forms of looms wherein the said fork is situated at one side of the warp and is not carried by the lay. The present warp stop-motion is not, however, limited to a loom of this special character; but it may be conveniently applied thereto.

W represents the warp-beam of the loom; *w*, the warp; H, the heddles; L, the lay, and B the breast-beam. Under the breast-beam is a rock-shaft R, which is adapted, when rocked, to release the shipper-lever S and permit the spring of said lever to shift it, and thus shift the belt or operate the clutch, so as to stop the loom. The mechanism comprising the shaft R and shipper-lever S is a known construction on this form of loom, and it is used on such looms in connection with the weft stop mechanism shown in the drawings and which will now be briefly described. Mounted on and pendent from the breast-beam, Figs. 4, 5 and 6, is a bracket *b*, to which is pivoted a curved operating-arm *a*, furnished with a laterally-projecting stud $a^{\times}$, which extends out normally, Fig. 4, over an arm $R^{\times}$ on the rock-shaft R. In its movements to and fro the lay L, when moving toward the breast-beam in beating up, approaches the upper free end of the curved arm *a*.

Fulcrumed on the under side of the lay is a tripper-lever T, the front end of which has an L shape, as seen in Fig. 6, and this end of the tripper plays normally over a curved guide on the bracket *b* in such a manner as to strike the free upper end of the curved arm *a*, whereby if this tripper-lever is not elevated when the lay advances to beat up the weft-thread its advancing end will strike, as above stated, the end of the lever *a*, swing it backward and downward, and cause the stud $a^{\times}$ thereon to depress the arm $R^{\times}$ and rock the shaft R, thus freeing the shipper-lever S and effecting through it the stoppage of the loom; but the forward end of the tripper-lever T is coupled by a connecting-rod *c* with a crank-arm $c^{\times}$ on a rock-shaft *c'*, mounted in bearings on the front of the lay, and the weft-fork F is fixed to this shaft, so that when the weft-thread has been properly shot beneath the fork and is unbroken the weft-fork will rest on it as the lay advances and act, through the rod *c*, to keep the tripper-lever T elevated, so that it will pass above and not strike the end of the

curved arm *a*. If, however, the weft-thread breaks and the weft-fork is not upheld thereby, the tripper will follow over the guide on the bracket *b*, strike the arm *a*, depress it so as to rock the shaft R, and then pass over said arm to the end of its stroke. A counterweight *l* on the rear arm of the tripper-lever T serves to partly counterbalance the weight of the parts.

The means for effecting the object last above described when a warp-thread breaks will now be described. Fulcrumed on the under side of the lay L and preferably on the same pivot-pin with the tripper-lever T is a tripper-lever 1, one arm of which projects forward and has its front end situated just back of the L branch of the lever T, but just above the normal level of the latter, so that habitually when the lay advances this end of the tripper-arm will pass above the end of the curved operating-arm *a*. The other or rear arm of the tripper-lever 1 carries an armature 2, which is situated below and within the sphere of attraction of the pole of an electromagnet 3, mounted on the lay L back of the trippers. When this magnet is excited, it attracts the armature 2, and thus rocks the tripper-lever 1, depressing the front arm of the latter until it is in line with the end of the arm *a*, whereby the latter will be impinged upon by the end of the tripper-lever 1 when the lay advances and the shaft R be thus rocked.

In order to excite the magnet 3 whenever a warp-thread breaks, the devices now to be described are employed. On each warp-thread is supported a circuit-closing drop 4 of an oblong form and of thin sheet metal. Fig. 1 shows the preferred form of the drop. It has in it a slot 4^a, narrowed near its upper end by a laterally-projecting part beveled or inclined on its under side to form an inclined or sloping contact 4^b, and the warp-thread passes through the slot in the drop above this projection. Within the slot 4^a and extending transversely of the warp *w* through all of the drops of the series is a terminal contact-bar 5, which will be preferably of metal, and in the upper edge of this bar 5 is set a metal strip forming the other terminal contact 6, the contacts 5 and 6 being carefully insulated from each other, although connected together mechanically for convenience of construction. When the warp-thread supporting any one of the drops 4 breaks, the drop falls vertically until the inclined lower edge 4^b of the lateral projection strikes the contact 6, as seen in one of the series of drops in Fig. 1. This has the effect to slightly tilt or cant the drop, so as to insure the contact of the metal drop with the side of the contact-terminal 5, and thus close an electric circuit which consists of the conductors 7^a and 7^b and includes the electromagnet 3, a switch, and any suitable generator 7. The drop 4 may be normally or habitually in electrical contact with the contact-terminal 5, as the latter is adapted to serve as a guide for the drop in its vertical movements; but as the light drop must be left free to fall by gravity it is not desirable to have the contact-bar 5 fit the slot so closely as to cause much friction; hence the employment of the inclined contact 4^b in the slot where the contact with the terminal 6 is made. This construction insures contact of the bar 5 with one margin of the slot in the drop.

In the construction seen in Fig. 2 the terminals 5 and 6 pass through separate closed slots in the drop situated one above the other, and there are two inclined surfaces 4^b, one at the upper end of each slot. In this case the thread-aperture has a lateral slot 4^c, at which the warp-thread is entered.

In the construction illustrated in Fig. 3 the contact-terminals 5 and 6 are situated above the warp in a closed slot, and the warp-thread engages an open slot below. In all cases, however, the contact-terminals 5 and 6 occupy a slot or aperture of some kind in the drop, and the contacts are made wholly interiorly and not exteriorly. The advantages of this on short looms, where the warps are not twisted in, and especially on looms for weaving certain classes of woolen or worsted fabrics, are very important. It is important to economize the space lengthwise of the loom and also to insure the falling of the drop when a thread of the warp breaks. There will sometimes be several series of the drops, and in this class of looms the several series must be close together and take up little space. Woolen warp is what is called "oozy" or "fuzzy," and the threads lying side by side incline to adhere together, so that if a break in a thread occurs at some distance from the drops the broken thread will be sustained by the adjacent threads, and this will prevent the drop from falling. To overcome this difficulty, which cannot be done by spreading the threads apart laterally, we provide means for spreading them vertically, forming a shifting shed, as usual, with the heddles, which shed extends from the reed 10 to the drops, and another shed, which may be called a "permanent" shed, extending from the whip-roll 11 to the drops. Thus a shed extends practically from the whip-roll to the reed and keeps the threads of the warp apart vertically, except, perhaps, just at the point where the drops are situated, and this short space is not of sufficient extent, measured lengthwise of the warp, to offer any obstacle to the falling of the drops. This permanent shed between the whip-roll and the drops is effected by inserting a single spreader 12, Fig. 1, alternate warp-threads passing over and under said spreader. This spreader will be by preference relatively broad and flat, and it may be made from any suitable material. To limit the extension rearwardly of the shed produced by the heddles and to separate this

shed from the permanent shed produced by the spreader 12, the warp is made to pass between two transverse rods 13, Fig. 1, which keep the warp flat at this point. The drops shown are readily placed and replaced after a thread breaks, and the several series of drops may be placed close together.

To prevent the roughness of the moving warp-threads from dragging some of the drops 4 forward and getting them out of alinement, a stop-bar 8 may be employed, extending across the warp. This may be a flat strip, as shown in the principal views, or a round rod or wire, as shown in Fig. 2. The stop-bar 8 is merely a precautionary device, and it need not be set, primarily, in contact with the drops. It is found that on ordinary looms provided with these drops where the terminals are within the drops the closely-set series of drops forms a channel or chamber occupied by the terminals which is practically closed against the accumulation of fluff or lint, which would affect, of course, the electrical contact of the drop with the terminals. The accumulation of fluff below the warp in looms is very considerable at the point where the drops are situated.

It is desirable to break the circuit through the magnet and permit it to free the tripper 1 as soon as the shaft R is rocked for stopping the loom, and to effect this automatically the switch or circuit-breaker before referred to is employed. This consists, as herein shown, of a spring-terminal 9 on the breast-beam in the circuit and a similar spring-terminal 9^a on and insulated from the arm $R^\times$ of the rock-shaft R and also in the circuit when the parts are in their normal positions and the loom in motion. (See Fig. 4.) These terminals 9 and 9^a are in electrical contact; but when the arm $R^\times$ is depressed in stopping the loom the terminals separate, as in Fig. 5, and break the circuit.

Some simple shunt device whereby the drops 4 are cut out of the circuit at the instant the magnet 3 is excited may be employed. This will insure the retention of the energy of the magnet 3 until the loom is stopped, even if the jarring of the loom should break the circuit at the fallen drop.

The terminals 5 and 6 are, as before stated, connected together mechanically for convenience, and they play in one continuous slot in the drop for the same reason; but it will be obvious that they may be separate, as seen in Fig. 2, and occupy two really distinct slots 4^a, separated by a tie 4^d; but this arrangement of the slots is merely a difference of detail.

While we have shown our stop-motion applied to the warp in a loom, it will be obvious that the circuit-closing drops are adapted as well for use in warping-machines or "warpers" which have electrical stop-motions and in other like apparatuses where threads are strained taut and there is liability of their breakage. Therefore their use is not confined solely to looms.

Having thus described our invention, we claim—

1. The combination with both terminals of the operating-circuit of an electrical warp stop-motion, of a circuit-closing, gravity-drop of thin, flat metal, said drop having a guide-slot through which the terminals extend, a thread-aperture above said slot, and an inclined contact-surface at the upper end of said guide-slot for tilting the drop laterally when it falls, substantially as set forth.

2. As an improved article of manufacture, a circuit-closing, gravity-drop for an electric warp stop-motion, said drop being of thin, flat metal, having an elongated form, a thread-aperture, a longitudinally-extending guide-slot below said aperture to receive the terminals of the circuit, and a narrow lateral thread-passage connecting the said slot and thread-aperture, substantially as set forth.

3. The combination with both terminals of the operating-circuit, said terminals forming permanent parts of said circuit, of a series of gravity-drops taking over the terminals, said drops being each of elongated form, with an aperture for the passage of the supporting warp-thread, a longitudinal guide-slot to receive both terminals, and a contact projection between said slot and thread-aperture, said projection extending from one side of the slot nearly to the other side, whereby a narrow thread-passage is formed, substantially as set forth.

4. As an improved article of manufacture, a circuit-closing, gravity-drop for an electric warp stop-motion, said drop being of thin flat metal of elongated form and having a thread-aperture, a longitudinal guide-slot below said thread-aperture and open at the lower end of the drop, a narrow, lateral thread-passage connecting the thread-aperture and guide-slot, and an inclined contact-surface at the upper end of the slot for tilting laterally the fallen drop, substantially as set forth.

5. As an improved article of manufacture, a circuit-closing gravity-drop for an electrical warp stop-motion, made of thin, flat metal, said drop having an elongated form, a longitudinally-extending slot open at the bottom of the drop, to receive the terminals of the circuit, and a thread-aperture above said slot, the upper end margin of said slot being inclined so as to cause the drop to tilt or cant when it falls and thus insure lateral contact with the lower terminal, substantially as set forth.

6. As a new article of manufacture, a compound circuit-terminal for an electrical warp stop-motion comprising a metal bar, forming one terminal, a metal strip, forming the other terminal, set in the upper edge of said bar and projecting above the said upper edge, and insulating material between said strip and bar, substantially as set forth.

7. In an electrical warp stop-motion, the

combination with a series of circuit-closing drops adapted to be supported by the threads of the warp, of an electrical operating-circuit having two normal, non-moving terminals adapted to be put in contact with any one of said drops when it falls, said terminals being mounted one in the other and insulated from each other, substantially as set forth.

8. A circuit-closing drop for an electrical warp stop-motion, of thin metal and having a slot therein with an inclined contact-surface at its upper end, in combination with two terminals of the electric circuit extending transversely of the warp and through said slot, one of said terminals making contact with the drop at the lateral margin of said slot and the other, when the drop falls, making contact with said inclined surface at the upper end of the slot, substantially as set forth.

9. In an electrical warp stop-motion, the combination with two non-moving contact-terminals extending transversely of the warp and placed one above the other, of a series of circuit-closing drops, each having a slot or aperture to receive the warp-thread which supports it, a slot through which said terminals extend, and an inclined projection to impinge upon the upper contact-terminal when the drop falls, whereby the lower terminal is insured lateral contact with the drop, substantially as set forth.

10. In an electrical warp stop-motion, the combination with a series of circuit-closing gravity-drops, of thin, flat metal, elongated in form, longitudinally slotted, and placed close together, abreast, of an electrical operating-circuit having two non-moving terminals, normally in the circuit, one of said terminals being set in the upper edge of the other and insulated therefrom, and said compound terminal extending transversely of the warp through the slots in said drops, substantially as set forth.

11. In an electrical warp stop-motion for looms, the combination with a normally open electric circuit including a generator, and a series of circuit-closers for closing said circuit when a warp-thread breaks, of a mechanism for stopping the loom, an arm *a*, adapted to operate said mechanism to stop the loom when said arm is depressed, a rocking, tripper-lever 1, mounted on the lay of the loom, said tripper-lever carrying an armature on its rear arm and having the end of its front arm normally adapted to pass the arm *a*, and a magnet 3 mounted on the lay adjacent to the armature on the tripper-lever and in said circuit, whereby said tripper-lever is rocked when the magnet is excited and its front end put in operative position, substantially as set forth.

12. In an electrical warp stop-motion for looms, the combination with circuit-closing drops supported by the warp-threads, an electric circuit adapted to be closed by the falling of a drop, and including a generator, electromechanical means controlled by said circuit for stopping the loom when a drop falls and closes a circuit, means for forming two sheds in the warp, one permanent and extending from the whip-roll to and in front of the drops, and the other a shifting shed, extending from the permanent shed to the reed, whereby lateral adhesion of the warp-threads is measurably avoided, substantially as set forth.

13. The combination, with both terminals of the operating-circuit of an electrical warp stop-motion, of a circuit-closing, gravity-drop of thin, flat metal, said drop having a slotted construction whereby it embraces both of said terminals, and having also a thread-aperture, and an inclined contact surface or surfaces above the terminals and adapted to close said circuit when the drop falls from the breaking of its supporting warp-thread, substantially as set forth.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

WILLIAM H. BAKER.
FREDERIC E. KIP.

Witnesses for William H. Baker:
DEXTER S. LUTHER,
CHAS. H. NEWELL.

Witnesses for Frederic E. Kip:
FRANK F. OSMER,
FRANK H. JORDAN.