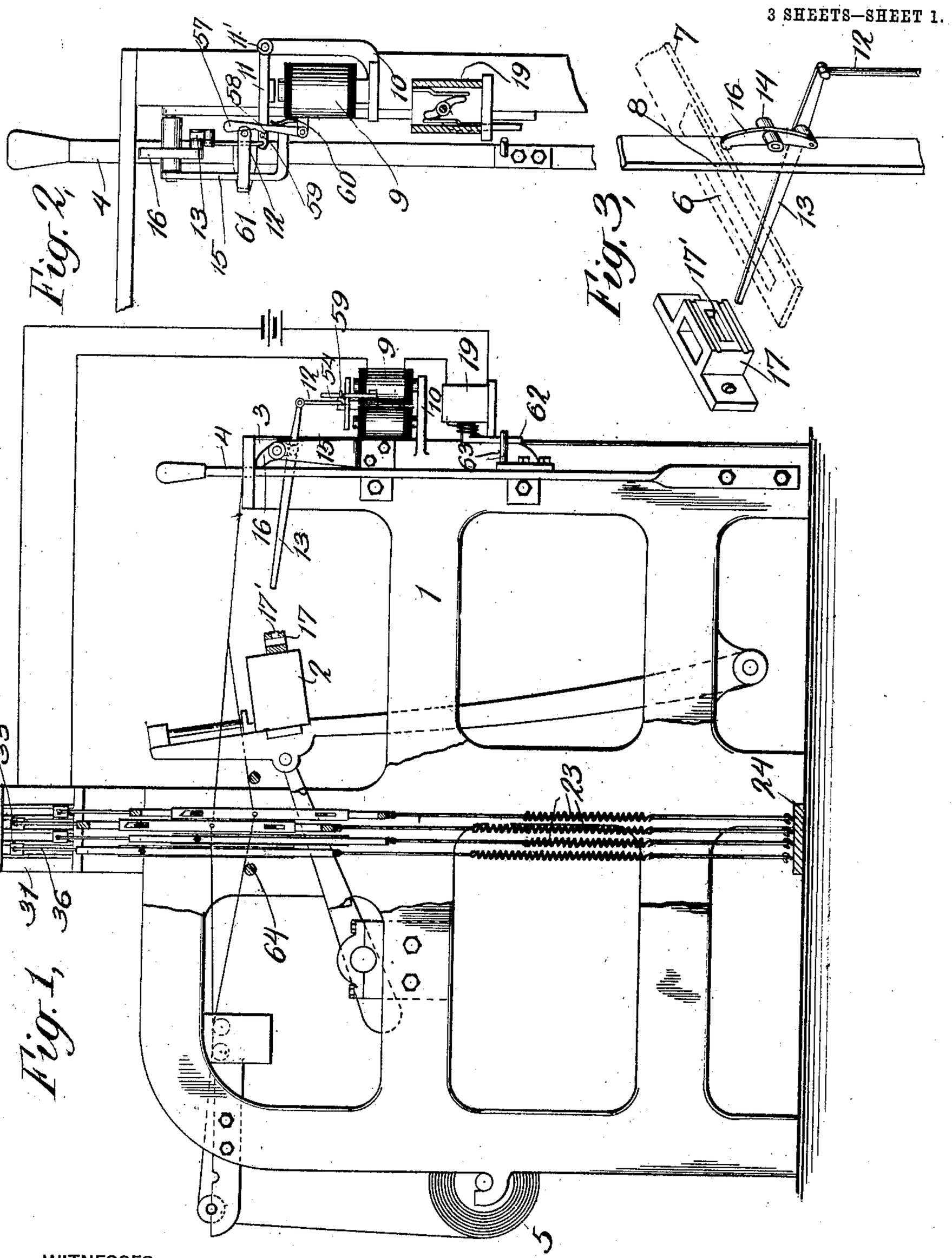
No. 813,308. PATENTED FEB. 20, 1906.

F. E. KIP & E. GREENWOOD.

WARP STOP MOTION FOR LOOMS.

APPLICATION FILED MAR. 3, 1905.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 5.

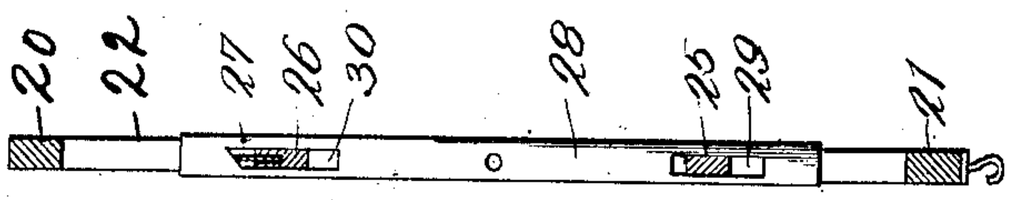
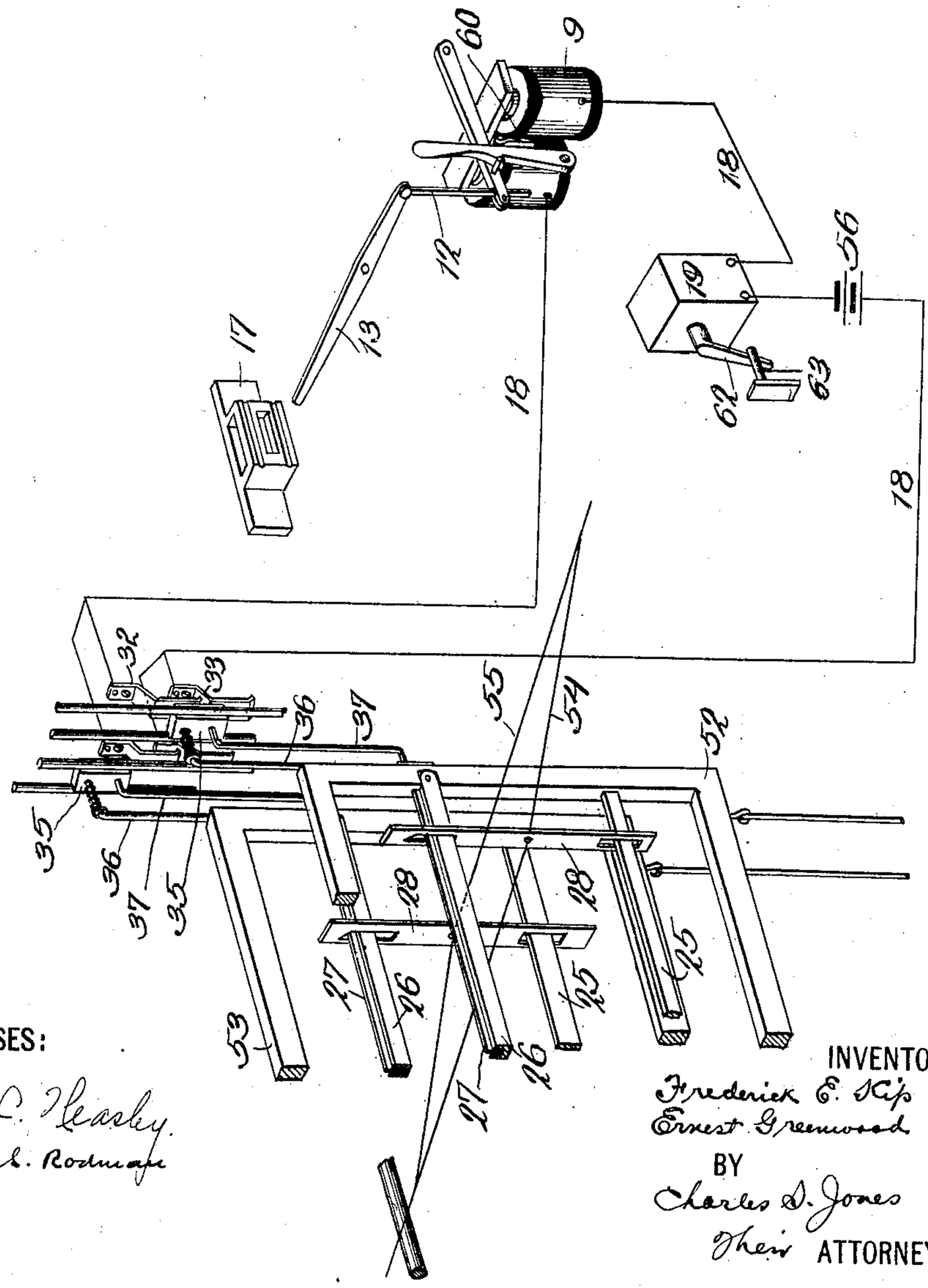


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 12.

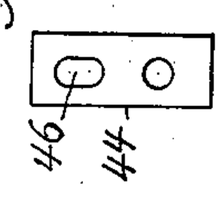


Fig. 9.

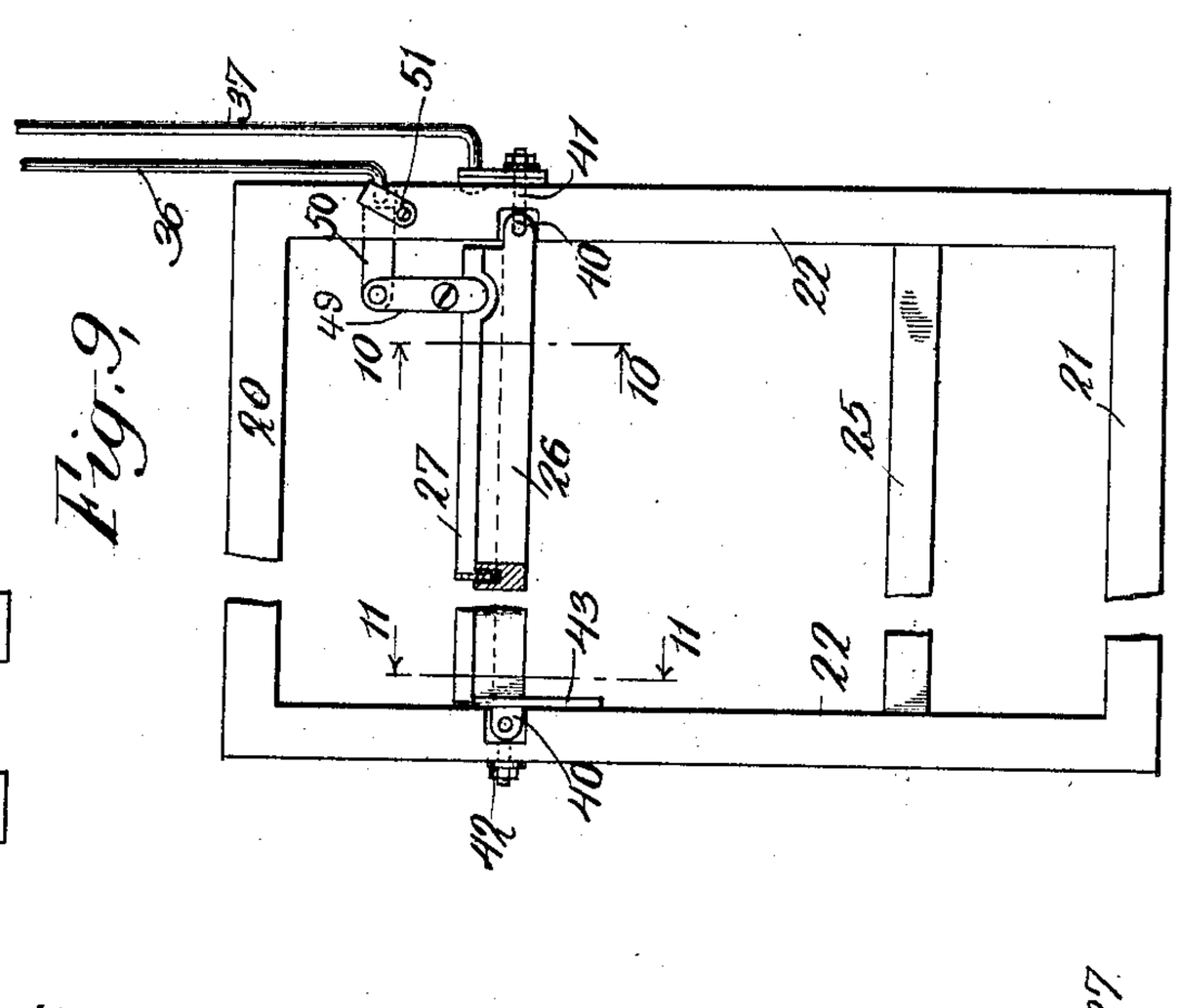


Fig. 8.

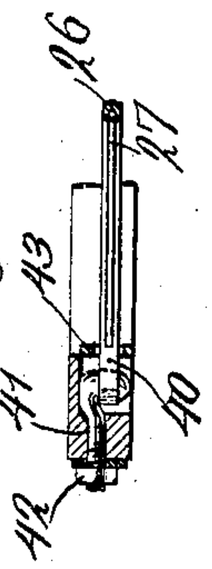


Fig. 10.

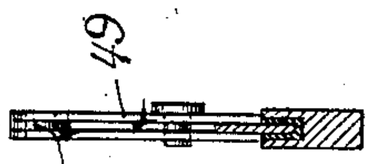


Fig. 11.

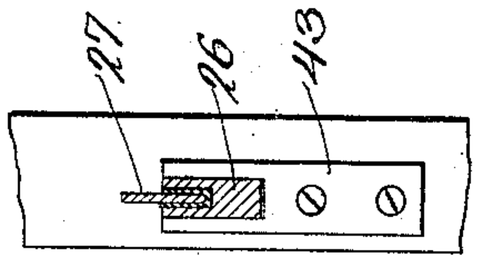


Fig. 6

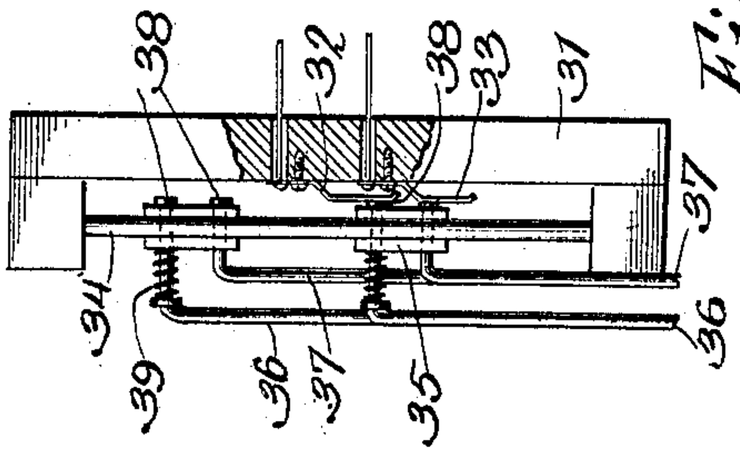
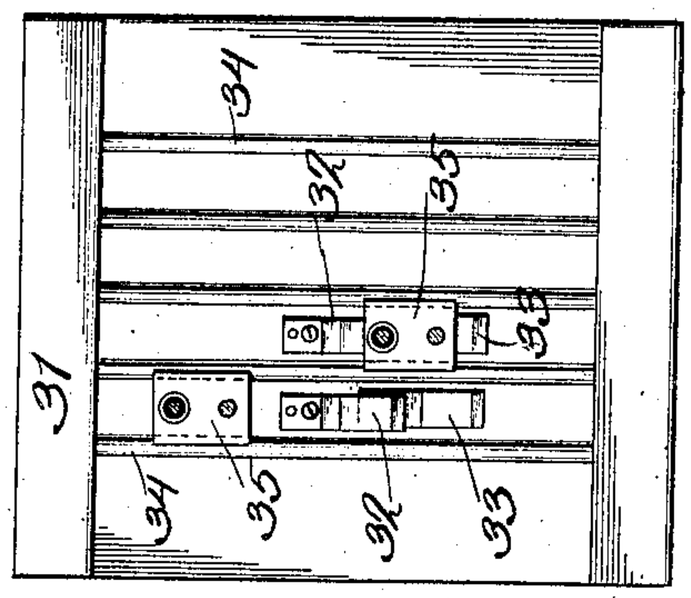


Fig. 7.



WITNESSES:

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UNITED STATES PATENT OFFICE.

FREDERIC E. KIP, OF MONTCLAIR, NEW JERSEY, AND ERNEST GREENWOOD, OF BRIDGEPORT, CONNECTICUT, ASSIGNORS TO KIP-ARMSTRONG COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

WARP STOP-MOTION FOR LOOMS.

No. 813,308. Specification of Letters Patent. Patented Feb. 20, 1906.

Application filed March 3, 1905. Serial No. 248,252.

To all whom it may concern:

Be it known that we, FREDERIC E. KIP, a resident of Montclair, New Jersey, and ERNEST GREENWOOD, a resident of Bridgeport, Connecticut, citizens of the United States, have invented certain new and useful Improvements in Warp Stop-Motions for Looms, of which the following is a specification.

The present invention relates to a warp stop-motion for looms contained in the harness and in which the formation of the shed is not only controlled by the heddles, but the latter also act to close an electric circuit upon the breakage or undue slackness of a warp-thread to set in operation the loom-stopping mechanism.

To that end the invention embodies an electric circuit which is controlled in such manner as to be alternately opened and closed at two points by the heddle-frames as the latter are moved in the formation of a shed, one such point being within the harness-frame and the other without, the operation being so timed during the normal running of the loom that when the circuit is closed at one point it is broken at the other. The heddle or harness frames comprise as one of the lifting-bars for the heddles a compound terminal, with one member of which the heddles are in constant contact; complete electrical engagement being made when the harness-frames are in an elevated position and also when a warp-thread breaks or becomes unduly slack, although in the former instance the loom is prevented from knocking off by the breaking of the circuit at the point outside of the frames.

The invention will be understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a loom, showing the application of the invention thereto, parts of the loom-frame being broken away; Fig. 2, a front elevation of the left-hand end of the breast-beam; Fig. 3, a perspective detail view; Fig. 4, a diagrammatic view showing two of the harness-frames and the controlling-circuit. Fig. 5 is a vertical sectional view of a harness-frame. Fig. 6 is a side view, partly in section, showing the contact-shoes. Fig. 7 is a front view of the same. Fig. 8 is a detail view. Fig. 9 is a front view of a harness-frame, showing the manner of connecting the compound electrode or terminal. Fig. 10 is a sectional view on the plane of the line 10 10 of Fig. 9, and Fig. 11 a sectional detail view on the plane of the line 11 11 of Fig. 9. Fig. 12 is a detail view of certain locking-plates.

Similar reference-numerals indicate similar parts in the several views.

Referring to the drawings, the frame 1, lay 2, breast-beam 3, shipper-lever 4, and warp-beam 5 may be and are of the usual construction and arrangement in looms. The shipper-lever, as usual, occupies a slot 6 in a bracket 7, forming an extension of the breast-beam, and engages when the loom is running a shoulder 8. When freed from this shoulder, a spring (not shown) shifts the shipper-lever to stop the loom. In order to set the shipper-lever free, an electromagnet 9 is mounted below the breast-beam upon a bracket 10, secured by suitable means to the loom-frame, and its armature-lever 11, fulcrumed at 11′ on said bracket, is connected by a link or wire rod 12 to one end of a dagger 13. Pivotally supported by a pin or stud 14 in a bracket 15, secured to the loom-frame, is a knock-off lever 16, attached at its lower end to the dagger 13 (see Fig. 3) and at its upper end adapted to engage the shipper-lever 4. The dagger 13 is normally in such position that upon the beat up of the lay it will enter an opening 17′ in a bunter 17, mounted on the lay or some other vibrating or moving part of the loom; but when the magnet 9 is energized through the means hereinafter described the dagger is moved into such position as to be impinged upon by the face of said bunter, thereby moving the knock-off lever to free the shipper-lever and stop the loom, as will be readily understood. In this connection we have shown a form of bunter described in the patent of Allan A. Johnson, No. 778,132, dated December 20, 1904, as such bunter prevents the operative from interfering with the effectiveness of the knock-off mechanism, although any other suitable form of bunter could be used.

In order to energize the electromagnet 9, and thus set in operation the loom-stopping mechanism whenever a warp-thread breaks or becomes unduly slack, a controlling-circuit is employed, which circuit includes the coils of said magnet, a cut-out switch 19, and con-

tact-terminals outside of the harness-frames and adapted to be engaged by shoes connected to said frames to complete the circuit at such times.

The heddle or harness frames, of which there may be any desired number, are composed of top and bottom bars 20 and 21, respectively connected at or near their ends by side bars 22. They may be supported in any well-known or suitable manner—as, for example, by straps connecting the upper bars 20 with actuating-levers, springs 23, secured to the lower bars 21 and to a fixed plate 24, serving to pull the frames to their lowermost positions after having been raised to the limit of their upward movement by the straps and actuating-levers. Rigidly secured to the side bars 22 of each frame is a bar 25, and above the same, near the upper part of the frame and also rigidly secured to the side bars, is a compound electrode or terminal, which terminal is of well-known construction and comprises an electrically-conductive body member 26 into one edge of which is set an electrically-conductive strip or blade 27, properly insulated from the body member. The heddles 28 may be of any form adapting them to the desired purpose. As shown they are made of thii metallic strips having slots 29 and 30, through which are passed, respectively, the bar 25 and compound terminal, and by which the heddles are hung or supported in the harness-frames on said bars and compound terminals. The thickness of the body members 26 of the compound terminals and the bars 25 is substantially equal to the width of the slots 29 and 30, so as to maintain the heddles in proper vertical position and in side contact with said members and bars, and the length of said slots is such as to permit of a slight vertical movement of the heddles independently of the movement of the frames. The upper wall of the slot 30 is preferably inclined to insure proper electrical engagement with the blade 27 of the compound terminal. When the loom is running normally, the heddle-frames will act as usual loom-harnesses for the formation of the shed. When a frame is raised to it suppermost position, the tendency of a warp-thread is to draw its heddle downward and into electrical engagement with the compound terminal. When the harness is dropped so far as to depress the threads which it controls below their normal level, then each of the threads which is intact or unbroken raises its heddle and supports it out of operative engagement with the compound terminal. If, however, one of the threads is broken, then its heddle will fall into electrical engagement with the compound terminal, and when the frame containing the broken thread reaches its lowermost position then the circuit is closed, not only through said terminal, but also through the spring-plates, which in reality constitute a switch, as will be hereinafter described, and the current is then free ~~to~~ flow through its completed circuit. If the circuit is not cut out at all times other than when the frame is at its lowermost position, then the loom will be stopped not only when the harness-frames are at their highest positions, but also when sufficiently raised to permit the heddles to hang loosely. In other words, when the loom is running normally and a circuit is closed through the compound terminal by the upward movement of the harness it must be broken at a switch outside of the harness-frames. Each harness-frame with its heddles must therefore be an electrical unit, each containing in itself the electrical stopping elements and each provided with controlling devices to admit the electrical current to those elements at the proper time and withhold it from them at all other times.

In an application filed of even date herewith in the names of Frederic E. Kip and Frederick M. Armstrong, Serial No. 248,251, there is described a warp stop-motion comprising a switch located outside of the heddle-frames and adapted to alternately open and close the circuit for each frame during a complete upward and downward movement of the frame, and that application claims broadly the subject-matter of the present application, it being the intention to restrict the claims of the latter to the specific mechanism for accomplishing the desired results.

To break the circuit 18 during the normal running of the loom when the heddles are in electrical engagement with the compound terminal and to close it at a point outside the heddle-frames when the heddles are not so engaged, and also to close said circuit at said outside point and at the compound terminal when a warp-thread breaks or becomes unduly slack, we have devised the mechanism now to be described.

At a convenient point on the loom-frame and preferably above the harness-frames is rigidly secured a block 31, made of non-conducting material, and secured to said block are two spring-plates 32 and 33, to which the terminals of the controlling-circuit 18 are respectively connected in any suitable manner. Supported vertically in the block 31 are guides 34, between which are mounted slide-blocks 35, made of non-conducting material, as fiber or hard rubber, which blocks are carried upon the bent upper arms of two rods 36 and 37, of conductive material. The rod 36 at its lower end is mechanically and electrically connected to the blade 27, and the rod 37 is similarly connected to the body member 26 of the compound terminal in the particular manner hereinafter described. The bent upper arms of the rods 36 and 37 are passed through the insulating-blocks 35 and terminate on the side of the block toward the spring-plates 32 and 33 in suitable buttons or

shoes 38 to prevent said rods from being withdrawn from the blocks, said shoes also being adapted to properly contact with said spring-plates to close the circuit at that point when a harness-frame is at its lowermost position. It will be noted that the rod 36 is directly over the rod 37 and is maintained away from its fellow rod to prevent short-circuiting by a spring 39 on the upper bent arms, as shown clearly in Fig. 6.

The connecting-rods 36 and 37 may be joined to the harness-frame and to the compound terminal in any suitable manner, the specific means devised by us being as follows: Each end of the body member 26 of the compound terminal is formed with a small lug 40, pierced to receive a holding-bolt 41, the latter being a simple draw-bolt of the usual type provided with a nut 42 at one end and at the other end with a hook, as shown in Fig. 8. The compound terminal is prevented from overturning by an engaging forked piece 43, screwed to the harness-frame. Interposed between the end of the draw-bolt at the right in Fig. 9 and the harness-frame are two plates 44 and 45. (Shown in Fig. 12.) In the upper end of the plate 44 is an elliptical slot 46, the major axis of which is such as to admit the hooked end of the connecting-rod 37 when the plate 45, which is formed with a fork 47 at the top and a slot 48 for the draw-bolt 41 at the bottom, is slipped up to lock the rod 37 in place. At the same end of the compound terminal the body member thereof is cut away from around the blade, as shown in Fig. 9, and at that point a pinch-clamp 49 is fastened to the blade 27, and the upper end of this clamp is connected with a conducting-strip 50, that projects through the harness-frame. In the end of said strip 50 is an eye to receive the lower bent arm of the rod 36, the latter being held in its eye by a spring-clip 51, which when the rod 36 is to be removed from the harness-frame may be swung to one side. Each harness-frame is provided with connecting-rods 36 and 37 and slide-blocks 35, and each has a set of corresponding spring-plates 32 and 33, as above described. In practice one branch of the controlling-circuit 18 may be connected to one of the plates 32 and all of the other plates 32 electrically connected to the first one, or one branch of the controlling-circuit 18 may have branch connections to all of the plates 32. In a similar manner all of the plates 33 may be electrically connected.

The operation of the mechanism above described will be readily understood, and for the sake of clearness we will refer to two harness-frames 52 and 53 (shown in Fig. 4) and assume that at each pick of the loom said two frames are moved alternately, causing the threads carried thereby to be alternately moved into the upper and lower planes of a shed. As the frame 52 is made in the usual manner to move the warp-threads 54 to form the lower plane of a shed, the tension of such warp-threads, if unbroken, will hold the heddles through which they pass out of contact with the blade 27 of the compound terminal, thus opening or breaking the circuit at that point. At the same time, however, the connecting-rods 36 and 37 have moved the block 35 corresponding to the frame 52 into such position that the shoes 38 on the ends of said rods are brought, respectively, into electrical engagement with the spring-plates 32 and 33, thereby closing the circuit for the frame 52 at that point. The reverse situation at such time is present in the harness-frame 53. In that frame, shown at its uppermost position, the tension of the warp-threads 55 holds the heddles in contact with the blade 27 of the compound terminal, thereby closing the circuit at that point; but the connecting-rods 36 and 37 have raised the shoes 38 to a position above and out of electrical engagement with the spring-plates 32 and 33 corresponding to the harness-frame 53, thereby breaking the circuit at that point. Thus it will be seen that the controlling-circuit 18 has two points at which during the normal operation of the loom it is alternately broken and closed, one within the harness-frame and the other outside thereof, and that for a given harness-frame when the circuit is broken at one point it will be closed at the other. The parts described are so constructed and their operation so timed during the normal running of the loom that the shoes 38 corresponding to a particular harness-frame do not make electrical engagement with their spring-plates 32 and 33 until after the heddles of that frame have been raised in the downward movement of the frame by the tension of the warp-threads out of contact with the blade 27 of the compound terminal. In other words, when the loom is running normally the circuit is not closed at the same time through the compound terminal and the spring-plates 32 and 33. As the harness-frame begins to rise no movement will be imparted to the heddles, owing to the slight vertical play allowed them; but as the upward movement of the frame continues the compound terminal will engage the upper walls of the slots 30 in the heddles 28, and the latter will be raised with the frame, the tension of the thread acting in a downward direction after they are raised above their normal level to hold the heddles in electrical engagement with the compound terminal. The lower slot 29 is made longer than the upper slot 30, so as to insure good electrical contact between the compound terminal and a fallen heddle. If a warp-thread should break when a harness-frame is at its lowermost position, its heddle falls and makes electrical engagement with the blade 27 of the compound terminal. The circuit when the frame containing the broken thread is in that position is

then closed through both the compound terminal and the spring-plates 32 and 33 and may be readily traced from battery 56 to cut-out switch 19, electromagnet 9, plate 32, rod 36, blade 27 of the compound terminal, heddle 28, body member 26, rod 37, spring-plate 33 to battery. When the electromagnet 9 is thus energized, its armature-lever 11 is attracted and moves the dagger 13 into position to be impinged upon by the bunter 17 to thereby stop the loom. If a thread should break when the frame is at its uppermost position, its heddle being already in contact with the blade 27, so as to close the circuit through the compound terminal, will remain in that position during the downward movement of the frame; but the stopping mechanism will not be thrown into action until the frame is moved to its lowermost position to bring the shoes 38 of that frame into electrical engagement with the corresponding spring-plates 32 and 33. Likewise if a thread should break when a frame is at an intermediate position the circuit will be immediately closed through the fallen heddle and the compound terminal; but the loom will not be knocked off until the frame reaches its lowermost position, so as to close the circuit through the spring-plates 32 and 33. In other words, the controlling-circuit 18 is closed both through the compound terminal and the spring-plates 32 and 33 only when the harness-frame is at or about its lowermost position and that said circuit is closed through the compound terminal no matter in what position the frame may be whenever a warp-thread breaks or becomes unduly slack.

The present construction differs, among other things, from the companion application above referred to in that the former involves no ground-circuit at the harness, a direct electrical connection being made with both the blade and the body member of the compound terminal, the current entering and returning from the harness through the spring-plates 32 and 33, whereas in said companion application the current enters the harness-frame from the switch, running to the blade of the compound terminal, and is grounded through the pull-down springs.

When the loom is operated at high speed, the duration of the electric current through the circuit is so short as to amount to hardly more than an impulse, being frequently just sufficient to move the armature and its connected dagger, but not sufficient to hold them in position to engage the dagger with the bunter and stop the loom. To insure the maintenance of the dagger in position after it has once been set by the movement of the armature of the electromagnet, it is desirable to have some kind of locking means for the dagger. For that purpose we have shown in the present application a mechanical locking device comprising a lever 57, pivoted at its lower end on a suitable bracket and having a shoulder 58, adapted to be engaged by a pin 59 on the armature-lever 11 when the latter is drawn down by the magnet 9. A spring 60 bears against the lever 57 and tends to move it outward to hold the pin 59 in proper engagement with the shoulder 58. The armature-lever may be released as soon as the loom is stopped by moving the lever 57 back by hand or when the loom is again started by an arm 61, attached to the shipper-lever and adapted to contact with the lever 57.

In order to save the batteries, it is desirable that the circuit should be broken after the current has done the work required of it in moving the dagger 13 in position to be impinged upon by the bunter 17. To effect this, we include any ordinary form of switch 19 (shown in section in Fig. 2) in the controlling-circuit 18, said circuit being normally closed through said switch. As here shown, the switch 19 is supported upon a bracket secured to the loom-frame and is provided with a lever 62, adapted to be moved by a projecting arm 63 on the shipper-lever, said arm being forked or otherwise connected so as to move said lever in both directions—that is, to break the circuit at the switch 19 when the shipper-lever is moved to stop the loom and to close the circuit at said point when the shipper-lever is moved to start the loom.

In practice it may be found desirable to use adjacent to the loom-harness two rods 64 to prevent too great sag of the warp-threads due to the weight of the heddles. These rods are placed immediately below the plane of the lower shed, so that in the normal running of the loom a uniform plane will be maintained and the usual amount of sag of the warp-threads prevented from closing the circuit, and thus knocking off the loom.

What we claim, and desire to secure by Letters Patent, is—

1. In a warp stop-motion for looms the combination of a controlling-circuit for setting in operation the stopping mechanism, a harness-frame having a series of heddles suspended therein, a switch comprising plates to which the terminals of said circuit are connected and shoes carried by the harness-frame and adapted to break and close the circuit at said plates as the frame alternately rises and falls.

2. In a warp stop-motion for looms the combination of a controlling-circuit for setting in operation the stopping mechanism, a harness-frame having a series of heddles suspended therein, a switch comprising plates to which the terminals of said circuit are connected, a slide-block having shoes connected to said frame and adapted to break and close the circuit through said plates as the frame alternately rises and falls.

3. In a warp stop-motion for looms the combination of a controlling-circuit for set-

ting in operation the stopping mechanism, a harness-frame having a fixed contact-bar secured thereto, a series of heddles suspended on said bar, a switch comprising plates to which the terminals of said circuit are connected and shoes carried by the harness-frame and electrically connected to said bar, said shoes being adapted to break and close the circuit through said plates as the frame alternately rises and falls.

4. In a warp stop-motion for looms the combination of a controlling-circuit for setting in operation the stopping mechanism, a harness-frame having a fixed contact-bar secured thereto, said bar comprising two members insulated from each other, a series of heddles suspended on said bar, a switch comprising plates to which the terminals of said circuit are connected, shoes carried by said frame and connected respectively to the members of said bar, said shoes being adapted to break and close the circuit through said plates as the frame alternately rises and falls.

5. In a warp stop-motion for looms the combination of a controlling-circuit for setting in operation the stopping mechanism, a harness-frame having a fixed contact-bar secured thereto, said bar comprising two members insulated from each other, a series of heddles suspended on said bar, rods of conductive material secured to the members of said bar and carrying shoes at their upper ends, contact-plates located outside of said frame and to which the circuit-wires are connected, the parts being so related to each other that during the normal running of the loom the circuit will be closed through said plates by contact of the shoes therewith only when the harness-frame is at or near its lowermost position the tension of the warp-threads at such times on the heddles serving to break the circuit at said contact-bar.

6. In a warp stop-motion for looms the combination of a controlling-circuit for setting in operation the stopping mechanism, a harness-frame having a fixed contact-bar secured thereto, said bar comprising two members insulated from each other, a series of heddles suspended on said bar, rods of conductive material secured to the members of said bar and carrying shoes at their upper ends, a support of insulating material having vertical bars, said shoes being carried by blocks supported between said guide-bars, contact-plates secured to said support and to which the circuit-wires are connected, whereby during the normal running of the loom as the frame is raised and lowered the circuit will be closed and broken alternately at said plates.

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

FREDERIC E. KIP.
ERNEST GREENWOOD.

Witnesses to the signature of Frederic E. Kip:

ALFRED HOLROYD,
ARTHUR OAKLEY.

Witnesses to the signature of Ernest Greenwood:

JAMES W. BOOTH,
JAMES C. DRISCOLL.