T. THOMPSON.

AUTOMATIC STOPPING DEVICE FOR LACE LOOMS.

APPLICATION FILED FEB. 12, 1913.

1,076,798.

Patented Oct. 28, 1913.

4 SHEETS—SHEET 1.

FIG. 1.

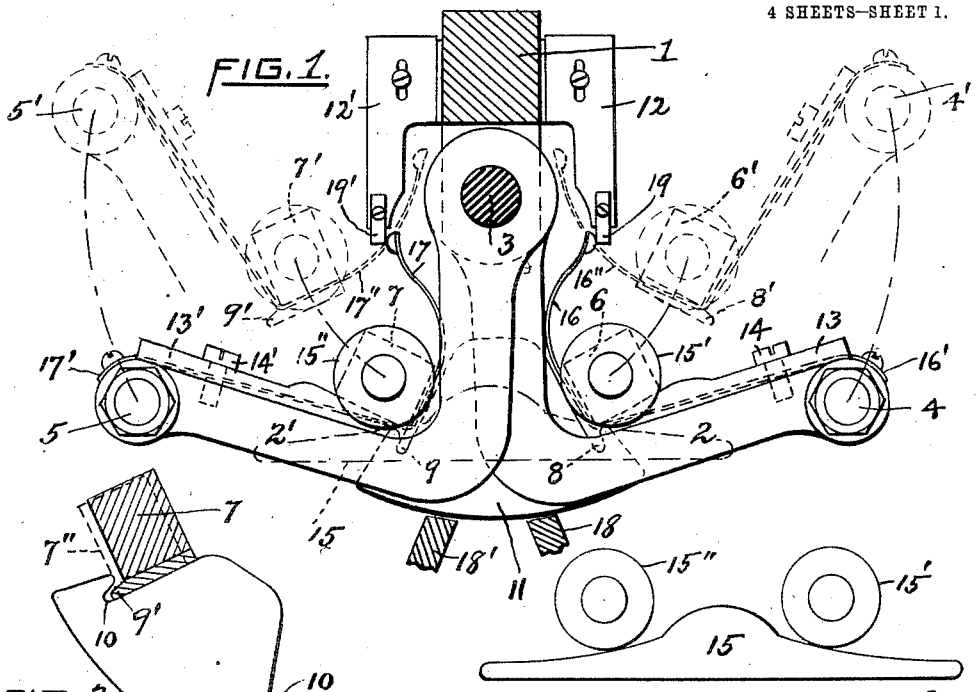

FIG. 3.

FIG. 4.

FIG. 2.

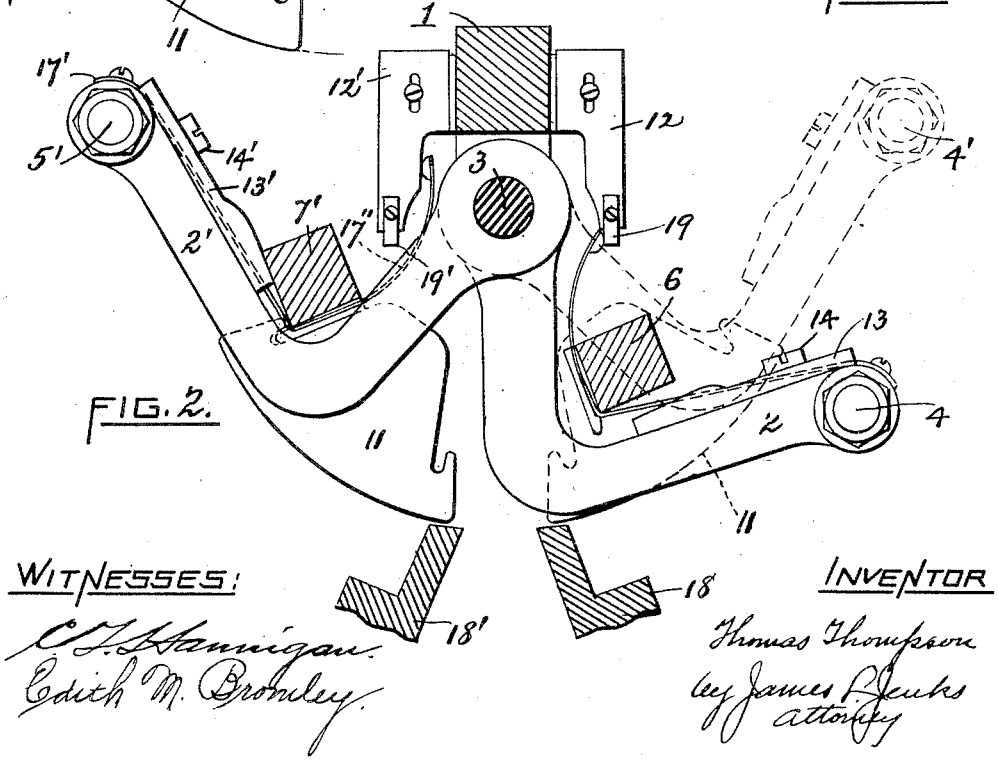

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FIG. 5.

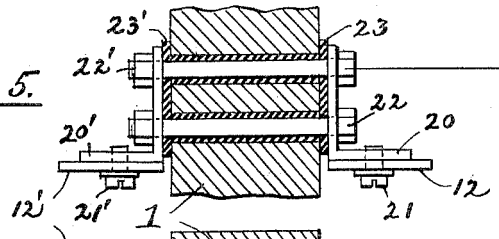
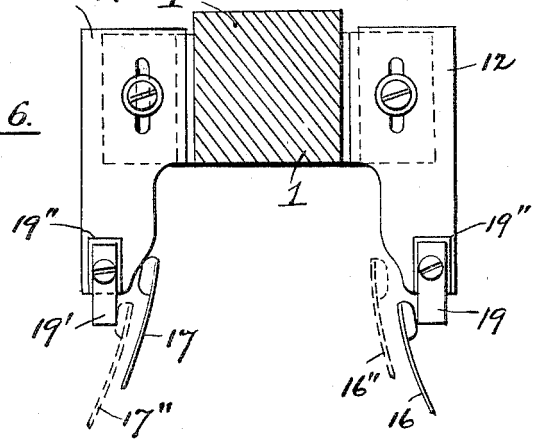


FIG. 6.



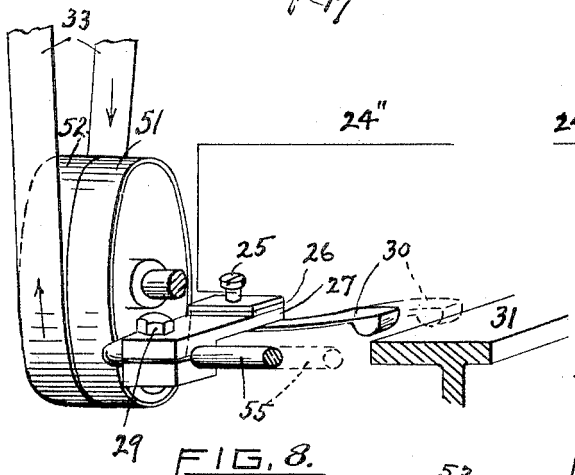


FIG. 8.

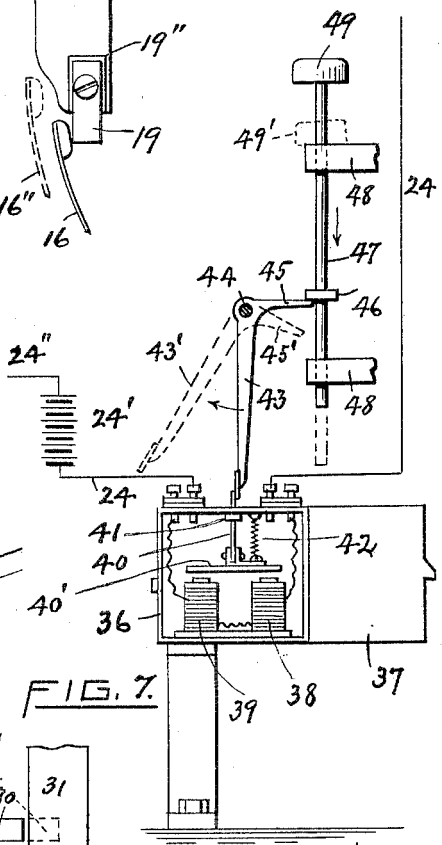


FIG. 7.

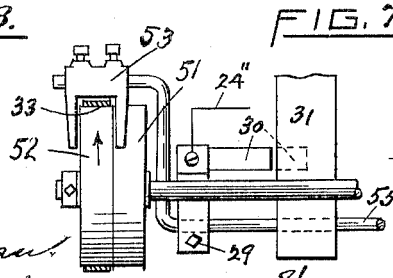


FIG. 8½.

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4 SHEETS—SHEET 3.

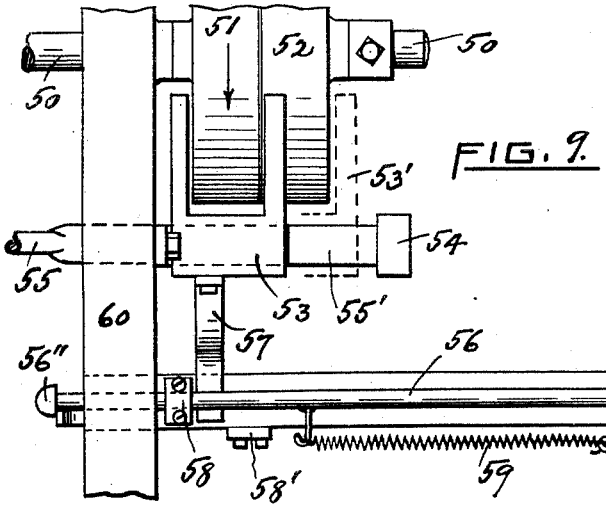

FIG. 9.

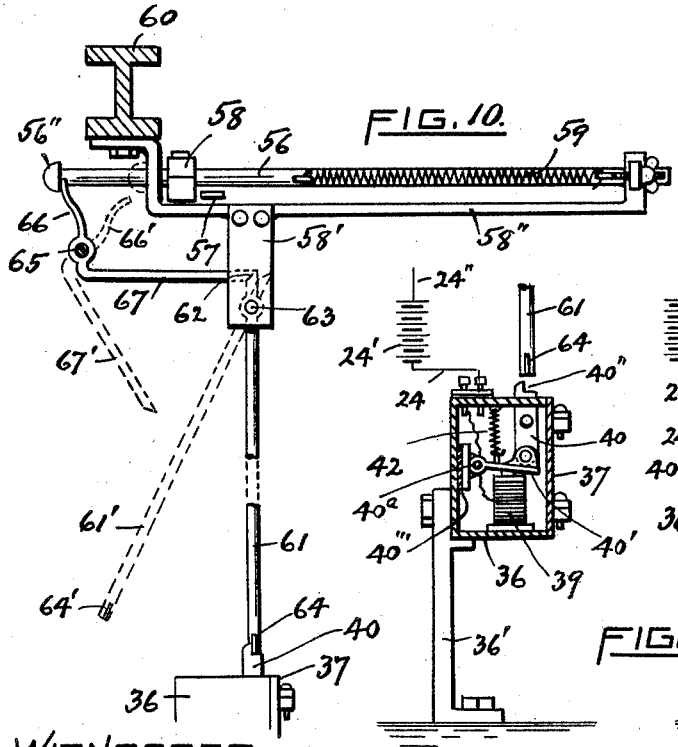

FIG. 10.

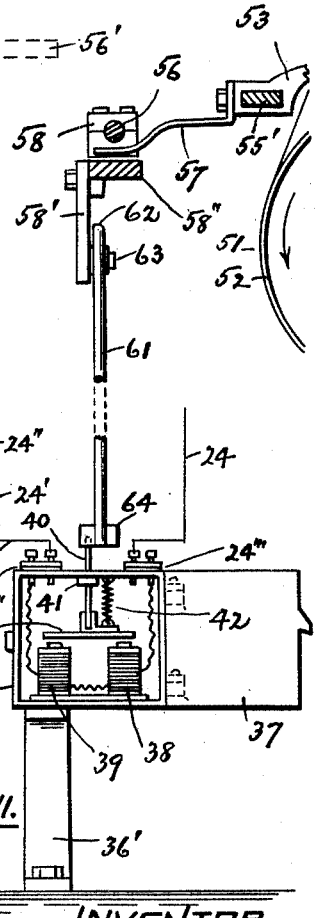

FIG. 11.

FIG. 12.

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4 SHEETS—SHEET 4.

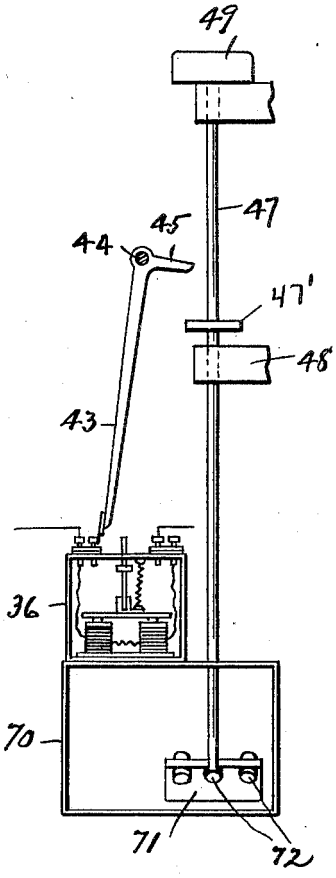

FIG. 15.

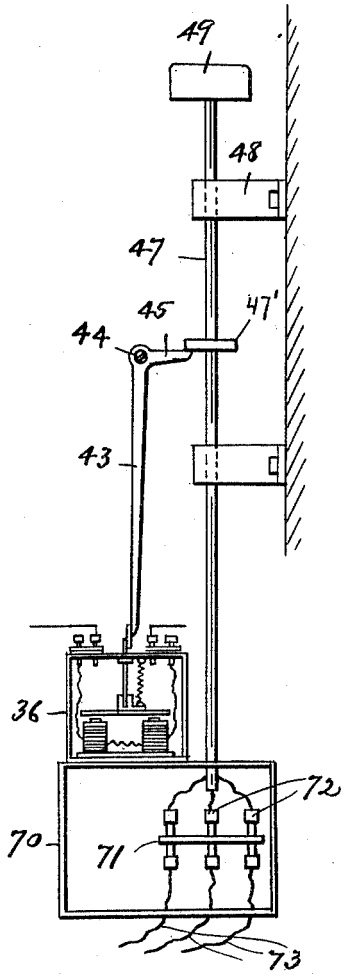

FIG. 13.

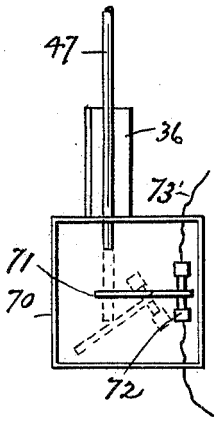

FIG. 14.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC STOPPING DEVICE FOR LACE-LOOMS.

1,076,798. Specification of Letters Patent. Patented Oct. 28, 1913.

Application filed February 12, 1913. Serial No. 747,982.

To all whom it may concern:

Be it known that I, THOMAS THOMPSON, a citizen of the United States, residing at Pawtucket, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Automatic Stopping Devices for Lace-Looms, of which the following is a specification.

My invention relates to improvements in automatic stopping devices for lace looms of the type known as "lever" or "go through" lace looms, and the purpose of my invention is to provide a device which will automatically stop the loom when any dislocation of the shuttle occurs. This purpose is accomplished by means of the mechanism shown in the accompanying drawings, in which—

Figure 1 is an end view of the catch bars of the loom together with the elbows actuating the same. Fig. 2, a detailed drawing of a portion of the same. Fig. 3, a detail of the shuttle with a cross section of the catch bar. Fig. 4, an end elevation of the cam and rolls causing the alternate engagement and disengagement between the catch bars and shuttles. Figs. 5 and 6 are details of a portion of the mechanism showing the manner of making and breaking the electric connection controlling the stop motion; Fig. 7, an elevation of the tripping device and the battery and electromagnets operating the same; Fig. 8, a perspective of the hand shipper, showing the method of stopping the machine independent of the automatic stopping device, and also the method of breaking and establishing electrical connection between the battery and the frame of the loom when the loom is started or stopped by hand. Fig. 8½, a plan view of the same. Fig. 9 is a view of the shipper as operated by the automatic stop motion; Fig. 10, a detail of the tripping mechanism, and Figs. 11 and 12, views of the electromagnet and battery as applied to the tripping mechanism. Figs. 13, 14 and 15, are details of a modification of my invention operating as hereinafter described to stop a motor-driven machine by breaking the current from the feed station to the motor.

The same parts of the mechanism are indicated by the same letters throughout the several views.

In Fig. 1, 1 is a cross-section of a horizontal rectangular bar forming a portion of the frame work of the machine and acting as a support to the shaft 3 on which are movably suspended the elbows 2—2′, that oscillate alternately back and forth, as indicated by the dotted lines. At the extremities of the elbows 2—2′ are rods 4—5 serving to actuate the catch bars 6—7 of the loom. As the elbows oscillate upon the shaft 3, these rods assume the dotted line positions indicated at 4′—5′ respectively. The catch bars 6 and 7 run the entire length of the machine and are operated by the oscillating arms or elbows 2—2′ and the rods 4—5 and these catch bars are raised and lowered, as seen in the dotted line positions 6′—7′. A cross-section of the catch bar 7 is seen best in Fig. 3 and as there shown it has upon its inner surface a projection 9′ the use of which will be hereinafter described. 11, seen best in Fig. 3 is an ordinary shuttle used in this type of loom, and consisting substantially of a thin sheet of steel shaped as shown in Figs. 2 and 3 and having in it the depressions 10—10, and carrying a bobbin of yarn not disclosed in the drawing and not pertinent to this application. These depressions 10—10 are made for the reception of the projection 9′ of the catch bar 7 and it is the alternate engagement and disengagement of the projection 9′ with the shuttle 11 that passes the shuttle through the loom from one side to the other in the making of the lace 15, seen best in Fig. 4, but also shown in dotted lines in Fig. 1, is a cam operating in connection with the rolls 15′—15″ to alternately engage and disengage the catch bars 6 and 7 from the shuttles 11 in the operation of the machine. These rolls are rotatably mounted on the catch bars 6—7.

If the loom operated without error or displacement of any of its parts, the oscillating arms or elbows 2—2′ in connection with the catch bars and shuttles would keep the shuttles oscillating backward and forward from one side of the machine to the other, and the lace pattern would continue to be woven in accordance with the preconceived design, until the machine was stopped by the operator; but in practice it occasionally happens that one or more shuttles become accidentally displaced, and their displacement forces up the catch bars 6—7 until one or both of said bars comes entirely out of

engagement with the entire line of shuttles, of which there may be as many as 3,000 or 4,000 in a medium sized lace machine, thus causing far reaching damage or partial destruction of the machine. It has therefore been my purpose to provide a device by means of which the slightest dislocation or displacement of the catch bars 6—7 caused by any displacement or deformity or dislocation of the shuttles 11 will, operating through a suitable electromagnet and tripping device, instantly stop the entire loom.

In brief, my improvement consists in making the metallic body of the machine itself a portion of an open electric circuit, and by means of the oscillating arms or elbows 2—2′ and springs 16 and 17 completing or closing the electric circuit when either of said catch bars are forced out of engagement with any of the shuttles, thus through the agency of an electromagnet calling into operation a tripping mechanism which shifts the belt in a belt driven machine, or breaks the feed current in a motor-driven machine.

The springs 16 and 17 are fastened by screws or in some other suitable manner to the extremity of the elbows 2—2′; and pass close to the inner surface of the latter, and underneath the catch bars 6—7, and thence upward in close proximity to members 12—12′ which are fastened to the column 1 of the machine, but not in electrical connection therewith. When the catch bars 6—7 are in proper engagement with the shuttles they keep the springs 16—17 pressed downwardly so that as the arms or elbows 2—2′ oscillate back and forth, the springs 16 and 17 swing free and clear from the members 12—12′ and go up into the recesses shown in Fig. 1 between the column 1 and the lower portions of the members 12—12′, and so long as the catch bars are not thrown out of engagement no electrical connection will be made between the loom itself and the members 12—12′; but the instant that the catch bars are thrown out of engagement by any displacement of the shuttle 11, then the springs 16 and 17 are released by the lifting of the catch bars and the upper extremity of spring 16 or 17 is immediately thrown into electrical contact with the member 12 or 12′, according to the side upon which the displacement occurs, thus closing the circuit and operating the tripping mechanism as hereinafter described. Adjusting members 13 and 13′ are attached to the elbows 2—2′ by screws 14—14′ and serve to adjust the degree of engagement between the catch bars 6—7 and the shuttles 11.

18 and 18′ are fixed portions of the loom serving as rests or supports on which the shuttles 11 slide in their oscillations.

Figs. 5 and 6 show respectively a horizontal and vertical section of the column 1, hereinbefore described, and the members 12—12′ with the method of attaching the same to the column 1. The members 12—12′ are in the nature of metallic plates adjustably mounted upon the angular metal support 20—20′ by means of the adjusting screws 21—21′, while the angular metal plates 20—20′ are themselves attached to the column 1 by the bolts 22—22′. The plates 20—20′ and the bolts 22—22′, are insulated by suitable insulating material 23—23′ from the body of the loom. Spring retainers 19—19′ at the lower portion of the plates 12—12′ and thereto attached are also insulated from 12—12′ by plates of insulated material 19″—19″ and serve to retain the springs 16, 17 in position, preventing the springs from swinging outside the members 12—12′ when the catch bars are at their lowest position. At the right of Fig. 6 in dotted line position designated 16″, is seen the upper portion of the spring 16 which position it occupies when the parts of the machine are in normal condition, while full line position designated 17 on the left hand side of Fig. 6 shows the spring making an electrical connection with the member 12′, thus operating to stop the machine, as hereinafter shown.

Figs. 10 and 11 show the tripping device operating the shipping lever. Fig. 11 is a vertical view of the tripping mechanism, and Fig. 10 a front elevation of the same; while Fig. 9 shows the shipper and the spring actuating the same. In Fig. 11, at 55′, the shipper bar is shown in cross-section, which bar carries the shipper fork 53, while 51 and 52 indicate the tight and loose pulleys, respectively. As shown in Fig. 9, the shipper bar 55—55′ is slidably mounted in a portion of the frame of the loom, and attached to the shipper fork 53 is a projecting arm 57 adapted to be actuated by a collar 58 adjustably fixed upon the sliding bar 56, which bar is, when the machine is stopped by my invention, drawn into the position shown by the dotted lines 56′ by means of the spring 59. 56″ is a head upon the bar 56 limiting the motion thereof toward the right, (while 54 is the terminus of the shipper bar 55—55′). The shipper bar 55—55′ of Fig. 9 shown broken away, runs the entire length of the loom, so that it may be operated by hand at the will of the operator when not automatically operated. Attached to the frame 60 of the loom is a metallic frame work 58″ having projecting downwardly therefrom the apron 58′ and upon the back of said apron 58′ as shown in Figs. 11 and 10 and attached thereto by the stud 63 is the vertical rod 61 terminating at its lower end in a flat plate 64. This rod 61 is free to oscillate on the stud 63. The upper portion of the rod 61 is beveled, as shown at 62, making an angle of approximately 45° with a horizontal plane. At-

tached to the frame of the machine by a stud 65, seen best in Fig. 10, is the bell crank lever 66—67 and the right hand extremity of the limb 67 is beveled so as to engage by contact with the beveled upper end of the rod 61.

36 in Figs. 10, 11 and 12, is a suitable box containing an electromagnet 39, having a hinged armature 40′ connected with the sliding bar 40. This bar terminates at its upper end outside the box in the angular extremity 40″ which is adapted to engage with the metallic plate 64 forming the lower end of the rod 61. The armature 40′ is hinged on the back by the pin 40ª and lever 40 is held in engagement with the plate 64, when a current is not passing, by the spring 42. 24′ represents a battery, one pole connecting with the wire 24″ and the other with the wire 24. The wire 24 connects through magnets 39 with the members 12—12′ best seen in Figs. 5 and 6, while the wire 24″ from the other pole of the battery terminates in the binding screw 25, as shown in Fig. 8, and thence with the member 30, it being, however, insulated from the body of the machine itself by the insulating plate 26.

It should be noted that in the plan view, Fig. 9, the lower part of the drawing shows the back of the loom, while in Fig. 8, a perspective view, the front of the loom is nearest the spectator, 51 and 52 being the loose and tight pulleys, respectively.

In Figs. 8 and 8½ the belt 33 is represented as being on the loose pulley 52, 55 being the shipper rod used by the operator to start the machine. This shipper rod carries a shipper 53 as shown in said figure. It will be seen by reference to Figs. 8 and 8½ that while the belt is on the loose pulley, the machine being then stopped, there is no electrical connection with the frame, even though the springs 16 and 17 should be in contact with the members 12—12′, but when the machine is ready to start and the catch bar is in its proper place, the springs 16—17 will then be out of connection with the members 12—12′ and the operator by shifting the hand shipper bar 55 to the right immediately establishes connection through the spring member 30 with the frame 31 of the machine. As soon as this is done, one pole of the battery is then in electrical connection with the frame of the machine through the medium of the spring member 30, but complete connection is not made so long as the catch bars remain in their normal condition because the springs 16—17, Fig. 6, will not make contact with the members 12—12′.

It is to be understood that all parts of the frame when the machine is in operation are in electrical communication with one pole or the other of the battery, except where it is herein specified as being insulated from the frame, but, as just stated, when the machine is stopped by the operator, there are two breaks in the circuit, one by the separation of the spring 30 from the frame 31, as seen in Figs. 8 and 8½ and the other caused by the separation of the springs 16 and 17 from the members 12 and 12′ in Fig. 6, and thus the springs 16 and 17 become inoperative except when communication is made between 30 and 31, Figs. 8 and 8½ that is, except when the machine is in actual operation.

Assuming the machine to be in operation and the shipping and tripping devices being as shown in Figs. 10 and 11, any displacement of a shuttle sufficient to tend to disengage the catch bar will cause immediate contact to be made between the spring 16 or 17 with its adjacent member 12 or 12′, thereby closing the circuit. The current at once through the magnet 38 and 39 pulls down the armature 40′, thus releasing the catch 64 and the spring 59 operating through the head 56″, the bell crank lever 66—67 and the vertical swinging bar 61, causes immediate disengagement between 61 and the arm 67 of the bell crank lever, this latter taking the position shown in the dotted lines 66′—67′ Fig. 10. The bar 56 thus being released shifts the shipper fork 53 from the tight pulley to the loose pulley through the operation of the spring 59 and the collar 58, as shown in Fig. 9, thus instantly stopping the loom.

My device is equally applicable to the case of a loom driven by a motor, the electromagnet operating to throw out the fuses in the main line between the electrical supply and the motor. The mechanism by which this is accomplished is shown in Figs. 13, 14 and 15 in which 47 is an upright rod surmounted by the weight 49; 48—48 are supports attached to the body of the machine in which the rod 47 slides. Fixed to the rod 47 is a collar 47′. 43—45 is a bell crank lever pivoted upon a pin 44 which is fixed to a suitable part of the machine. The bottom of the arm 43 engages with a plate projecting from the armature of an electromagnet in the same manner as described in the mechanism above specified, and the arm 45 of this lever sustains the weight 49 with the connected rod 47, while the machine is in operation. 72 are fuses in the main current supplying the motor, while 73′, seen best in Fig. 14, are the wires leading to the motor from the fuses. These fuses are all mounted or affixed to a board or plate 71 so that they may be all thrown out of connection at the same time. As seen in Fig. 14, this board or plate projects from the fuses in such a manner that a sharp blow upon the front edge of the board will immediately disengage the fuses from their spring connection, thus breaking the current. The rod 47 is mounted immediately above the outer edge of the board 71 and when this rod is released by the closing of the circuit due to a displacement of the catch bars

the dropping of the rod will disengage the fuses, their position after disengagement being shown in the dotted lines in Fig. 14, thus instantly stopping the motor and loom.

Another object of great importance is accomplished by my invention: It occasionally happens that an operator starts the loom inadvertently or carelessly before the catch bars have been placed in proper engagement with the shuttles. Such an operation invariably does very great damage not only in breaking the thousands of threads forming the lace pattern but in frequently destroying important members of the loom itself. By my device, such a mishap is wholly prevented. Assuming the catch bar has not been put in its proper place and that the operator attempts to start the loom by means of the hand shipper bar 55 of Fig. 8, which is the sole method of starting it. Under the assumed conditions, one or both of the members 16—17 will be in contact with the plates 12—12′ and the instant the hand shipper bar 55 moves the belt even a short distance toward the tight pulley 52, the electric circuit is completed through the member 30 and the frame 31, thus instantly making it impossible to push the hand shipper farther, on account of the resistance of the released spring 59 of Fig. 10; and in the case of a motor-driven loom, the instant parts 30 and 31 come in contact, the fuses are immediately knocked out of circuit, thus preventing the starting of the motor.

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

1. An automatic stopping device for lace looms consisting of a galvanic battery or other source of electricity; a spring member comprising one pole of said battery and a metallic plate comprising the other pole, said spring member being depressed by the catch bar when the latter is in proper position; and thus kept out of contact with said other pole, but adapted to touch the same and thus close the circuit when said catch bar is displaced; an electromagnet in said circuit; a tripping device which is released by said magnet when the circuit is closed and a shipper operated by said tripping device, substantially as set forth.

2. In an automatic stopping device for lace looms, a galvanic battery or other source of electricity having as one of its poles a spring and as the other a metallic plate or similar conductor, said spring being so connected with the catch bar of the loom when said catch bar is in proper position as to be out of circuit with said battery, and being so adjusted with relation to said catch bar and metallic plate as to come into electric contact with the latter and close the circuit by the displacement of the catch bar; an electromagnet in the circuit of said battery; a shipper and actuating means therefor and a tripping device actuated by said electromagnet and operating to release said shipper actuating means and shift the belt, thus stopping the loom, substantially as described.

3. In an automatic stopping device for lace looms, a galvanic battery or other source of electricity having one pole consisting of a spring and the other of a metallic plate in close proximity thereto, said spring normally being depressed and kept out of contact with said plate by the catch bar when the latter is in its proper position, but adapted to close said circuit when released by the displacement of said catch bar; a hand shipping rod forming part of said circuit between one of said poles and the battery and adapted to break the connection between such pole and the battery when said shipping rod shifts the belt from the tight to the loose pulley; an electromagnet in said circuit; a tripping device adapted to be released by said magnet when the circuit is closed and a shipper operated by said tripping device and acting to stop the loom, substantially as specified.

4. In an automatic stopping device for lace looms, a battery or other source of electricity having one pole consisting of a metallic plate and the other of a spring so depressed by the catch bar when the latter is in its proper position as to be kept out of contact with said metallic plate and adapted to come into contact with said plate and thus close the circuit when said catch bar is displaced; an electromagnet in said circuit, and a tripping device embodying a latch capable of being released by the operation of said magnet when the circuit is closed to stop the loom, substantially as set forth.

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

THOMAS THOMPSON.

Witnesses:
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