(No Model.) 3 Sheets—Sheet 1.

J. BUCHEL.

AUTOMATIC ELECTRIC STOP MOTION FOR KNITTING MACHINES.

No. 513,259. Patented Jan. 23, 1894.

Fig. 1.

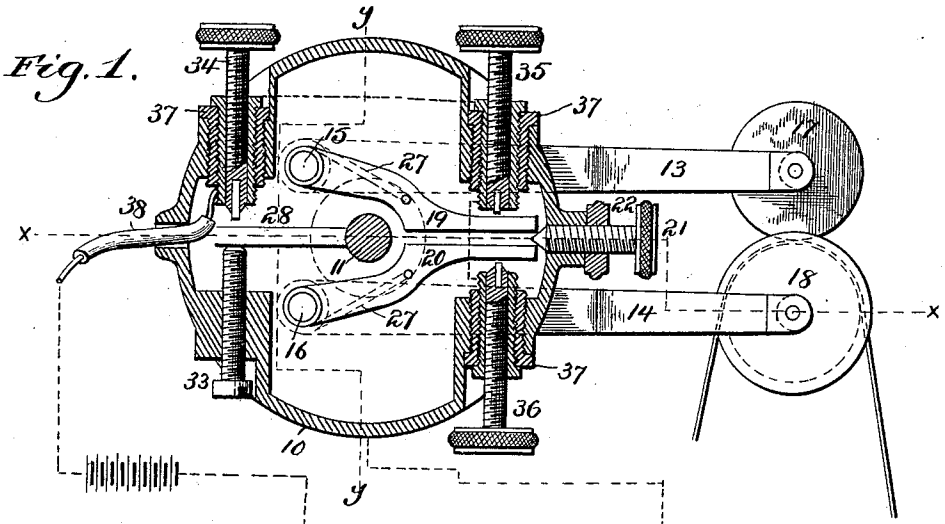


Fig. 2.

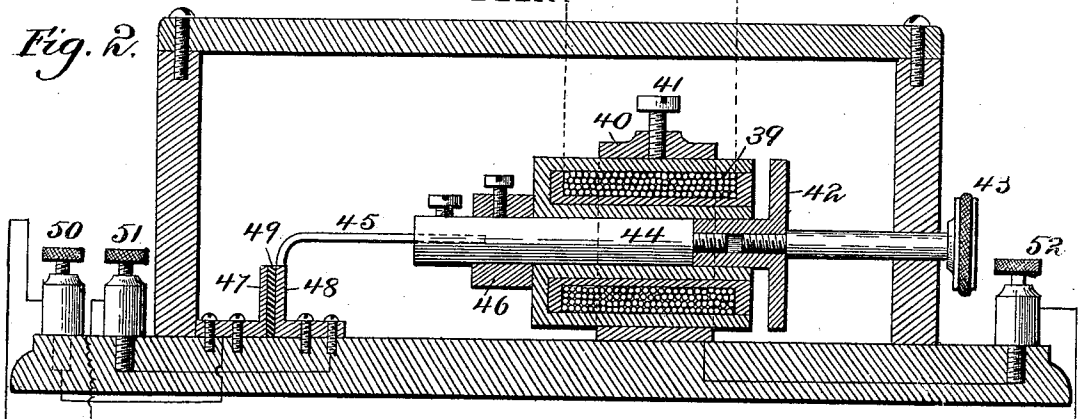
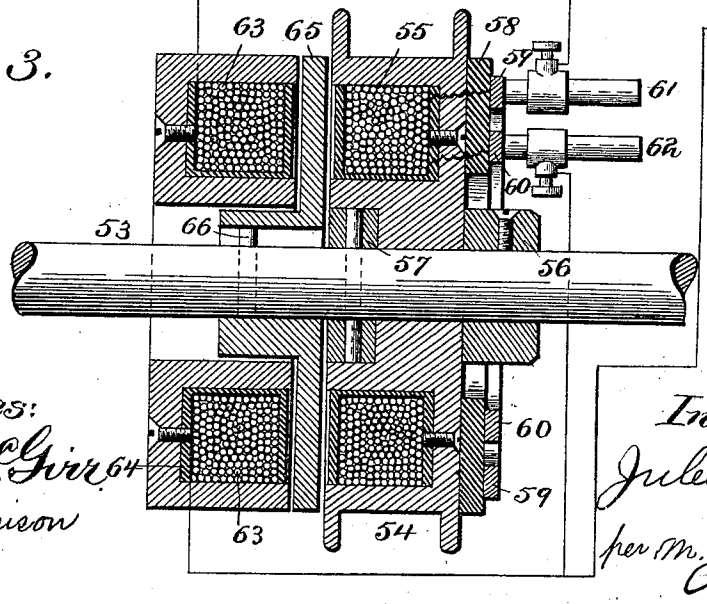


Fig. 3.



Witnesses:
J. B. McGirr
C. Dennison

Inventor:
Jules Buchel
per M. L. Moran,
Attorney.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

J. BUCHEL.

AUTOMATIC ELECTRIC STOP MOTION FOR KNITTING MACHINES.

No. 513,259. Patented Jan. 23, 1894.

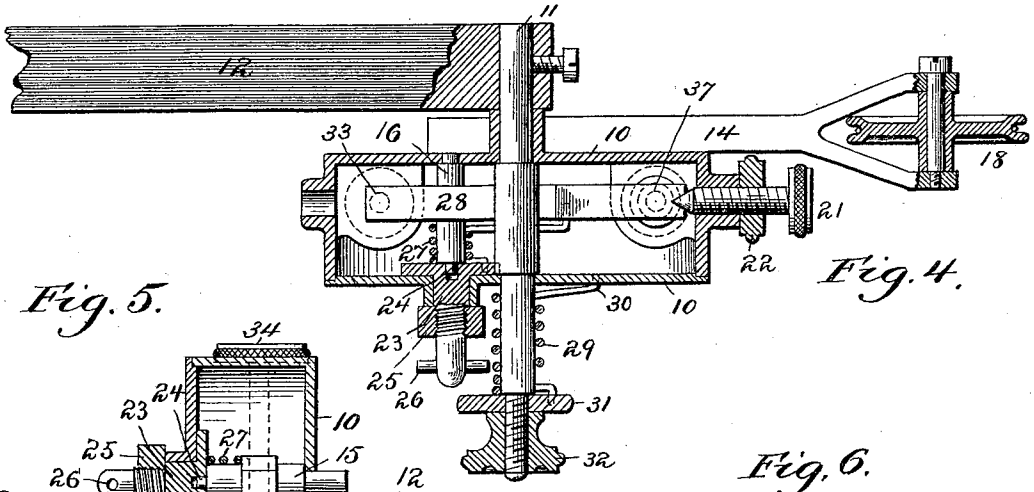


Fig. 4.

Fig. 5.

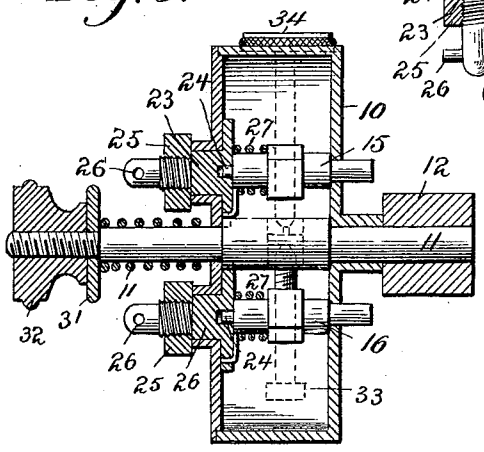


Fig. 6.

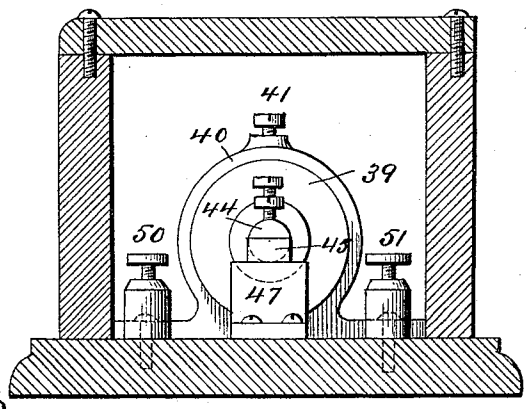
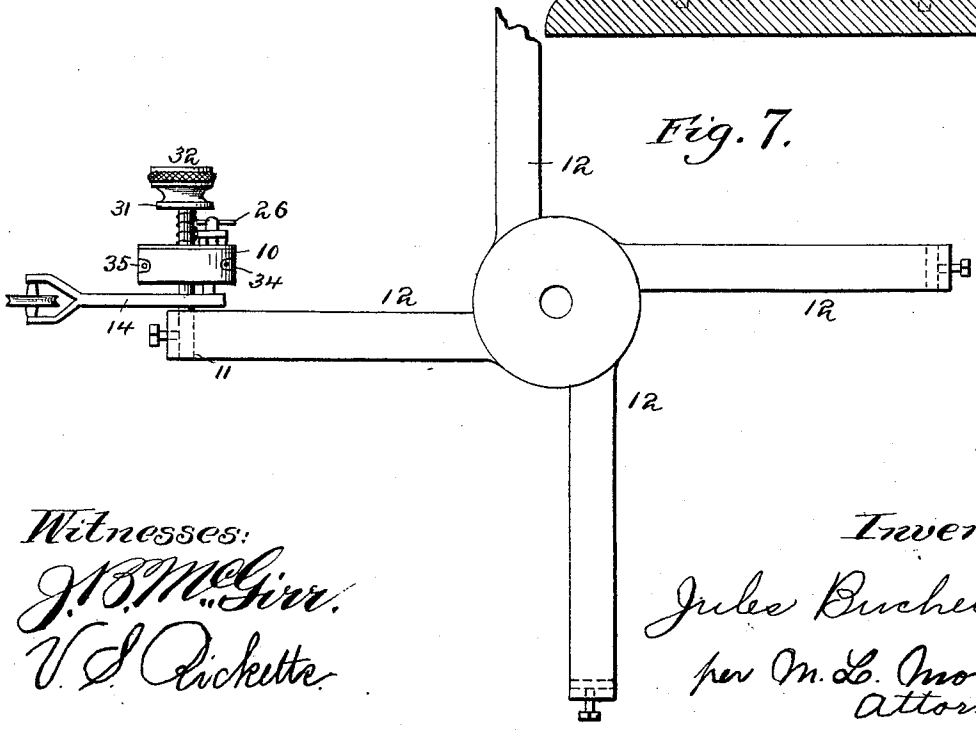


Fig. 7.



Witnesses:
J. B. McGirr.
V. S. Ricketts.

Inventor:
Jules Buchel,
per M. L. Moran,
Attorney

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.)

3 Sheets—Sheet 3.

J. BUCHEL.

AUTOMATIC ELECTRIC STOP MOTION FOR KNITTING MACHINES.

No. 513,259. Patented Jan. 23, 1894.

Fig. 8.

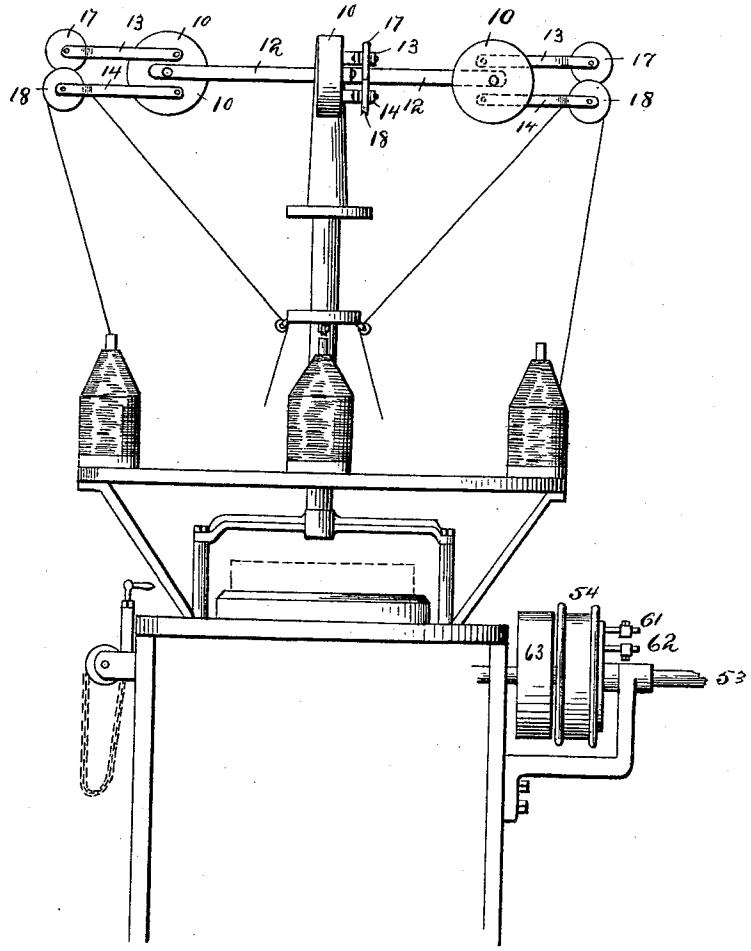
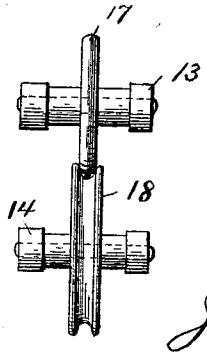


Fig. 9.



Witnesses:
J. B. McGirr.
A. V. Bates.

Inventor:
Jules Buchel
per M. L. Moran,
Attorney

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JULES BUCHEL, OF NEW ORLEANS, LOUISIANA.

AUTOMATIC ELECTRIC STOP-MOTION FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 513,259, dated January 23, 1894.

Application filed March 18, 1893. Serial No. 466,632. (No model.)

To all whom it may concern:

Be it known that I, JULES BUCHEL, a citizen of the United States of America, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Automatic Electric Stop-Motions for Knitting-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to stop mechanism for knitting machines by which the machine is stopped automatically when there is anything the matter with the thread.

In order that a knitting machine may operate successfully, it is necessary that the thread or yarn, fed to it from the spools, be free from knots or obstructions. It must also uncoil freely and not be subjected to too great a tension. If there is a knot or a lump of any kind in the thread, it obstructs the needles and other parts of the machine; if the thread breaks, it spoils the fabric on which the machine is working and if it does not uncoil freely it offers resistance to the machine, endangers the thread and produces an uneven fabric.

The object of my invention is to provide a device by which all of these evils may be obviated, that is one which is calculated to stop any machine to which it is attached almost instantly, should a thread break, or a spool on which the thread is wound offer too much resistance or should there be a lump of raw cotton or a knot in the thread as it is being fed to the machine.

With this object in view, the invention consists in a pivoted casing called the switch, supporting a system of pivoted levers so adjusted and balanced that the slightest irregularity of the feed, as it passes between the pulleys carried by the levers, will close the electric circuit, connected to the relay.

It also consists in the construction of the relay in combination with the brake, and also the driving pulley by which the power is applied to the shaft of the machine and which is regulated by the relay.

It also consists in the combination of these three parts so connected as to co-operate to produce the desired result and in certain details of construction hereinafter described and claimed.

In the drawings:—Figure 1 is a side sectional view of the switch embodying part of my invention. Fig. 2 is a sectional view of the relay connected by wires both to the switch and to the brake as shown. Fig. 3 is a sectional view of the brake and power pulley as applied to the main shaft of the knitting machine. Fig. 4 is a top sectional view of the switch taken on line x—x of Fig. 1. Fig. 5 is a back sectional view of the same taken on line y—y of Fig. 1. Fig. 6 is a front view of the relay. Fig. 7 shows a four armed spider, each arm of which is adapted to support a switch casing, only one being shown. Fig. 8 is a view showing part of a knitting machine with the various parts of my invention applied thereto. Fig. 9 is an end view of the wheels showing how the thread or yarn runs between them.

Similar numerals of reference denote like parts throughout the several views.

The switch box or casing 10 is preferably cylindrical in form and is itself supported on the short spindle 11 on which it turns. The spindles are carried by the arms 12 of the frame or spider in a convenient position over the feeding spools. Levers 13 and 14 are pivoted on the switch box at 15 and 16 respectively and carry at their outer ends the pulleys 17 and 18 between which the thread from the spool passes. The rim of the lower wheel 18 is hollowed out so as to provide a groove for the yarn or thread to run in as it passes to the needles of the machine. The rim of the upper wheel 17 is nicely rounded off to fit the groove in the rim of the lower wheel, but although the rounded rim conforms very closely to the inside of the groove, it does not quite touch it, but leaves just sufficient space for the yarn to pass freely over the lower wheel without troubling the upper one. When the machine is in operation the friction of the thread or yarn causes the lower wheel to revolve, but the upper wheel remains stationary, and only comes into play when there is some inequality or lumps in the yarn which being thicker than the space allowed for the

ordinary yarn between the wheels, forces them apart, causing a motion of the balanced levers, as will now be explained. The spindle 15 carrying the upper lever 13 passes through the casing of the switch box and is connected to another lever 19 on the interior of the box. Spindle 16 of the lower lever 14 is also connected with lever 20 on the inside of the switch box. These spindles 15 and 16 may be made integral with levers 19 and 20 respectively but the preferable construction is to provide their ends with openings of the size to fit the spindles upon which they may be keyed or fastened in any other ordinary way. These levers approach each other within the box as shown, and are held apart at their ends by the thumb screw 21 which passes through the end of the casing and has a pointed end which may be forced between the levers. This thumb screw serves the purpose of regulating the distance between the ends of the levers and has a jam nut 22 by which it is prevented from getting out of adjustment. By screwing this pointed screw inward it wedges itself between the levers 19 and 20 and keeps them apart at any predetermined distance according to the thickness of the yarn that is being used at any given time.

The spindles 15 and 16, which carry the levers, are journaled in the ordinary way in one side of the casing but at the other end they terminate in small bearings 24 provided in the ends of cylindrical plugs 23 which pass through the casing and are provided with heads, that bear against the inside surface of the casing, and are screw-threaded on the outside to receive nuts 25. The plugs extend out beyond the screw-threaded portions and are provided with holes 26 in which the adjusting pins are inserted to turn the plugs and adjust the springs 27 which are coiled on the spindles 15 and 16 and have one end fastened to the spindles themselves or to the levers 19 and 20. The plugs 23 are turned by means of rods or pins in the holes 26 and thus the spiral spring is wound or unwound until the desired tension is secured; then the nuts 25 are screwed tight against the casing thus preventing the spring from getting out of adjustment.

The switch casing 10 is itself pivoted or adapted to turn on spindle 11 which is fastened to the support 12. This spindle passes clear through the casing and is provided on the interior with a lever or arm 28 which is stationary with the spindle. A spring 29 is coiled on the outer end of the spindle one end being fastened to the switch-box at a convenient point as 30. The other end of the spring is fastened to a milled piece 31 which turns on a smaller part of the spindle and is held firmly in place at the desired point by the nut 32. By turning the milled piece to the left we get a tension on the spring which tends to turn the switch-box also in the same direction, but it is prevented from turning very much in this direction by the arm 28 which projects into the box and strikes against a set screw 34 in the casing. Another set screw 33 is placed opposite this one so that there is but a small space between their ends in which the arm 28 may oscillate. There are also other screws 35 and 36 set opposite each other in the other side of the casing having the ends of the levers 19 and 20 between their ends but not quite in contact therewith as shown. The three screws 34, 35 and 36 are fastened in the body of the switch, but are electrically insulated therefrom by the hard rubber bushings 37. These screws also preferably have brass ferrules inside the rubber bushings and are provided with platinum tips. The other screw 33 is not insulated but is set directly into the casing as shown, and prevents it from turning in one direction, the idea being that the adjustment shall be such that the arm 28 will normally bear upon this screw.

The three screws 34, 35 and 36, are provided with milled heads so that they may be adjusted and are connected to the same wire which passes out of the casing through an insulated opening 38 to one pole of a battery. The other pole of the battery is connected through the relay, presently described, with the switch box casing, so that if connection is made between either of the levers 28, 19 or 20 and the screws 34, 35, or 36 respectively, the circuit will be closed and the impulse sent through the relay.

The switch is shown with the levers horizontal, but it may be turned so that arm 28 will be vertical and the levers 13 and 14 project downward, or in any other convenient position without interfering with the operation of the device. Each switch controls one thread, so that there will be as many switch boxes as there are threads or one to each spool and these are supported at the end of the arms of a frame work or spider, of which one with four arms is shown in Fig. 7 and held in any convenient position over the machine. Now as to the adjustment of the switch: The spring 29 is set at a given tension which tends to turn the casing to the left and make contact between the arm 28 and the screw 34, but this is prevented by the constant force or pull of the thread or yarn as it passes normally over the pulley, so that if a thread breaks the resistance to this spring is removed and the said spring revolves the casing on the spindle 11 to the left, making the contact between screw 34 and arm 28 thus closing the circuit and causing the relay to act to stop the machine. If there is an over tension in any thread beyond safety for a thread of that size, the extra tension exerts a downward pull upon the wheel 18 and lever 14 and through pivot 16 upon lever 20, thus compressing the lower spring 27 and making electrical contact with screw 36 thereby stopping the machine. Now in case a knot or lump of any kind appears in the thread it cannot pass between the wheels 17 and 18 without forcing

them apart. But in this case it is not the lower wheel 18 that moves, but the upper one 17, and the reason is this:—The spiral spring on the upper lever's pivot is set so as to partly relieve the weight of the lever and wheel 17, or in other words, tends to turn the lever 19 toward the screw 35. The upper wheel does not quite touch the lower one and is prevented from doing so by the screw 21, but the upper spring 27 is so set that it nearly balances the weight of the upper lever and wheel so that the lever 19 bears very lightly on the point of the screw 21 and any irregularity of the thread which tends to separate the wheels will move the upper one 17 very easily, thus making the lever 19 touch the screw 35 and operating the brake through the relay. Thus there are three motions:—the rotation of the casing itself on the spindle 11 which operates the mechanism on the breaking of a thread, the upward movement of wheel 17, turning on pivot 15 at the appearance of a knot of any kind in the thread or yarn, and the downward movement of wheel 18 turning on pivot 16 if the thread is subjected to undue tension. Now if any one or more of these movements occur the electric circuit is closed and the current travels through the wire to the relay. This wire is wound in a coil on a hard rubber spool which is set in a tubular soft iron casing forming the electro-magnet 39 of the relay. The relay is inclosed in a suitable casing in which sits the brass frame 40 into which the tubular magnet is fitted and finally held by set screw 41. The armature 42 has a cylindrical extension which passes into the tubular magnet but does not extend quite to its center in order to economically use the electrical forces. At this point a cylindrical piece of brass 44 or some other non-magnetic metal is screwed into or fastened to the armature and extends out beyond the other end of the spool 39. Copper brushes 45 are suitably fastened to the end of the brass rod and are arranged to slide over two contact pieces 47 and 48 which are separated by the non-conductor 49 of proper thickness. These contact pieces are connected to binding posts 50 and 51 by their respective wires. A brass collar 46 which is adjustable on rod 44, is so set as to prevent the copper brush from moving beyond the contact pieces and also prevents the armature 42 from getting out of the field of attraction. There is a stem or rod fastened to the face of the armature which extends outside of the casing of the relay and terminates in a suitable handle or knob 43 by which the starting and stopping of the machine may be regulated. When a current is passed through the coil of electro-magnet 39 the armature 42 is strongly attracted, and as the part of the stem 44 beyond the center is of non-magnetic metal, there is no counteracting force, and the brush 45 is moved from contact piece 48 to contact piece 47. This may also be done by moving the handle or knob 43.

52 represents another binding post which is connected by wire to the frame 40 of the relay so that the current will continually pass through the relay to the connecting post 50 or 51 according as the copper brush connects with the contact piece 47 or 48.

The brake, or that part of the device which controls the starting and stopping of the machine is illustrated in Fig. 3.

53 denotes the shaft of the knitting machine on which runs the loose pulley 54 by which the power is applied. This pulley is flanged to receive the power belt and is made tubular so as to receive the spool of coiled wire 55 thus constituting at the same time an electro-magnet as shown. The pulley revolves loosely on the shaft between the collars 56 and 57 which are suitably set on the shaft. The collar 57 is set into the pulley so as to allow a flat surface for the armature to bear against the electro magnet. Connection is made between the coil of wire 55, on the revolving power pulley and the binding post 51 of the relay, in this way: First, a hard rubber ring 58 is fastened to the electro-magnet pulley 54; then two brass rings, 59 and 60, one within and separated from the other, are fastened on the outside of the rubber ring. Now each end of the wire coil 55 is carried through the rubber ring, one end being connected with brass ring 59 and the other end with ring 60. Two carbon brushes 61 and 62 are arranged to bear upon these brass rings, so that the contact will be constant as the pulley revolves. Brush 61 is connected by wire with binding post 51 of the relay and the other brush 62 is connected to the other pole of the battery as shown. On the opposite side of the driving pulley is the stationary tubular electro-magnet 63. This is preferably shown as surrounding the shaft and having a larger opening through its center for the shaft 53. This tubular magnet is adapted to receive the rubber spool of wire 64 one end of which coil is connected directly to the binding post 50 of the relay and the other end to the same pole of the battery as brush 62 above described. Between these two electro-magnets 54 and 63 is located the revolving movable armature 65. The shaft has a pin or key 66 in it at this point and armature 65 is provided with a keyway so that the armature may freely move longitudinally along the shaft yet always revolve with it. The shaft may be slotted clear through and a pin of the armature pass through the slot and slide longitudinally therein. Now we see that the armature always revolves with the shaft, the power pulley electro magnet revolves loosely on the shaft while the stationary electro-magnet is fixed and does not revolve at all, so that, considering the power pulley to be constantly running, we see that when the armature is attracted to its magnet 54, it will adhere and revolve with it thus starting the machine but when the current is turned from the coil 55 to coil 64 of the stationary magnet, it bears strongly against said magnet

causing the machine to stop almost immediately.

The operation of the device is as follows:—Suppose the machine to be running and one of the contingencies above described happens to the thread running over wheel 18. This imparts movement to one or more of the switch box levers closing the first circuit and sending the electrical impulse through the magnet of the relay. This attracts the armature 42 and moves the copper brush 45 from contact piece 48 to contact piece 47 thus sending the current through the stationary electro-magnet 63 instead of 54. The armature 65 will instantly leave the power pulley and act as a very efficient brake by bearing against the stationary magnet.

It is found by actual experiment that the machine is stopped almost instantaneously without the slightest jar or injury to the mechanism. When it is wished to start the machine again, the handle 43 of the relay is merely pulled out thus transferring the current back to the continually revolving electro magnet 54, when the armature which is fast to the shaft of the knitter begins to turn with it. Thus the relay by means of handle 43 constitutes an excellent starting and stopping device being independent and complete in itself.

I do not wish to be limited to the exact detailed construction shown as many changes may be made without departing from the spirit of my invention, such as the substitution of one conducting metal for another or using a current from a dynamo or storage battery instead of a galvanic battery; but

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

1. The combination of the pivoted switch-box, an arm engaging the same to limit movement in one direction, and a provision tending to turn the same in the opposite direction, with levers pivoted in said box, and provision for holding the outer ends of the same yieldingly in proximity to each other.

2. In a stop mechanism for knitting machines, the supporting box, two pivoted levers carrying wheels at their ends, the rim of one of the wheels having a groove, and that of the other being rounded to conform to said groove, and contact pieces of an electrical circuit arranged in proximity to the opposite ends of said levers by which the circuit may be closed, substantially as described.

3. In a stop mechanism for knitting machines the system of pivoted levers and pivoted switch box each balanced by an adjustable spring, and the insulated screws set in the casing in proximity to the ends of said levers by which the electrical circuit is closed substantially as described.

4. In a stop mechanism for knitting machines the lever 14 carrying the wheel over which the thread runs, the switch casing supporting said lever and pivoted on a spindle, the adjustable spring by which the casing is balanced, the arm or projection fastened to the spindle by which the turning of the switch casing is normally prevented and the opposite insulated screw by which the electrical circuit may be closed upon the movement of the casing substantially as described.

5. In a stop mechanism for knitting machines two wheels with conforming rims between which the thread passes, two balanced levers carrying said wheels, the balanced pivoted casing supporting said levers, the brake and the electrical connections by which the brake is operated substantially as described.

6. In a stop mechanism for knitting machines the pivoted switch casing, an arm of the spindle against which the casing bears, two pivoted levers carrying on the outside two wheels and terminating on the interior of the casing with their ends held adjustably apart and the insulated screws set in the casing opposite the ends of the levers substantially as described.

7. In a stop mechanism for knitting machines the relay consisting of the tubular electro magnet with its armature and its stem moving through the magnet, two contact pieces insulated from each other and the brush carried by the stem and adapted to move from one contact piece to the other, in combination with the brake and the electrical connections thereto, substantially as described.

8. In a stop mechanism for knitting machines the switch casing with its pivotal levers, the relay and its electro magnet connected to the switch casing, and the brake and its electrical connection to the relay substantially as described.

9. In a stop mechanism for knitting machines the combination of a switch containing the pivoted and yieldingly balanced levers by which the impulse is received, and the brake, electrically connected to the relay by which it is operated substantially as described.

10. In a stop mechanism for knitting machines the relay consisting of the tubular electro magnet 39, the armature 42 with its stem extending into the tubular magnet, the rod 44 of non-magnetic metal connected to the stem piece of the armature at substantially the center of the electro-magnet, and which carries the brush 45 at its end, insulated pieces over which the brush slides, the brake and electrical connections thereto substantially as described.

11. In a stop mechanism for knitting machines the brake consisting of the stationary electro-magnet 63, the armature which revolves with the main shaft 53 of the knitting machine, but is movable longitudinally upon it, and the relay electrically connected to said electro-magnet and by which it is actuated substantially as described.

12. In a stop mechanism for knitting machines the electro magnet 54 which constitutes at the same time the power pulley by

which the knitting machine is operated, turning loosely on the main shaft 53, and the armature fixed to the main shaft, in combination with the contact pieces 47 and 48, the copper brush 45 of the relay provided with handle 43 for moving it over the contact pieces, and the electrical connection to the revolving electro-magnet substantially as described.

13. In a stop mechanism for knitting machines the stationary electro-magnet of the brake and the armature revolving with the shaft, the contact piece 47 of the relay, brush 45 connected to the handle 43 which projects through the casing, in combination with the wire connecting one end of coil 64 with contact piece 47 and the wire connecting the other end of said coil through the battery to the brush 45 of the relay substantially as described.

14. In a stop mechanism for knitting machines the revolving electro-magnet of the power pulley 54, the armature 65 fastened on the shaft, the contact piece 48 of the relay connected electrically with one end of the coil of said magnet, and the brush 45 of the relay connected to the handle 43 and also electrically connected through the battery to the other end of the coil 55 of the revolving pulley substantially as shown and described.

15. In a stop mechanism for knitting machines the combination of the stationary electro magnet 63, the revolving electro-magnet and power pulley, the armature so fastened to the shaft as to revolve with it but slide longitudinally thereon, the two insulated contact pieces 47 and 48 of the relay connected respectively with the coils of the stationary electro-magnet 63 and revolving magnet 54 and brush 45 of the relay which is adapted to slide over the contact pieces and is connected electrically through the battery to both coils 64 and 55 of the stationary and revolving magnets of the brake substantially as described.

16. In a stop mechanism for knitting machines the combination of the switch to receive the impulse, the electro-magnet of the relay connected to the switch, the armature 42 carrying the brush 45, the contact piece 47, the stationary electro-magnet of the brake connected to said contact piece and the sliding armature 65 adapted to revolve with the shaft of the machine substantially as described.

17. In a stop mechanism for knitting machines the switch with its system of pivoted levers, the electro-magnet of the relay connected to the switch, the armature 42 carrying the brush 45, the insulated contact pieces 47 and 48 of the relay, the stationary and revolving electro-magnets of the brake and pulley connected respectively to contact pieces 47 and 48 and also by the other pole of the battery to the frame and armature of the electro magnet of the relay, and the revolving armature 65 adapted to slide on the main shaft between the two magnets 63 and 54 substantially as described.

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

JULES BUCHEL.

Witnesses:
JEAN MANDOT,
EMILE F. BUCHEL.