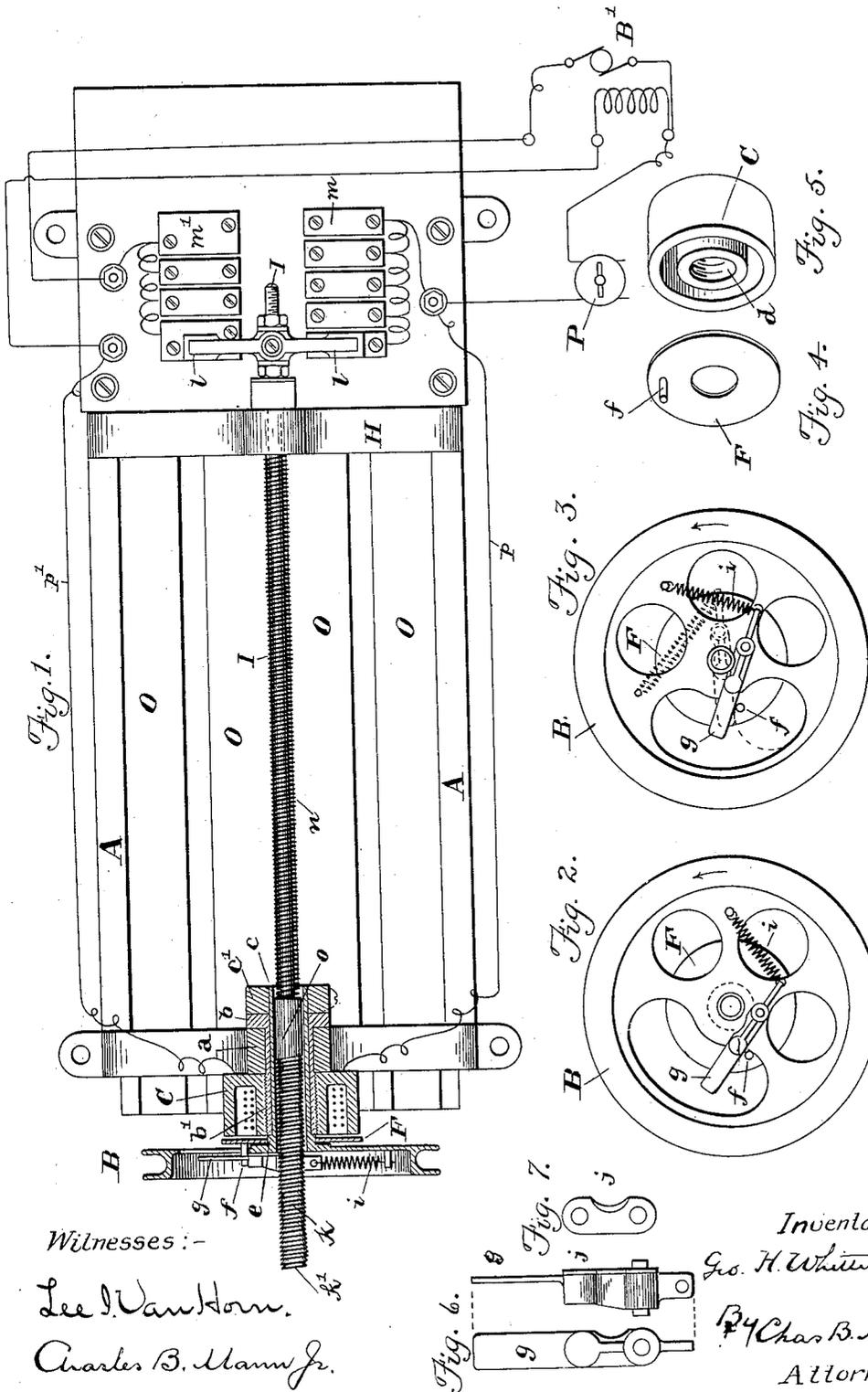


G. H. WHITTINGHAM.
MECHANISM FOR CONTROLLING ELECTRIC CIRCUITS.

(Application filed Apr. 5, 1898.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

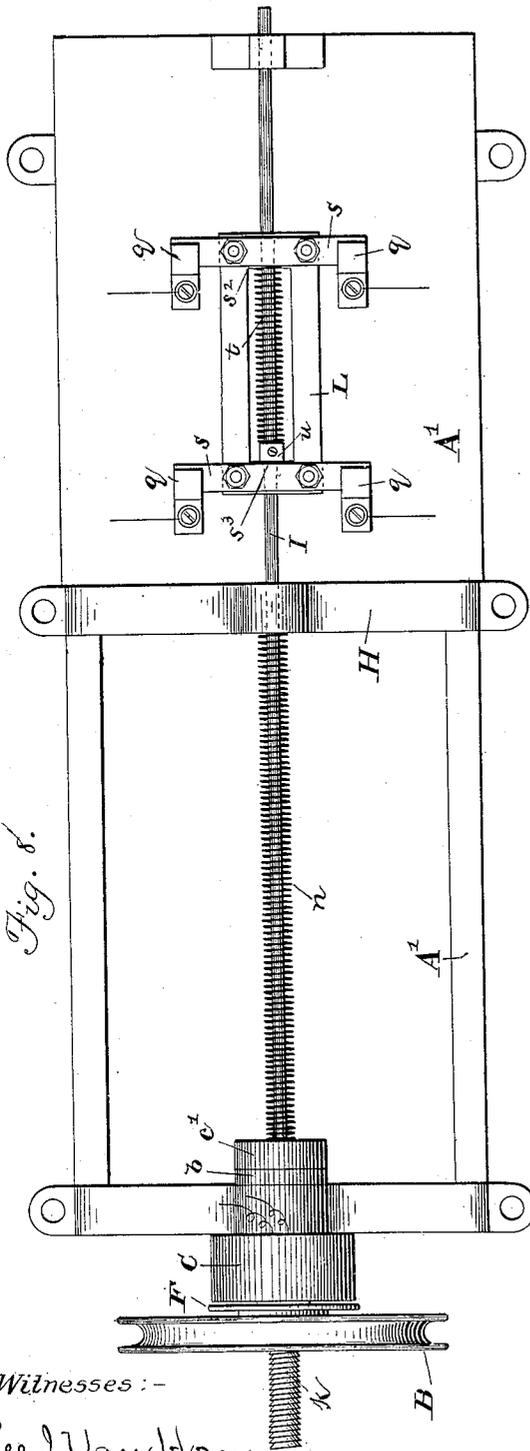


Fig. 8.

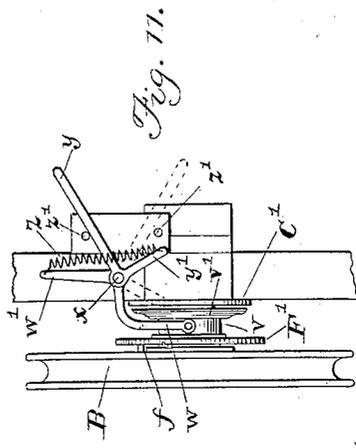


Fig. 11.

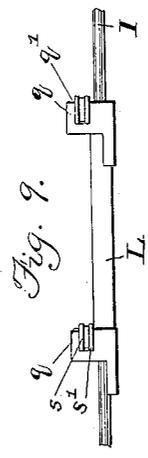


Fig. 9.

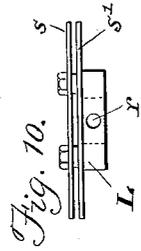


Fig. 10.

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UNITED STATES PATENT OFFICE.

GEORGE H. WHITTINGHAM, OF BALTIMORE, MARYLAND.

MECHANISM FOR CONTROLLING ELECTRIC CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 614,914, dated November 29, 1898.

Application filed April 5, 1898. Serial No. 676,526. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. WHITTINGHAM, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Mechanism for Controlling Electric Circuits, of which the following is a specification.

My invention relates to mechanism for controlling electric circuits, and has for its object to supply a powerful mechanical movement for operating controllers of electric circuits, which mechanical movement is adapted to be set in motion by a relatively small expenditure of energy. This is accomplished by the use of a rotary power supplied from any desirable source, which may be utilized as needed through the medium of the mechanism shown.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 represents a plan view of my device as employed to automatically cut out resistance in starting electric motors, certain parts of the operative mechanism being shown in section. Fig. 2 is a front view of a pulley to which the primary rotary power is imparted and shows the pivoted contact-lever in its normal disengaged position. Fig. 3 is also a view of the pulley and shows the position of the parts when the pivoted lever is in engagement with the screw. The final or third position of the pivoted lever is represented in broken lines. Fig. 4 is a perspective view of the rotary disk which engages with the electromagnet and revolves with the pulley. Fig. 5 is a perspective view of the shell of the stationary electromagnet. Fig. 6 shows two views of the pivoted contact-lever. Fig. 7 is a side view of the screw contact-plate detached from the pivoted lever. Fig. 8 is a modification showing my device applied to operate an electric switch. Figs. 9 and 10 are detail views of the switch parts. Fig. 11 shows a modification for the disk and magnet.

Referring now more particularly to the drawings, the letter A represents the frame of the machine, which is provided at one end with a bearing-box *a*, having a bushing *b*. A pulley-wheel B has an elongated hub *c*, which is mounted in said bushing and is free to revolve therein, but is prevented from longitu-

dinal movement by a collar *c'*, which is secured to the end of the hub by a set-screw *c*². The bushing *b* projects outwardly from the bearing-box toward the pulley B, and this projecting portion is screw-threaded on its outer surface, as at *b'*, and an electromagnet C, in circular form, has a bore *d*, which is screwed onto this projected end *b'*, the contact end of the magnet being coincident with the outer end of the bushing *b*.

Adjacent the wheel-body the hub *c* is provided with an annular stop or collar *e*, which determines the position of the wheel-hub with respect to the end of the bushing and leaves a space on the hub between the electromagnet and the side of the wheel. In this space and on the annular collar *e* is loosely mounted a metallic ring disk F, provided near its periphery with a pin *f*, which projects outwardly between the spokes of the pulley B. This disk is sufficiently near the poles of the electromagnet C to be drawn to the same when the latter is energized.

The wheel B carries on its outer face a lever *g*, pivoted at *h*, the edge of which is always caused to bear against the pin *f* by the action of the spring *i*, one end of which is secured to the wheel-spoke and the opposite end attached to said lever. A detachable plate *j* is secured to the lever *g*, as shown in Fig. 6, and has a curved knife-edge, for a purpose to be presently described.

The machine-frame has at its other end a cross-bar H, through which loosely passes a longitudinal rod I. One end of this rod is screw-threaded at *k* and loosely passes through the hub *c* of the pulley-wheel B. The opposite end of said rod is provided with a sliding contact-shoe *l*, which is adapted to slide over the two parallel rows of resistance contact-plates *m m'* to gradually cut out the resistance in starting an electric motor B'. The contact-shoe in this form of device is the movable part which proximately or immediately controls or affects the circuit. In this case by moving it will cut out resistance from the circuit. The spiral spring *n* is around the rod I and is interposed between the cross-bar H and the enlarged portion *o* of the rod which adjoins the screw *k*. I have constructed these devices with tubes O extending longitudinally of the machine-frame A, and inclosed

the resistance-coils in said tubes; but for the present case it is only necessary to consider the coils in connection with plates $m m'$.

The operation of the parts thus far described is as follows: Rotary motion is to be imparted to the wheel B from any convenient source. This rotary motion may, if desired, be transmitted from the motor itself when the latter is started. If, as shown in Fig. 1, my controlling device is applied to cut out the resistance in starting an electric motor, the switch P must be moved, when the current will flow to one row of resistance-plates m , to the shoe l , to the other row of plates m' , and to the motor B'. A small portion of the current will also flow along the line p to the electromagnet C and return along line p' . The electromagnet C may be energized either by direct electrical connection with the motor-circuit, as here shown, or by a separate battery-circuit. The instant the magnet C is energized the metallic ring disk F will be attracted thereto and held in contact with same as long as the circuit is maintained. Now by reference to Fig. 2 it will be seen that the wheel B will revolve in the direction indicated by the arrow and the lever g on the wheel will be carried around with it; but by reason of the fact that one end of the lever bears against the pin f (which at this instant is stationary, being fixed to the disk F, just attracted to the magnet) as the wheel B revolves the position of the lever g will be changed and forced to assume the position shown in Fig. 3, where its knife-edge plate j engages the screw-thread k of the stationary rod I. For the time being this lever practically becomes a fixed part of the wheel. The pin f , being in contact with the disk F also to revolve while still magnetically held in contact with the electromagnet, the disk sliding around on the magnet as the wheel B revolves. The magnet thus acts as a brake on the disk. Now as the screw-rod I does not revolve, but can move only endwise, the action of the revolving plate j , which engages the screw k , is to impart a longitudinal motion to the rod I and cause the contact-shoe l to move from the position shown in Fig. 1 over the resistance contact-plates $m m'$, and thus gradually cut out the resistance in starting the electric motor B'. The rod I continues to move longitudinally, as stated, until the plate j runs off the end k' of the screw. At this instant the lever g ceases for a moment to be rigid with respect to the wheel, and consequently the resisting pressure of the pin f , which the brake action of the magnet occasions, again moves the lever until the spoke q of the wheel comes in contact with the pin f , and thereby forces the lever g to take the position shown in dotted lines in Fig. 3—that is, directly across the end k' of the screw-rod. The lever will then remain in this latter position during the running of the motor or as long as the electromagnet C

continues energized. When rod I and shoe l have been moved toward the right hand to the point of least resistance, the spring n will be compressed. It will be observed that when the said lever g is in this last position it bridges over the hole or opening of the hub of the wheel B, and in so doing prevents the rod I from moving back to its primary position, which is that shown in Fig. 1. When the electromagnet ceases to be energized, the disk F will be released from magnetic connection therewith and will then turn perfectly free, and in consequence the pin f of the disk will no longer serve to resist the pressure of the lever g , and thereupon the spiral spring i in contracting to its normal state will cause the lever g to return to its primary position, (shown in Fig. 2,) and the compressed spring n around the rod I will expand and force the rod to its primary position, as in Fig. 1, and thereby restore the shoe l to the position of greatest resistance.

In Figs. 8, 9, and 10 the movable device which immediately controls or affects the circuit is shown as a circuit make and break or switch. The construction of the pulley-wheel B and the lever which it carries, magnet C, ring disk F, screw-rod I, and spring n are all as in Fig. 1; but instead of a resistance to be gradually cut out when starting a motor there is shown a switch which may be used for any purpose. The letter q designates the four terminals of the circuit secured to a board A'. Each of these terminals has a lateral open notch q' . A reciprocating frame L has a hole r at each end through which the rod I is movable. This frame carries at each end two parallel spring-plates $s s'$, which when the frame is in one position take into the open notch q' of the terminals, as in Fig. 8, and thereby complete the circuit. A spiral spring t is on the rod I between the two ends of the frame L. One end of this spring bears directly against one end s^2 of the frame and the other end of the spring bears against a collar u , fastened rigidly on the rod I and in contact with the end s^3 of the frame.

The operation is as follows: Rotary motion being continually imparted to the wheel, a small current will be turned into a circuit, including the magnet C. The energizing of the magnet will attract the ring disk F and cause the lever g on the wheel to engage the threads of screw k . The rod I will thereby be moved endwise. Said rod will pass loose or free through the holes r . The collar u on the rod will gradually compress the spring t , which abuts against one end of the frame L. When the constantly-increasing pressure of this compressed spring becomes great enough to overcome the frictional grip of the spring-plates $s s'$, held in the notch q' , the spring-plates will suddenly disengage from the terminals q , and said plates and frame L will be forced violently toward the right hand in the present instance. In this action the circuit is instantly broken and sparking is avoided.

At this stage the spring t is relaxed and the other spring n on the rod is compressed. Now when the magnet C ceases to be energized the lever g will disconnect from the screw k , and at once the compressed spring n will expand and throw the frame L toward the left hand and cause the spring-plates $s s'$ to make quick contact with the terminals q , and thus establish the circuit.

I have thus far described the magnet C as the means for creating a friction or brake action on the revolving disk; but I will now describe a modification wherein a magnet is dispensed with. This modification is shown in Fig. 11. Here the ring disk F' has a neck v and a flange v' loosely mounted in the hub c of the wheel B . The ring disk has the pin f , which operates as in the other case. Instead of the circular face of the magnet for the disk to revolve against as a brake a stationary disk or plate C' is used, and a lever is applied to the neck v of the ring disk to press it in contact with the said stationary plate. A lever has two prongs w , which take on the neck v of the ring disk and is pivoted at x . The lever also has an upward-projecting arm w' . A bell-crank-shaped arm is also pivoted at x and has a grasp end y and a downward-projecting end y' . A spiral spring z connects the extremity of the upward-projecting arm w' and the extremity of the downward-projecting end y' . The grasp-arm y has a swing movement between two stop-pins z' . When the grasp-arm y is in the position shown, the tension of the spring z throws the two prongs w against the ring disk F' and serves to keep it away from the stationary or brake disk C' . This is the position the parts take when the lever g is not acting on the screw-rod. When the grasp-arm y is in the position indicated by broken lines, the lower end of the spiral spring z will be swung to a position on the opposite of a vertical line through the pivot x , and thereupon said spring will shift the two prongs w and press the ring-disk flange v' in contact with the stationary or brake disk C' , and as the ring disk F' revolves the disk C' will act as a brake just as the magnet in the other case.

Having thus described my invention, what I claim is—

1. In mechanism for controlling electric circuits, the combination of a movable device which immediately controls or affects the circuit; a screw which imparts motion to said device; a pulley-wheel carrying a lever which is adapted to engage the threads of said screw and thereby move it endwise in one direction; and means to place the lever in engagement with the screw.

2. In mechanism for controlling electric circuits, the combination of a movable device which immediately controls or affects the circuit; a screw which imparts motion to said device; a pulley-wheel carrying a lever which is adapted to engage the threads of said screw

and thereby move it endwise in one direction; means to place the lever in engagement with the screw; and means to move the screw in the opposite direction when the said lever disengages the screw.

3. In mechanism for controlling electric circuits, the combination of a movable device which immediately controls or affects the circuit; a screw which imparts motion to said device; a pulley-wheel carrying a lever which is adapted to engage the threads of said screw and thereby move it endwise in one direction; a device which loosely engages the said lever but revolves with the pulley-wheel; and a stationary electromagnet which attracts the said device and acts as a brake.

4. In mechanism for controlling electric circuits, the combination of a movable device which immediately controls or affects the circuit; a screw which imparts motion to said device; a pulley-wheel carrying a lever which is adapted to engage the threads of said screw and thereby move it endwise in one direction; means to move the screw in the opposite direction when the said lever disengages the screw; a stationary electromagnet; and a ring disk retarded by the attraction of the magnet and revolving with the wheel—said disk having provision for engaging the lever on the wheel.

5. In mechanism for controlling electric circuits, the combination of a movable device which immediately controls or affects the circuit; a revoluble pulley-wheel having an open-center hub; a rod which imparts motion to said movable device and at one end has a screw-thread which passes freely through said open center of the pulley-wheel; a lever pivoted on the wheel and adapted to engage the threads of the said screw and move it endwise one way; and a device which loosely engages the said lever but revolves with the pulley-wheel and is retarded by the attraction of the magnet.

6. In mechanism for controlling electric circuits, the combination of a movable device which immediately controls or affects the circuit; a revoluble pulley-wheel having an open-center hub; a rod which imparts motion to said movable device and at one end has a screw-thread which passes freely through said open center of the pulley-wheel; a lever pivoted on the wheel and adapted to engage the threads of the said screw and move it endwise one way; a spring on the wheel acting on said lever; and a spring around the screw-rod to move it endwise in the opposite direction when said lever disengages the screw.

7. The combination of a motor; a resistance in series with the armature of the motor when starting; a movable device which engages the said resistance to cut it out; a screw which imparts motion to said device; a pulley-wheel carrying a lever which will engage the threads of said screw to move it endwise in one direction to cut out the resistance; and means to

move the screw in the opposite direction and restore the resistance when the said lever disengages the screw.

8. The combination of resistance-coils; re-
5 sistance contact-plates; a movable shoe en-
gaging said plates; a screw-rod which imparts
motion to said shoe; a revoluble pulley-wheel
having an open center through which the said
screw-rod passes freely; a stationary electro-
10 magnet; means revoluble with the pulley-
wheel for engaging the threads of the screw-
rod and actuated by the attraction of the said

magnet, whereby the shoe will be moved in the direction of cutting out the resistance; and means for moving the screw-rod and shoe 15 in the opposite direction when the magnet is no longer energized.

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

GEORGE H. WHITTINGHAM.

Witnesses:

CHARLES B. MANN, JR.,
CHAPIN A. FERGUSON.