No. 835,415. PATENTED NOV. 6, 1906.

E. W. GOUGH.

SWITCH.

APPLICATION FILED MAY 3, 1905.

Fig. 1.

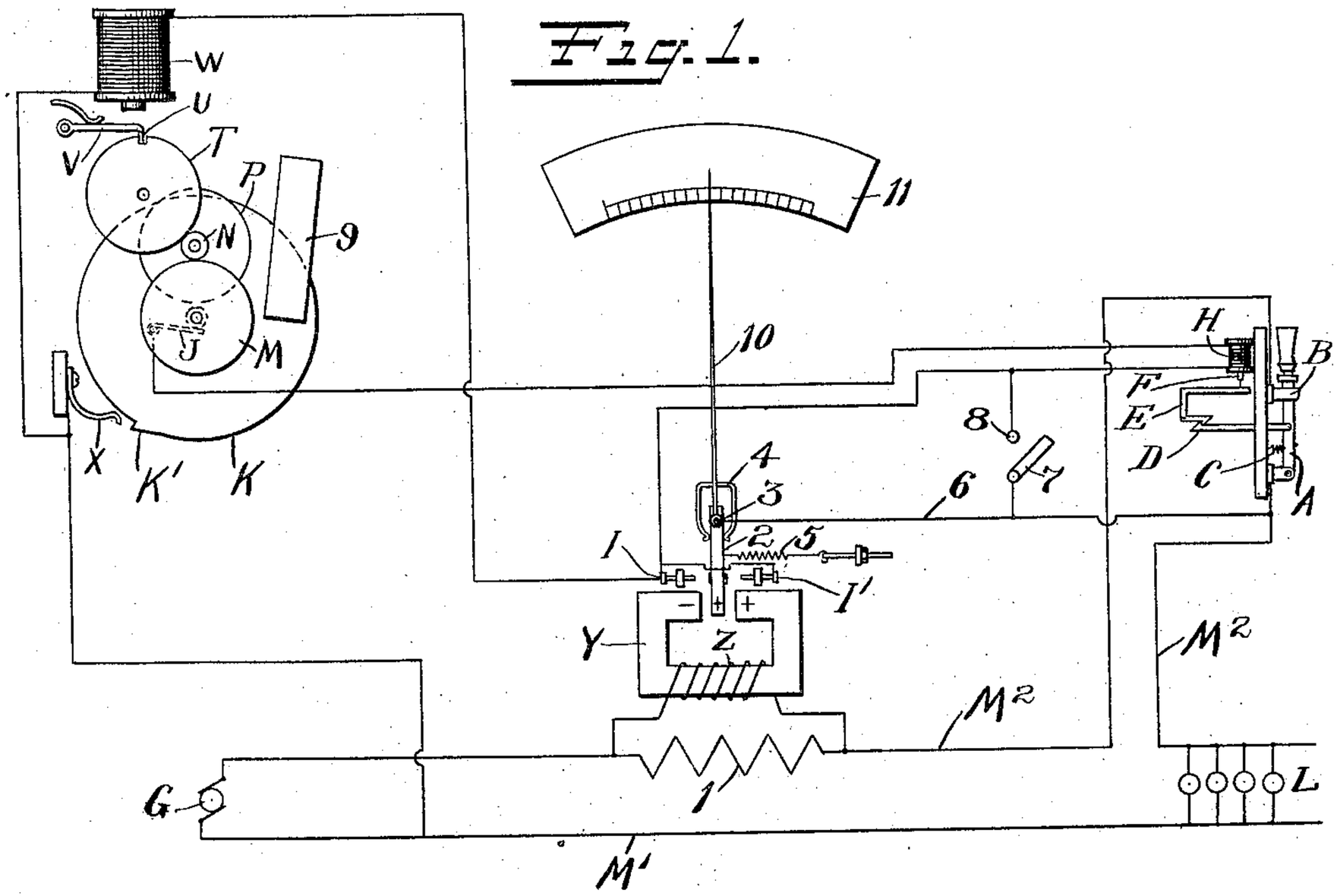


Fig. 2.

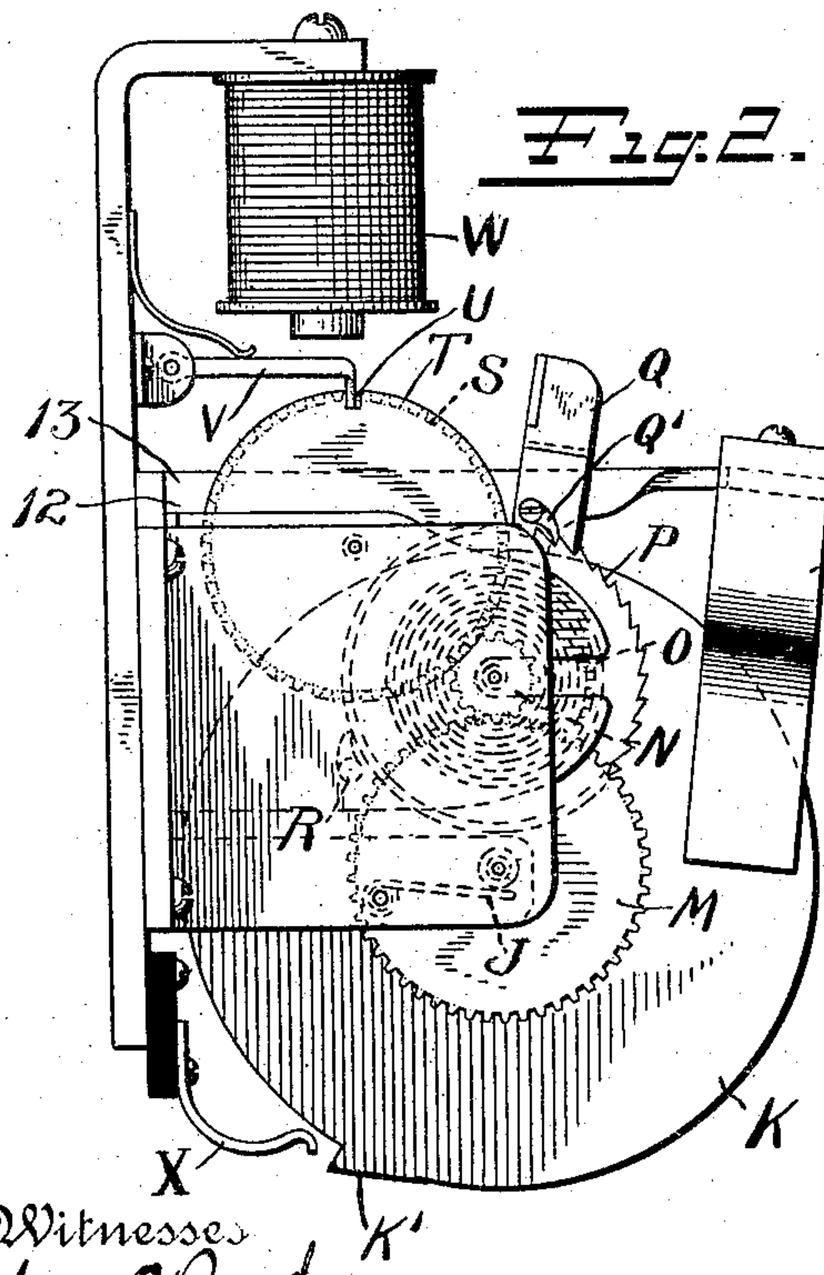
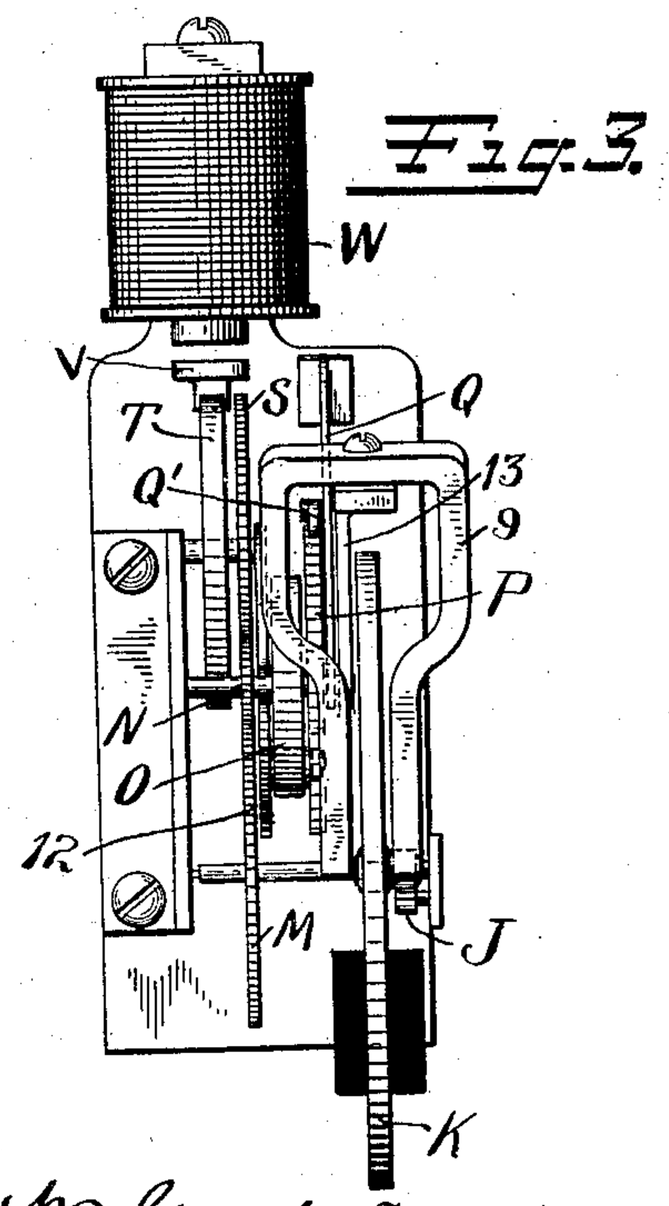


Fig. 3.



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SWITCH.

No. 835,415. Specification of Letters Patent. Patented Nov. 6, 1906.

Application filed May 3, 1905. Serial No. 258,681.

To all whom it may concern:

Be it known that I, EDGAR W. GOUGH, a citizen of the United States, residing at Great Barrington, county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Switches, of which the following is a full, clear, and exact description.

My invention relates to switches, and has for its object to produce a switch-actuating mechanism which shall actuate a switch-arm in response to conditions only when such conditions shall persist for a substantial period of time. I have shown it in such relation that the switch is opened when abnormal conditions persist in a circuit. It is, however, useful in other relations, such, for instance, as when it is desired to close a switch after certain conditions have arisen and been maintained.

Heretofore circuit-breakers have been constructed which operate whenever the conditions become abnormal. It is, however, very often desirable that the circuit-breaker shall not operate at once, since the presence of such abnormal conditions for a very short period is usually not a matter of serious importance. By providing a circuit-breaker which only acts after such conditions have persisted for a given length of time the circuit is only opened when necessary.

The invention may be embodied in automatic switches or in connection with switches which are not automatic, but in which the devices are put into action by manual operation, so that in case the device is used in connection with a circuit-breaker the load will be left on the circuit for a certain specified time after a switch has been so operated.

The object is to provide a cheap substantial construction which can be easily adjusted and set to considerable degrees of accuracy. The time of operation depends upon the proportions of the various parts, and in the embodiment shown can be easily changed by changing the ratio of the gearing employed.

Referring to the drawings, Figure 1 represents a diagrammatic view of apparatus embodying my invention, showing connections to the circuit. Fig. 2 represents a side elevation of one feature of the invention. Fig. 3 represents an end elevation of the same.

Referring more particularly to the drawings, A represents a switch-arm engaging the contacts B, so as to close the circuit between the generator G and the load L. C is a spring tending to force the switch-arm A away from the contact B. D is a latch engaged by the pawl E, which is connected to the core F of a solenoid H. This switch may be regarded as representing an electrically-controlled circuit-breaker of any ordinary type.

The solenoid H is in a circuit leading from the contacts I I′ to a brush J, bearing on the hub of a conducting-disk K, which is insulated from its shaft and by means of gears M and N is driven by the spring O, this spring O being capable of revolving the disk K a considerable number of times and constituting an independent source of power. The spring O has its outer end connected to the ratchet-wheel P and its inner end connected to the pinion, on which that wheel is mounted, and is wound by the lever Q carrying the pawl Q′. The lever Q is fulcrumed on the shaft of the wheel P. The pawl R also engages the wheel P and prevents it from moving backward. The gear N likewise meshes with gear S, which carries a disk T, the two being mounted on the same shaft. The disk T has a slot U, with which a spring-pressed pawl V engages. This pawl is of magnetic material and forms the armature of an electromagnet W, suitably supported above it. The conducting-disk K is provided with a projection K′, which is adapted to make momentary contact with a contact X, which is connected to the main M′. The electromagnet W is connected in shunt around the solenoid H, brush J, disk K, projection K′, and contact X.

From the foregoing it will be seen that if the contacts I I′ were electrically connected with the limb M^2 of the circuit the magnet W would lift the detent V, permitting the train to revolve, and that if such electric connection with the main M^2 were maintained the disk K when the projection K′ made contact with the contact X would complete the circuit through the solenoid H, which thereupon would raise its latch E and permit the spring C to force the switch-arm A away from the contact B. If, however, contact with the main M^2 after it had once been made so as to energize the magnet W and withdraw the pawl U from the disk S were not maintained, the disk K, when the projection K′ made contact with the brush X, would not com-

plete the circuit through the solenoid H, since that circuit would not be connected to the limb M^2. The solenoid H would, therefore, not be energized and the switch-arm A not released.

In order to automatically actuate the device, I provide a relay having a core Y, energized by a coil Z, preferably when intended to respond to overloads or reverse currents in shunt to a resistance 1 in series with the load. The coil Z normally magnetizes the poles of the core Y with opposite polarities, as indicated. Between the poles of the electromagnet thus produced is located a polarized armature 2, pivoted at the point 3. This polarized armature is maintained in a central position by the spring 4 and is subject to adjustment by a spring 5. It is connected to the main M^2 by a conductor 6, and when sufficiently moved in either direction makes the electric contact with one of the terminals I I'. If, now, there is an overload, the polarized armature 2 is drawn to the left until electric contact is made with the terminal I. This energizes the magnet W, which withdraws the pawl V from the disk U, whereupon the train including the disk K begins to operate. If the conditions persist long enough so that the disk K makes one complete revolution, thus bringing the projection K' into contact with the brush 7 before the normal conditions of the circuit have been restored, a circuit is completed from the main M' through the brush X, projection K', disk K, brush J, solenoid H, contact I, armature 2, conductor 6, to the main M^2, resulting in energizing the solenoid H and withdrawing the latch E, so as to release the switch-arm A. In case, however, the conditions do not persist until the projection K has made contact with the brush X, the electric circuit through the solenoid H is not completed by contact between the projection K' and the brush X, being broken at the contact I, and therefore the switch-arm A is not released.

In case of a reverse current the poles of the core Y are magnetized in the reverse direction, with the result that the armature 2 is drawn to the right, so that electric contact is made with the terminal I'. Under those conditions the same circuit through the magnet W is established, and if the same abnormal conditions are maintained until the projection K' makes contact with the brush X a circuit is established through the solenoid H in the same manner as before described, and the switch-arm A is released.

In case it is desired to operate the magnet W manually a switch 7 is provided at any convenient point. When this switch is moved, so as to make engagement with the contact 8, the circuit through the magnet W is established, and if the switch 7 is maintained closed sufficiently long the circuit through the solenoid H is established by the engagement of the projection K' with the brush X, so that the switch-arm A is released as before described.

In order to retard the movement of the disk K, I provide any suitable retarding means—such, for instance, as a magnet 9 embracing the disk and acting to set up eddy-currents therein.

The armature 2 of the relay may constitute the movable element of an indicating device, so as to indicate to the eye the condition of the circuit. In order that it may do this, I connect thereto a pointer 10, whose position is indicated by a scale 11, as shown. When provided with proper contacts, any suitable indicating mechanism may be substituted for the relay above described. In case it is desired to provide against overloads only the contact I' may be omitted.

An intermediate plate 12, projecting from the base, supports the inner end of the shaft of the gear S and the pawl R. It also separates the spring O from the gears of the train. The side plate 13 supports the rear end of the shaft on which the disk K is carried and also supports the magnet 9.

My invention admits of various modifications and can be used for various purposes. I do not desire to limit it to the particular arrangements of parts or to the particular arrangement of circuit connections shown, since others will be obvious to those skilled in the art.

What I claim is—

1. In a time-controlled switch, the combination of a switch-arm, electromagnetic means for releasing the same, a circuit for said electromagnetic releasing means, and means for closing said circuit, consisting of a power-actuated train, a detent for restraining said train, electromagnetic means for releasing said detent and contact devices connected with said circuit and brought into and out of, engagement by one continuous action of said train, during a part of its cycle.

2. In a time-controlled switch, the combination of a switch-arm, electromagnetic means for releasing the same, a circuit for said electromagnetic releasing means, and means for closing said circuit, consisting of a power-actuated train, a detent for restraining said train, electromagnetic means for releasing said detent, and contact devices connected with said circuit and brought into and out of, engagement by one continuous action of said train during a part of its cycle, and means for supplying a retarding force to said train.

3. In a time-controlled switch, the combination of a switch-arm, electromagnetic means for releasing the same, a circuit for said electromagnetic releasing means, and means for closing said circuit, consisting of a power-actuated train, a detent for restraining said train, electromagnetic means for releasing said detent, and contact devices con-

nected with said circuit and brought into and out of, engagement by one continuous action of said train, during a part of its cycle, and a magnetic brake retarding said train.

4. In a time-controlled switch, the combination of a switch-arm, an electromagnetic device for releasing the same, a circuit for said electromagnetic device, a slow-acting device for closing and opening said circuit during a part of one continuous movement, a detent for restraining said slow-acting device, a second electromagnetic device for releasing said detent, and a relay controlling said second electromagnetic device.

5. In a time-controlled switch, the combination of a switch-arm, an electromagnetic device for releasing the same, a circuit for said electromagnetic device, said circuit having two sets of contacts, a slow-acting device which during part of one continuous movement closes and opens said circuit at one of said sets of contacts, a detent for restraining said slow-acting device, a second electromagnetic device for releasing said detent, and a relay acting to control the circuit through said second electromagnetic device, and also the circuit through said first electromagnetic device, at the second set of contacts.

6. In a time-controlled switch, the combination of a switch-arm, an electromagnetic device for releasing the same, a circuit for said electromagnetic device, said circuit having two sets of contacts, a slow-acting device which during a part of one continuous movement closes and opens said circuit at one of said sets of contacts, a second electromagnetic device for controlling said slow-acting device, and a polarized relay acting to close the circuit through the said first electromagnetic device at the other of said sets of contacts, and also the circuit through said second electromagnetic device when magnetized by an abnormal current.

7. In a time-controlled switch, the combination of a switch-arm, an electromagnetic device for releasing the same, a circuit for said electromagnetic device, a slow-acting device for closing and opening, said circuit at one point during one continuous movement, a second electromagnetic device for controlling said slow-acting device, an independent circuit therefor, and a relay controlling said independent circuit and also at a second point, the circuit through said first electromagnetic device.

8. The combination of a gear-train, a brake therefor, means adapted to drive said train when free to move always in a forward direction, an electric circuit having two sets of contacts, an electromagnet controlled by said circuit, means actuated by a continuous forward movement of said train so as to make and break said circuit at one of said sets of contacts, a detent for restraining said train from forward movement and an electromagnetic device for withdrawing said detent, a circuit for said electromagnetic device and means for closing said circuit and also the first-mentioned circuit at the second set of contacts.

9. The combination of a gear-train, a brake therefor, means adapted to drive said train when free to move always in a forward direction, an electric circuit having two sets of contacts, means actuated by a continuous forward movement of said train so as to make and break said circuit, at one set of contacts, a relay for making and breaking said circuit at the second set of contacts, a detent for restraining said train from forward movement, an electromagnetic device for withdrawing said detent, and a circuit through said device also controlled by said relay.

Signed at Great Barrington, Massachusetts, this 1st day of May, 1905.

EDGAR W. GOUGH.

Witnesses:
F. L. SNOW,
J. C. FREIN.