J. L. CREVELING.

ELECTRIC SWITCH.

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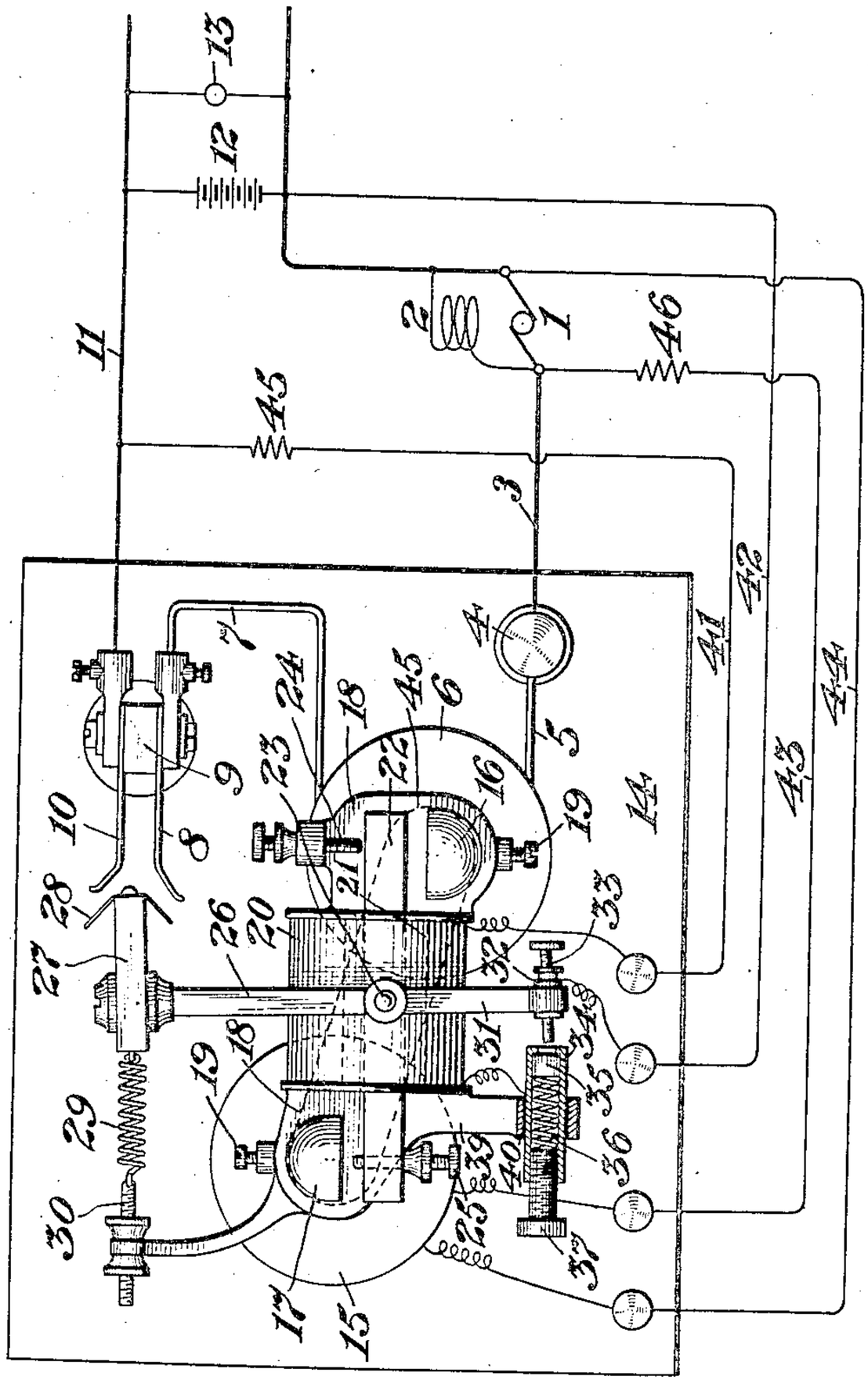
963,996.

Patented July 12, 1910.



WITNESSES

Chas. J. Clagett

B. J. Stockley

INVENTOR

John L. Creveling

UNITED STATES PATENT OFFICE.

JOHN L. CREVELING, OF NEW YORK, N. Y., ASSIGNOR TO SAFETY CAR HEATING & LIGHTING COMPANY, A CORPORATION OF NEW JERSEY.

ELECTRIC SWITCH.

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To all whom it may concern:

Be it known that I, JOHN L. CREVELING, of New York, of the county of New York, State of New York, have invented a certain new and useful Improvement in Electric Switches, as set forth in the annexed specification and drawing forming a part thereof.

My invention pertains to that class of switches designed to operate automatically under predetermined conditions and has for its principal object to provide means whereby a circuit between a generator and a storage battery or other translating devices will be automatically closed when the voltage of the generator shall reach a certain predetermined point, and to automatically vary the point of operating or closing to compensate for changes in voltage of the battery or other translating devices.

In the drawing (1) designates a dynamo or generator provided with the ordinary field coil (2) and from one pole of which is led the main (3) to the binding post (4) of my improved switch. From the binding post (4) is led the coarse winding (5) of the bobbin or coil (6) from whence the other end of the winding (7) is led to the contact piece (8) carried by the insulating support (9) upon the other side of which is a like contact piece (10) in connection with the main (11) which may be connected to the voltage battery (12) and lamps or other translating devices (13) the opposite terminals of which are connected back to the generator as indicated.

(14) represents the base of the switch which may be made of any insulating material and upon which are mounted the magnet cores (16) and (17) which may be connected together magnetically as by the yoke indicated in dotted lines (45).

The coils (6) and (15) are slipped upon the cross cores (16) and (17) and held in place by the frame (18) which fits over the pole pieces of (16) and (17) and is held in place as by the screws (19). This frame (18) carries the bobbin or solenoid (20) having an opening therethrough as indicated in dotted lines (21) within which is hinged or pivoted the armature (22) as by the pivot or shaft (23).

The limit of movement of the armature (22) is predetermined in one direction by screw (24) and in the other direction by screw (25). Upon the shaft (23) is connected the lever (26) carrying the insulating member (27) to which is attached the contact member (28) in such manner that by swinging the lever (26) against the action of the spring (29) adjustable as by the screw (30) member (28) may be made to complete the circuit through members (8) and (10). The lever (26) is provided also with an extension (31) carrying insulating bushing (32) threaded to hold the screw (33) which when the lever (26) is rocked so as to complete the circuit as above mentioned will pass through the small aperture in the shell (34) and contact with the member (35) so that further motion of (26) will cause compression of the spring (36) which is adjustable as by screw (37). The shell (34) is carried by the member (39) which is a part of the frame (18) and is insulated therefrom as by means of the bushing (40).

One end of the fine winding of magnet or solenoid (20) is connected with the battery (12) as by wire (41) while the other end of the winding of solenoid (20) is connected to the shell (34). The screw (33) is connected to the opposite side of the storage battery as by wire (42).

The magnet or coil (15) comprises a fine winding in shunt across the generator as by wires (43) and (44).

Resistances (45) and (46) may be placed in series with coils (20) and (15) if desired for the purpose of adjusting the current in said coils. The coils (20) and (15) are wound in such manner that their magneto-motive forces tend to set up magnetic fields in reverse directions through the armature (22) as will hereinafter more plainly appear.

The winding of core (6) is such that current flowing through the same from the generator to the battery generates a magneto-motive force tending to assist the coil (15) while current flowing back from the battery through the coil (6) will oppose the magnetic action of coil (15).

The operation of my improved switch is as follows: If the generator (1) has its armature revolved the field (2) will build up in a well known manner, and current will begin to flow from the generator through wire (43) winding of coil (15) and wire (44) back to the generator.

When the generator shall have reached any appreciable voltage say for instance one-

quarter the usual voltage of the storage battery (12) proper adjustment of the spring (29) will then allow the magnet (15) to attract the armature (22) against the action of spring (29) in such manner as to cause contact between the screw (33) and the spring plunger (35) which will arrest any further movement of the lever (26) until the spring (36) shall be compressed.

The contact of screw (33) with the member (35) will allow current to flow from the storage battery through wire (41) to the winding of the solenoid (20) thence to the member (35) screw (33) and back to the battery through wire (42). The action of this current as above mentioned will be to tend in a measure to reverse the direction of the magnetic lines set up by the coil (15) but inasmuch as there is an air gap between the members of high magnetic permeability energized by each coil the resultant action instead of a number of magnetic lines which is the difference between those set up by each bobbin will be two independent though coöperating resultant magnetic fields causing repulsion between the armature (22) and the pole pieces (16) and (17) until the magneto-motive force exerted upon the armature (22) by the winding (15) be sufficient to actually overcome the action of winding (20) and cause magnetic lines to pass through the armature (22) in a direction opposite to those normally set up by the bobbin (20). It is obvious that the point at which this reversal shall take place depends both upon the strength of the magnetic field set up by (20) and the magnetic field set up by (15). It is also plain that if spring (36) be properly adjusted and arranged and coils (15) and (20) be properly designed and adjusted as by means of resistances (46) and (45) and the air gaps properly adjusted as by means of screw (24), coil (15) can be made to move armature (22) at a predetermined voltage of the generator so as to cause contact (28) to connect contact members (8) and (10) so that current from the generator will tend to flow through the said contacts to the storage battery through wire (11) and thence back to the generator as shown. It is also plain that by proper adjustment of the air gaps when the switch is closed as by means of screw (25) that the switch may be made to open again if the voltage shall have fallen to such a point that the current in the coil (15) shall have appreciably decreased. Further the current passing from the generator to the battery and translating devices will set up a magneto-motive force through the instrumentality of coil (6) assisting the coil (15) so as to hold the armature (22) to keep the circuit through members (8), (28) and (10) closed. It is also obvious that any current flowing back from the battery circuit through the winding (6) to the generator will tend to weaken the resultant magneto-motive force set up by coils (6) and (15) and allow the switch to open.

From the foregoing it is plain that by properly adjusting the various coils, springs, and air gaps, the switch may be caused to close when the generator voltage shall equal that of the battery when said adjustment is made. Further that proper design and adjustment may also cause the effect of the current in bobbin (20) to so vary with the voltage of the storage battery that the switch will close at different voltages of the generator depending upon the voltage of the storage battery (12) for instance, adjustment may be made so that if the storage battery voltage be say 60 volts the switch will close at practically 60 volts across the generator and open at a very slight decrease below 60 volts but if the batteries be charged until their voltage shall be say 80 volts the switch will not close until the voltage across the generator is practically 80 volts and will open at a slight fall below this voltage. Therefore it is obvious that the switch will open and close with practically no difference of potential across the members (8) and (10), preventing injurious sparking at these contacts as well as fluctuation in voltage throughout the various translating circuits.

I do not wish in any way to limit myself to any of the exact constructions or details shown in the attached drawing which is a mere diagrammatic representation of an electric system embodying the essentials of my invention and it is quite obvious that wide departure in forms of construction may be taken without departing from the scope of my invention.

Having thus described my invention what I consider novel and desire to protect by Letters Patent is as set forth in the following claims:

1. An electro-magnetic switch comprehending a plurality of coils tending to set up a magnetic field, a path of low magnetic reluctance for a portion of said field, a member of low magnetic reluctance contained in the remaining portion of said field and movable therein, a coil surrounding said member to set up magnetic lines therethrough opposed to those set up by one of the first mentioned coils and under predetermined conditions reversed thereby and coöperating with said magnetic field to effect the movement of said member to operate the switch.

2. An electro-magnetic switch comprehending means for setting up a magnetic field, means within said field tending to set up an independent magnetic field opposed thereto, and reversed thereby combined with a movable member exposed to the joint action of said fields and moved by the effect of said reversal to operate the switch.

3. An electro-magnetic switch comprehending a winding adapted to be placed in series with a generator, a core for said winding, a winding adapted to be placed in shunt to a generator, a core for said winding, a path of low magnetic reluctance connecting said cores combined with a member of low magnetic reluctance in the magnetic field between said cores and provided with a winding adapted to be placed in circuit with a storage battery tending to set up a magnetic flux through said member of low reluctance in reverse direction to the magnetic field above mentioned.

4. The combination with a generator and storage battery and a switch having a movable member the motion of which opens and closes said switch and a plurality of actuating windings for said switch of means whereby the energizing of one of the windings causes slight movement to said movable member at a voltage insufficient to close said switch and means whereby said movement completes a circuit through another winding so that the joint action of said windings closes said switch.

5. The combination with a generator and a storage battery in circuit therewith, of an electro-magnetic switch controlling said circuit comprehending a winding in series with the generator, a core for said winding, a winding in shunt to the generator, a core for said winding, a path of low reluctance connecting said cores, a member of low magnetic reluctance in the magnetic field between said cores provided with a winding in circuit with the storage battery tending to set up a magnetic flux through said member of low reluctance in reverse direction to the magnetic field above mentioned.

JOHN L. CREVELING.

Witnesses:
C. J. STOCKLEY,
E. E. ALLBEE.