R. E. WETTER.

AUTOMATIC SERVICE SWITCH.

APPLICATION FILED AUG. 3, 1912.

1,092,415.

Patented Apr. 7, 1914.

2 SHEETS—SHEET 1.

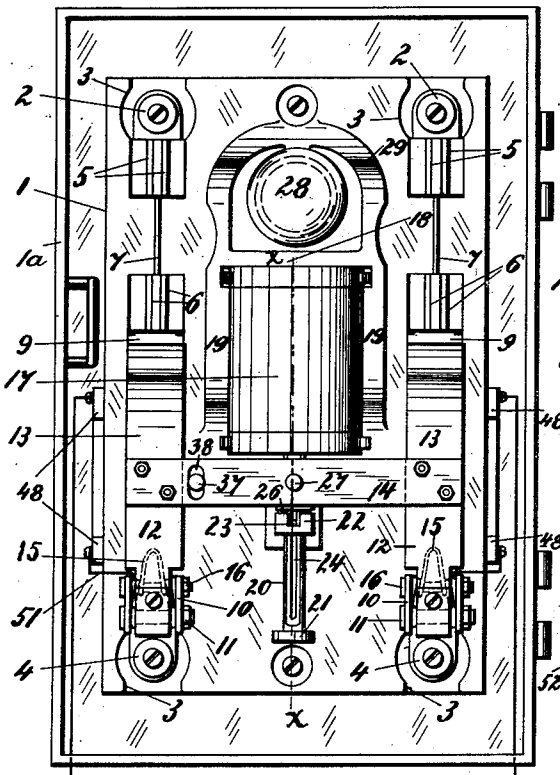


Fig. 1.

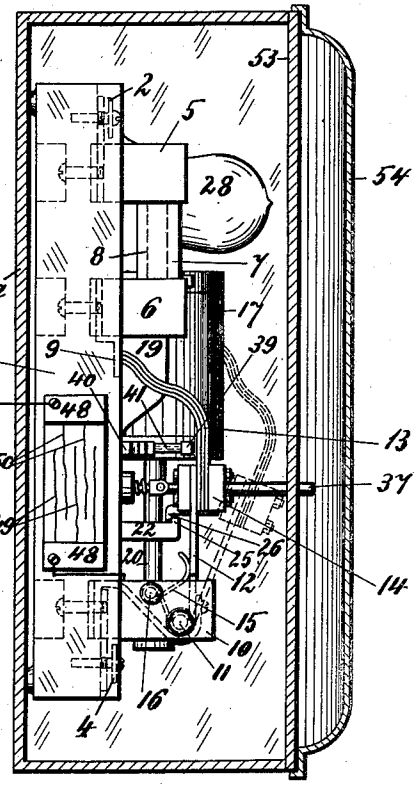


Fig. 2.

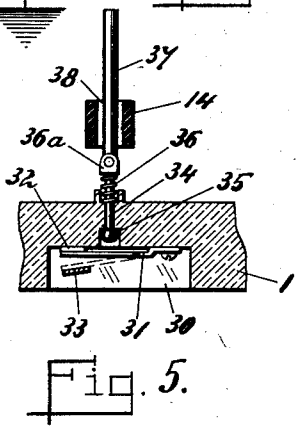


Fig. 5.

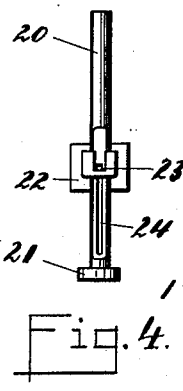


Fig. 4.

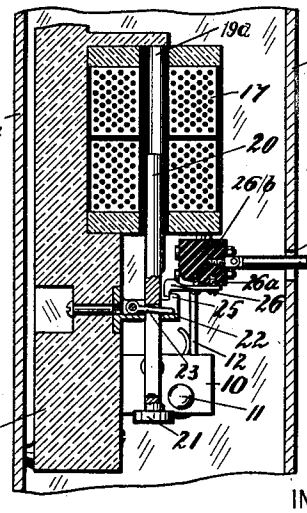


Fig. 3.

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2 SHEETS—SHEET 2.

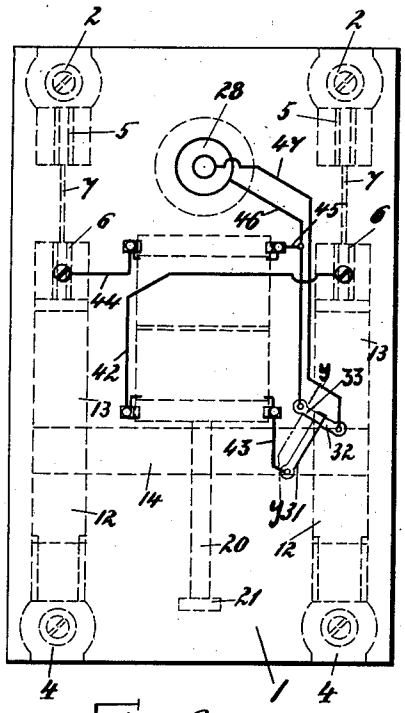


Fig. 6.

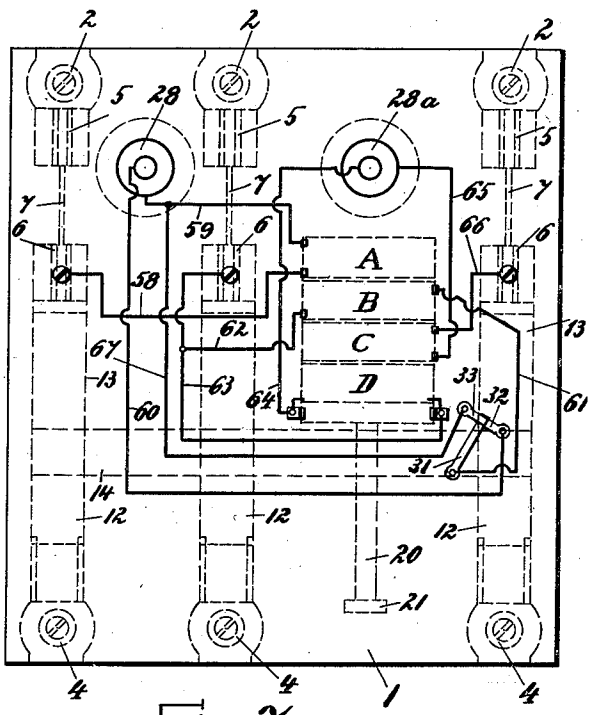


Fig. 7.

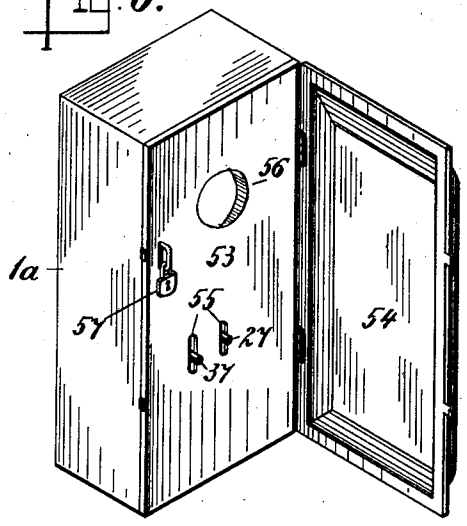


Fig. 8.

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AUTOMATIC SERVICE-SWITCH.

1,092,415. Specification of Letters Patent. Patented Apr. 7, 1914.

Application filed August 3, 1912. Serial No. 713,156.

To all whom it may concern:

Be it known that I, RALPH E. WETTER, a citizen of the United States, residing at Dallas, in the county of Dallas and State of Texas, have invented certain new and useful Improvements in Automatic Service-Switches, of which the following is a specification.

My invention relates to an automatic service switch, and its object is to provide a switch by means of which an electric circuit including the interior wiring of a building may be automatically broken when the voltage of the circuit increases through any cause to a dangerous or abnormal degree. Such an increase of voltage may result from the primary coils of a transformer becoming overheated and burning through their insulation, thus establishing a short circuit with the secondary coils by which electricity is furnished to various buildings. A temporary high tension current may also be generated in the service wires due to the same being struck by lightning or due to the formation of a temporary short circuit between a primary and secondary wire caused by a heavy rain or by flowing water. The generation of a high tension current in the wiring of a building not only endangers the occupants of the building, but creates a fire risk, endangering the property, and it is the object of the present invention to eliminate such danger to life and property.

It is a further object of the invention to provide an automatic service switch, which will be entirely concealed within a casing ordinarily kept locked, thus preventing any unauthorized parties from endangering themselves by tampering with the switch, and furthermore impeding any attempt to defraud the company furnishing the current by rendering the switch difficult of access.

A still further object is to provide an automatic service switch that will be correlated with an incandescent light in such a manner that the burning of the light will serve to indicate a current of normal tension flowing through the circuit.

Finally the object of my invention is to provide a device of the character described that will be strong, durable, simple and efficient and comparatively easy to construct, and also one that will not be likely to get out of order.

With these and various other objects in view, my invention has relation to certain novel features of the construction and operation, an example of which is described in the following specification and illustrated in the accompanying drawings, wherein:

Figure 1 is a front view of my invention, the cover of a casing in which the device is to be mounted being removed. Fig. 2 is a view of the device in side elevation, the metal casing within which the device is contained being shown in section. Fig. 3 is a detail sectional view showing an electromagnet which serves to automatically actuate the switch to its open position, the section being taken upon the line X—X of Fig. 1. Fig. 4 is a detail view of an iron plunger which forms a core for the solenoid magnet illustrated in Fig. 3. Fig. 5 is a fragmentary sectional view showing a small switch which forms a supplementary feature of the automatic switch, the section being taken upon the line Y—Y of Fig. 6. Fig. 6 is a rear view of the base upon which the switch is mounted, the wiring of the switch being diagrammatically shown. Fig. 7 is a rear view of a modified form of switch intended for use in connection with a three phase installation the wires again being shown diagrammatically. Fig. 8 is a perspective view of a casing in which the automatic service switch is to be mounted showing one of the covers in an open position.

Referring now more particularly to the drawings, wherein like reference characters designate similar parts in all the figures, the numeral 1 denotes a rectangular base preferably formed of porcelain, which base is vertically mounted within a metallic rectangular casing 1^a, said casing being vertically mounted upon a wall or some other supporting surface. Any suitable means may be employed to rigidly secure the base 1 to the back wall of the casing.

Upon the upper extremity of the base 1 there are mounted two binding posts 2— positioned respectively adjacent to the lateral edges of said base. These binding posts will preferably be partly recessed in suitable apertures 3 formed in the front surface of the base. The binding posts 2 are intended to receive the extremities of two service wires (not shown). At the lower extremity of the base 1, a second pair of binding posts 4 are provided, each being located adjacent to one of the lateral edges of the base and being partially recessed in an aperture 3, similar to those receiving the

binding posts 2. The binding posts 4, are intended to be respectively connected with two wires (not shown) and leading to the lights and other electrical equipment of a building. Each of the binding posts 2 is rigidly connected with a socket forming contact 5, and each contact 5 is vertically spaced from another socket forming contact 6. Each vertically alined pair of contacts 5 is made to receive the extremities of a fuse comprising two strips of mica 7, between which a fusible conductor 8 is mounted. Each of the contacts 6 has rigid connection with a contact member 9 projecting downward from the correlated contact and flush with the front surface of the base 1. Each of the binding posts 4 has a rigid electrical connection with a bracket comprising two parallel rectangular plates 10, said plates being also parallel to the lateral edges of the base 1. Each pair of bracket forming plates 10 supports the extremities of a pin 11, and each of said pins acts as a pivot for an upwardly extending switch arm 12, the arm being so constructed as to partially encircle the correlated pin, and having the portion thus constructed extended toward the base at an upward inclination and rigidly secured to the correlated binding post 4. The upper portion of each switch arm will be preferably formed of several strips of thin metal 13 rigidly connected, said portion being curved inwardly toward the base, and adapted to contact at its free extremity with one of the contact members 9. The two switch arms are held in a rigid and parallel relation by a cross piece 14 formed of any suitable insulating material. Each switch arm is acted upon by a wire spring 15, having one end portion mounted upon the correlated pin 11 and the other end portion bearing outwardly upon the lower portion of the correlated switch arm, the intermediate portion of the spring being coiled upon a pin 16. Thus it is obvious that the two springs 15 impress upon the switch a tendency to swing outwardly about the pivots formed by the pins 11, thus breaking contact between the free switch extremities and the contact members 9.

Just above the cross-piece 14 of the switch a solenoid magnet 17 is vertically mounted upon the base 1, said magnet being partially inclosed by insulating ribs 18 and 19. The magnet is wound in two separate coils, as is clearly indicated in Fig. 3 of the drawings, the purpose of this construction being made clear hereinafter. An axial tubular aperture 19^a is provided within the magnet 17, and an elongated soft iron core plunger 20 is adapted to undergo a vertical displacement in said aperture. Normally the weight of said core will cause it to occupy its lowermost position of adjustment, as shown in Fig. 3. An integral collar or head 21 is formed upon the lower extremities of the plunger core 20, which head serves the dual purpose of increasing the weight of the core and actuating a tripping arm during upward displacement of the core. The latter function of the collar 21 will presently be made clear.

A short distance beneath the solenoid 17, a channel shaped bracket 22 is rigidly mounted upon the front surface of the base 1, the plunger core 20 being made to pass through a suitable aperture provided in said bracket. Within the channel of the bracket, there is pivotally mounted an arm 23, projecting through a vertically elongated slot 24, formed in the lower portion of the core, said arm normally resting upon the bracket in a substantially horizontal position, as is shown in Fig. 3. When the core is in its lowermost limiting position, the arm 23 passes through the upper portion of the slot 24, and the length of said slot is such that when the core is displaced upwardly, the lower end wall of the slot will communicate an upward angular displacement to the arm 23, just before the core reaches its uppermost limiting position of displacement. The outer end of the bracket 22 is provided with a pair of upwardly projecting hooks 25, which are adapted to be engaged by a latch member 26 mounted upon the under surface of the cross-piece 14. The latch member is secured to the cross-piece by a screw 26^a, holding said member normally horizontal, but permitting it to undergo a slight angular displacement upwardly. The under surface of the cross-piece 14 is beveled slightly just above the latch member in order to make such displacement possible. A screw 26^b carried by the cross-piece 14 passes freely through the latch member, serving to guide the latch member during its angular displacement, and to hold it in a proper position to engage the hooks 25 when the switch carrying the latch member is in a closed position. A handle member 27, which projects rigidly outward from the cross-piece 14 permits the switch to be normally displaced from an open to a closed position.

Just above the solenoid 17, an incandescent lamp 28 is mounted upon the base 1, the resistance of said lamp being considerably greater than that of the coils forming the winding of the magnet 17. The socket receiving said lamp is mounted in an inclosure formed by the rib 18 in conjunction with a substantially semi-circular rib 29 integral with the base 1.

In the rear surface of the base, an aperture 30 is provided, within which aperture is mounted an auxiliary switch, comprising a resilient strip of metal 31, having one extremity fixed and the other adapted to undergo a displacement to or from the base, the free end of said strip being normally in

contact with a terminal plate 32 contiguous with the bottom of the aperture 30 and being adapted through a manually applied displacement to make contact with a terminal plate 33, opposite to the plate 32 and spaced therefrom. The mechanism for manually bringing the arm 31 into contact with the plate 33 consists of a rod 34, transversely mounted in the base 1 opposite to the arm 31 and adapted to deflect said arm through a sliding displacement. A head 35 is provided upon that extremity of the rod 34, which is adapted to bear upon the switch arm 31, said head being normally recessed in the bottom of the aperture 30, due to an impulse impressed upon the rod by a spring 36 coiled upon that portion of the rod which projects beyond the front surface of the base, one end of the spring being made to bear upon said surface, and the other end against a pivot forming head 36^a carried by the front end of the rod. A handle member 37 is pivotally connected to the head 36^a, said handle member being made to pass through a slot 38 provided in the cross-piece 14 of the main switch. When the main switch is closed, the handle member 37 will be substantially in alinement with the rod 34. When the main switch is displaced to its open position (illustrated by dotted lines in Fig. 2), the handle member 37 will swing freely about the pivot forming head 36^a, accommodating itself to the displacement of the main switch. The auxiliary switch will not be disturbed by either the opening or closing of the main switch.

The electrical connections between the main switch, auxiliary switch, solenoid, lamp, and certain other features of the device will now be fully discussed.

The terminals of the lowermost coil of the solenoid magnet 17 are designated by the numeral 39. Opposite to each of said terminals a socket forming contact member 40 is mounted upon the front surface of the base 1. Between each pair of adjacent members 39 and 40, a fuse 41 is removably mounted. The fuses 41 are parallel to each other and perpendicular to the base and are constructed similarly to the fuses 8, but are much smaller in size and have a comparatively small current conducting capacity. The contact members 40 have connection through the base with wires 42 and 43 respectively. The wires 42 and 43 are extended along the rear surface of the base and are respectively connected with one of the contact members 6 and with the switch arm 31. The other contact member 6 is connected by a wire 44 with one of the terminals of the uppermost coil of the solenoid 17. From the other terminal of the same coil, a wire 45 is extended to a wire 46 connecting one terminal of the lamp 28 with the terminal plate 33 of the auxiliary switch. A wire 47 establishes an electrical connection between the other terminal of the lamp 28 and the terminal plate 32. The lateral faces of the base carry two devices similar in construction to an ordinary lightning arrester, each device comprising two terminal plates 48 respectively disposed at the ends of the device and two sets of conductors 49 and 50, the former set being extended upwardly from the lower terminal plate and the latter set being extended downwardly from the upper terminal plate and passing between the conductors 49, the two sets of conductors sufficiently spaced to prevent any current of normal voltage from passing between the same, but are not sufficiently spaced to prevent a high voltage current from arcing across. The lower terminal plate 48 of each of said devices has connection through a wire 51 with the adjacent bracket 10, and thence with the switch arm mounted in said bracket. The upper terminal plate of each device is grounded through a wire 52.

The operation of the above-described device will now be explained.

Under normal conditions, there will constantly be a small flow of electricity through both coils of the solenoid magnet and through the incandescent lamp, the coils and the lamp being connected in series between the two contacts 6. The resistance of this series circuit will be sufficiently high to make the normal flow of current very small, the greater part of said resistance being furnished by the lamp 28. This small flow of current will not create a sufficient magnetic force in the solenoid 17 to raise the core 20, so that said core will normally occupy its lowermost limiting position as shown in Fig. 3 of the drawings. Also, under normal conditions the main switch will be closed, and the latch member 26 will engage the hooks 25, preventing the switch from assuming an open position due to the force exerted upon it by the springs 15. The small normal flow of current through the lamp 28 will be sufficient to light the same and therefore when the lamp is dark, it will be known that either a high tension current has been conducted by the service wires or that one of the main fuses 8 has given away. When through any cause, the service wires become conductors of an abnormally high tension current, this current in flowing through the coils of the solenoid 17 will at once create a strong magnetic force, sufficient to immediately draw the core 20 to its uppermost limiting position. Just before reaching said position, the lower end wall of the slot 24 will contact with the tripping arm 23, throwing the free end of the same into contact with the latch member 26 and disengaging said member from the hooks 25. This will leave the main switch free to undergo an immediate out-

ward displacement to its open position, due to the force exerted by the springs 15. Since the automatic opening of the switch is practically instantaneous, the high tension current is cut off from the wiring comprising the protected installation almost simultaneously with the generation of said current, thus completely eliminating the possibility of parties in the building being electrocuted or of a fire being started due to the existence of such a current in the wiring of the building.

In case of a very high voltage current being conducted by the service wires, there is a possibility that an arc might be created between the contact members 9, and the switch extremities which would be spaced from said contact members after the automatic opening of the switch. This arc would probably be immediately broken due to the breaking down of one of the main fuses 8. As an extra precaution against the existence of such an arc, however, the two brackets 10 are grounded through the devices comprising the parts 48, 49, and 50, and since the resistance offered by these devices will be readily overcome by a high tension current, a circuit to the ground will be formed and the arc will thus be broken.

The function of the auxiliary switch, comprising the members 31, 32, and 33, is to permit the main switch to be manually opened by cutting the lamp 28 out of series with the solenoid coils, permitting the current to flow direct to the upper coil of the solenoid from the arm 31, instead of first passing through the lamp, as under normal conditions. By thus largely decreasing the resistance of the circuit, of which the solenoid coils form a part, the voltage of the current passing through said coils is considerably raised, the increase in voltage being sufficient to produce a magnetic force within the solenoid, that will draw the core to its uppermost limiting position, and thus automatically open the main switch, in the manner already described.

The function of the small fuses 41 will now be explained. These fuses will readily transmit the small amount of current which they are required to conduct under normal conditions. The existence of a high tension current in the circuit will, however, tend to force a greater amount of current through the small fuses than they are able to carry, and consequently the small fuses will give way a moment after an abnormally high voltage has been impressed upon the solenoid coils. The momentary increase of current due to the abnormally high voltage in said coils will be sufficient however, to raise the core 20 to its uppermost limiting position, and thus automatically open the main switch. It is apparent that the light 28 will go out as soon as the small fuses give way, and therefore the darkening of said light will be an indication of the existence of abnormal conditions.

The insulating ribs 19 are provided as safe-guards against the contingency of an arc being created between the solenoid coils and the two contacts 6. Similarly, the insulating rib 18 prevents the existence of an arc between the solenoid coils and the socket of the lamp 28, and the rib 29 prevents arcing from the contacts 5 to the lamp.

The casing 1^a containing the automatic switch will preferably be provided with two doors, which are indicated in the drawings by the numerals 53 and 54 respectively. (See Fig. 8.) The inner door 53 is to be provided with two vertically elongated slots 55 through which the handle members 27 and 37 will respectively project, making it possible to operate either the main switch or auxiliary switch without opening the door 53. The upper portion of said door will be provided with a circular aperture 56 of sufficient size to readily permit it to be seen whether or not the lamp 28 is lighted. In order to prevent unauthorized persons from tampering with the mechanism of the switch and thus endangering themselves or injuring the mechanism, the door 53 may be ordinarily locked in its closed position, a locking means being indicated in the drawings at 57. The outer door 54 will ordinarily be kept closed, but need not be locked. This door will serve to keep dust and moisture from entering the casing 1^a through the apertures in the door 53, and also serves to impart to the casing a more finished and ornamental appearance.

A description will now be given of a modified form of the invention especially adapted for use in connection with a three phase circuit. In this modification which is diagrammatically illustrated in Fig. 7, the binding posts 2 and 4, the contacts 5 and 6, the fuses formed by the members 7 and 8, and the switch arms comprising the parts 12 and 13 are all used in triplicate. Two lamps 28 and 28^a will be employed, the same preferably being interposed between the contacts 5. The solenoid 17 will be wound to form four coils designated in Fig. 7 by the reference characters A, B, C and D. The latch mechanism for holding the main switch closed, and the mechanism for releasing the latch mechanism through an upward displacement of the plunger core will be the same as already described. The wiring which will preferably be carried on the rear surface of the switch, will, of course differ from the wiring for the single phase switch, and this wiring will now be described. From one of the outer contacts, a wire 58 is extended to one of the terminals of the coil A. From the other terminal of the coil A, a wire 59 is extended to one of the socket

terminals of the lamp 28. From the other socket terminal of said lamp 28, a wire 60 is extended to the terminal plate 32 of the auxiliary switch. The switch arm 31, which normally has contact with the terminal plate 32 is connected through a wire 61 with one of the terminals of the coil B. The other terminal of the coil B has connection through a wire 62 with a wire 63, leading from the middle contact 6 to one of the terminals of the coil D. A wire 64 is extended from the other terminal of the coil D to one of the socket terminals of the lamp 28a. From the other terminal of said lamp 28a, a wire 65 is extended to one of the terminals of the coil C, and the other terminal of the coil C is connected with the other outer contact 6 through a wire 66. From the terminal plate 33 of the auxiliary switch, a wire 67 is made to establish a connection with the wire 59.

From the above description it will be readily apparent that under normal conditions, a small quantity of current will flow through all four coils, A, B, C and D and through both of the lamps 28 and 28a, this current being sufficient to light both lamps, but not sufficient to generate such a magnetic force within the solenoid as will occasion a displacement of the plunger core 20. When a voltage abnormally high is impressed upon the circuit, a magnetic force will be set up within the solenoid sufficient to instantly displace the plunger core upwardly, thereby automatically opening the main switch as has been previously described. An instant after the main switch has been opened, the small fuses 41 will break down—due to the abnormal amount of current passing through them, and consequently the circuit including the lamp 28a will be broken and said lamp will be darkened. A darkening of the lamp 28a, therefore will be an indication either that an abnormal voltage has been impressed upon the circuit or that one of the main fuses has been broken down. When it is desired under normal conditions to open the main switch, the handle member 37 of the auxiliary switch will be pressed inward, thereby breaking contact between the terminal plate 32 and the switch arm 31 and bringing the latter into contact with the terminal plate 33. Consequently a current will flow between the wire 59 and the terminal plate 33 through the wire 67 and the lamp 28 will be cut out of the circuit and darkened. This will result in a decrease in the resistance of the circuit including the coils A and B, and the voltage impressed upon said circuit will accordingly increase to a sufficient extent to set up a magnetic force within the solenoid that will elevate the plunger core, and consequently open the main switch.

I am aware that numerous automatic circuit breakers have been provided which become operative upon an abnormal increase in the amount of current flowing through the circuit, and I now point out that my invention being operated upon an abnormal increase in voltage is in an entirely different class from the previous inventions mentioned and is in no wise anticipated by the same. My invention is presented as including all such modifications and changes as properly come within the scope of the following claims.

What I claim is:

1. In a device of the character described, the combination with a switch, of a bracket mounted upon the switch base, a latch member carried by the switch and adapted to hold the latter closed through the engagement with said bracket, a tripping arm pivoted upon the bracket, adapted to release the latch member from the correlated bracket when subjected to an upward angular displacement, a vertically mounted solenoid magnet having its coils connected across the switch poles, and a plunger core normally projecting downward from the magnet, and adapted to communicate an upward angular displacement to the tripping arm, when it is itself drawn up into the magnet due to an abnormal voltage being impressed upon the circuit.

2. In a circuit breaker, the combination with a switch normally closed, means tending to open the switch, a latch device holding the switch closed against the action of the opening means, a solenoid having a plunger carrying a tripping device, said latch device being located in the path of the plunger, a resistance element associated with the switch, the solenoid and resistance element being connected in series across the switch poles, said solenoid being arranged to operate under an abnormal voltage when in series with the resistance element, and an auxiliary switch having constant circuit connection with the solenoid and also having provision for manual operation, two auxiliary contacts alternately engaged by the switch, one of said auxiliary contacts having circuit connection with the solenoid, the other contact having circuit connection with the resistance element, the switch normally engaging the resistance contact whereby the solenoid and resistance element are connected in series, the switch being mounted to be moved out of contact with the resistance contact and engaged with the solenoid contact whereby the resistance element is eliminated.

3. In a device of the character described, the combination with a switch, of a bracket mounted upon the switch base, a latch member carried by the switch and adapted to hold the latter closed through engagement with said bracket, a tripping arm pivoted

upon the bracket, adapted to release the latch member from the correlated bracket when subjected to an upward angular displacement, a vertically mounted solenoid magnet having its coils connected across the switch poles, a plunger core normally projecting downward from the magnet, and adapted to communicate an upward angular displacement to the tripping arm, when it is itself drawn up into the magnet due to an abnormal voltage being impressed upon the circuit, a lamp in series with the magnet, and an auxiliary switch having provision for manual operation and arranged to cut out connection with the lamp.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

RALPH E. WETTER.

Witnesses:
J. S. MURRAY,
CALLIE MORGAN.