E. B. MERRIAM.

ELECTRIC SWITCH.

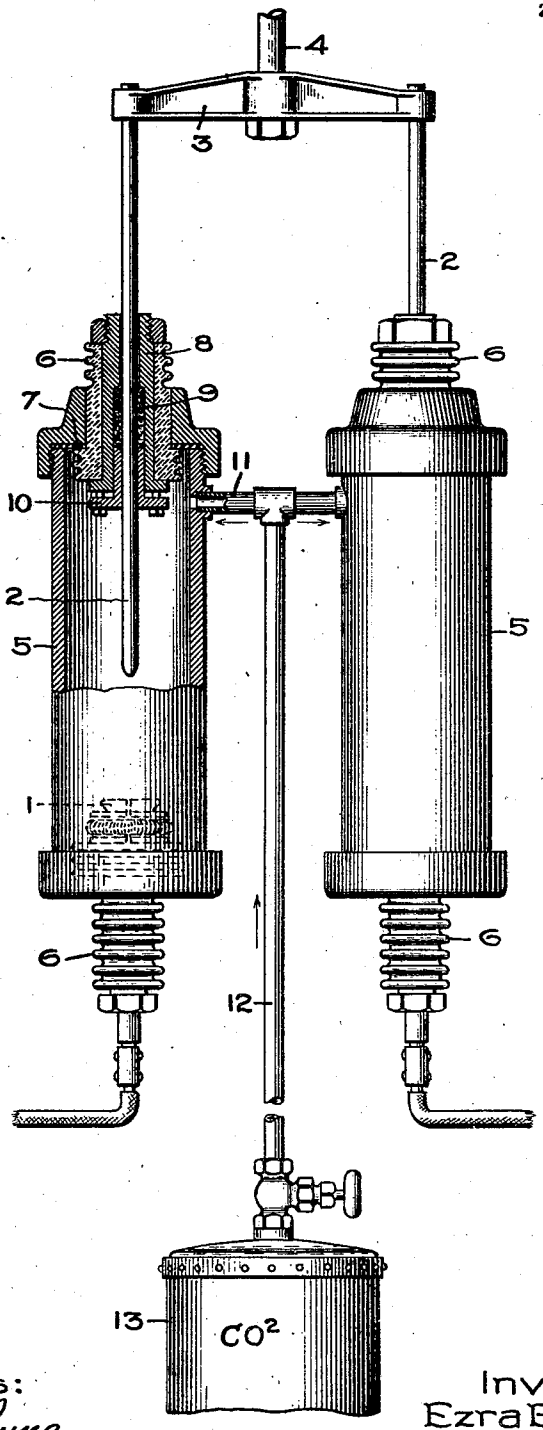
APPLICATION FILED FEB. 4, 1910.

1,144,047.

Patented June 22, 1915.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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J. Ellis Glen

Inventor:
Ezra B. Merriam,
by Albert G. Davis
His Attorney.

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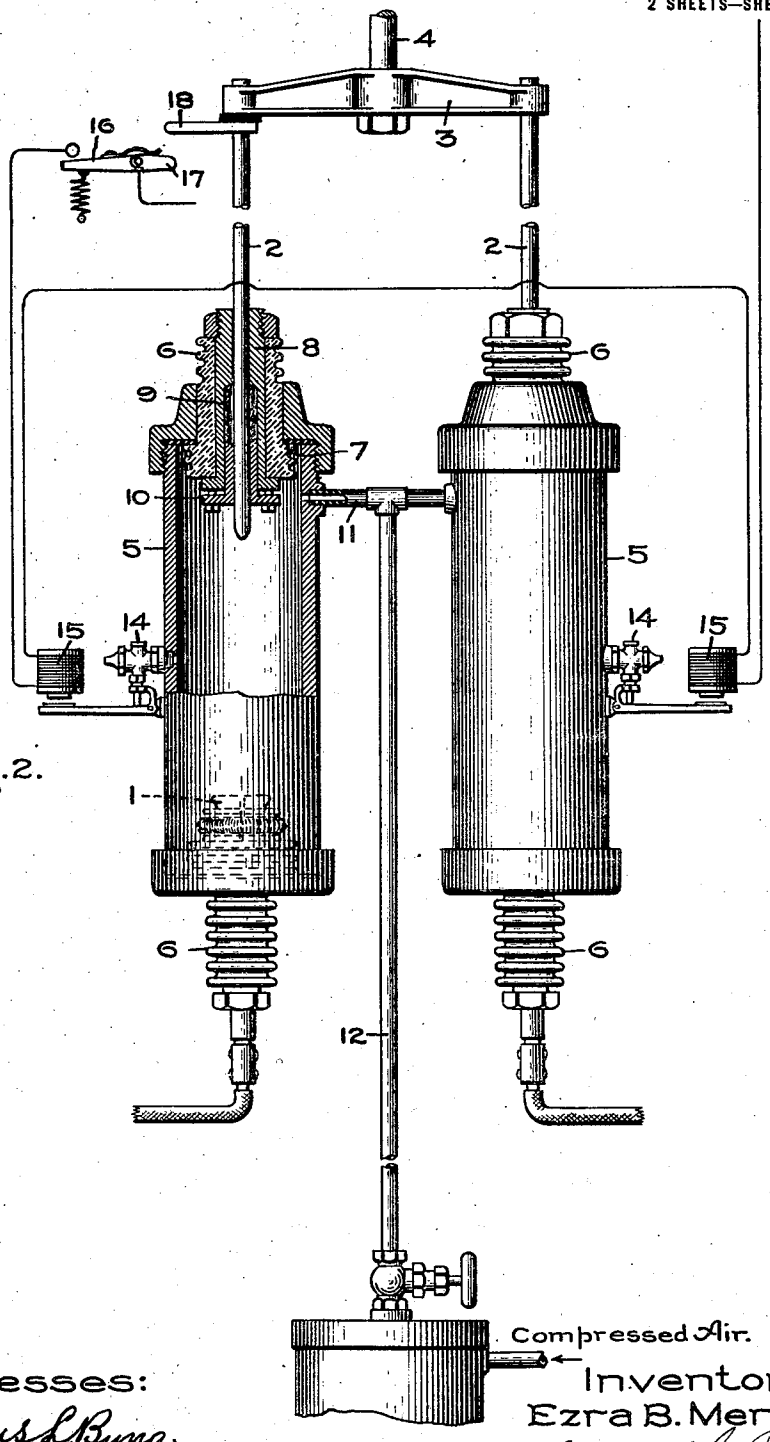


Fig. 2.

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UNITED STATES PATENT OFFICE.

EZRA B. MERRIAM, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC SWITCH.

1,144,047. Specification of Letters Patent. Patented June 22, 1915.

Application filed February 4, 1910. Serial No. 541,989.

To all whom it may concern:

Be it known that I, EZRA B. MERRIAM, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

My invention relates to switches for opening electric circuits and its object is to provide a simple and efficient switch by means of which circuits carrying large amounts of energy may be quickly and safely opened with a minimum disturbance of potential on the circuit, thereby eliminating the surges and similar potential strains produced by many types of switches heretofore used.

The insulating value of a gaseous insulating medium, such as air, increases rapidly with an increase in pressure of the medium, and in accordance with my invention the circuit is opened by means of contacts which separate in an atmosphere of gaseous insulating medium compressed to such an extent that the arc is quickly and safely extinguished and switching strains on the system are practically eliminated. The gaseous insulating medium is preferably compressed to a pressure greater than 100 pounds per square inch, and since air becomes ionized by an arc and thereby loses a part of its insulating value, I may use some other gaseous insulating medium, such as carbon dioxid, which ionizes very much less readily than air and may also provide means whereby the air ionized by opening the circuit is discharged from the switch and replaced with fresh compressed air having an undiminished insulating value.

My invention will best be understood in connection with the accompanying drawings, which, merely for purposes of illustration, show some of the various forms in which my invention may be embodied and in which—

Figure 1 is a view in elevation of the contacts and adjacent parts of the switch embodying my invention, with part of one chamber cut away to show details of construction; and Fig. 2 is a view similar to Fig. 1, with a relief valve for automatically venting the chambers at each operation of the switch and thereby adapting the switch for the use of compressed air as the insulating medium.

The particular form of switch illustrated in Fig. 1 comprises a stationary contact 1 of any suitable form, coöperating with a movable contact 2 in the form of a rod which is movable into and out of engagement with the stationary contact 1. In the specific form of switch illustrated, the rods 2 constitute the contact portion of a bridging contact formed by the contact rods 2 and the conducting yoke 3, which carries the contact rods and in turn is carried on an insulating rod 4 actuated by any suitable mechanism, not shown. As a result of this construction, the adjacent terminals of the circuit are connected to stationary contacts 1 which are bridged by the bridging contact formed by the contact rods 2 and the yoke 3. In carrying out my invention, various forms of construction may be used to cause the coöperating contacts 1 and 2 to separate in an atmosphere of compressed gaseous insulating medium, but the preferred form is that shown in the drawing, in which a chamber 5 carries at each end insulators 6 provided with shoulders 7 which engage the inner sides of the heads of the chamber 5 and thereby prevent the insulators being blown out by pressure in the chamber. The stationary contact 1 is carried on the lower insulator and the movable contact 2 is slidably mounted in the upper insulator in any suitable way which will make a substantially fluid tight joint with the insulator. In the preferred construction, the movable contact 2 slides through a metallic guide or support 8 carried on the insulator and made in the form of a stuffing box provided with packing 9 held in place by a gland 10, so that the contact rod 2 may be moved up and down and into and out of engagement with the stationary contact 1 without permitting fluid to escape from the chamber 5. An atmosphere of compressed gaseous insulating medium is maintained in the chamber 5 during the separation of the coöperating contacts by any suitable means, such as an insulated supply pipe 11 connected to the two chambers 5 and supplied through the pipe 12 from a supply tank 13 with the compressed gaseous insulating medium which is to be used. In the form of switch shown in Fig. 1, some gaseous insu-

lating medium, such as carbon dioxid, which does not ionize as readily as air, is stored in the tank 13 under pressure and is admitted to the chambers 5 for the purpose of maintaining in the chambers an atmosphere of gaseous insulating medium under a pressure of at least 100 pounds per square inch. Since the carbon dioxid does not ionize readily, it does not need to be replaced and hence it is necessary to draw on the tank 13 only to make good the leakage from the chambers 5. When the switch opens a circuit carrying a large amount of energy, an arc is formed between the stationary and the movable contact, but owing to the high pressure of the atmosphere in which the arc is drawn the arc does not have an opportunity to expand to any great extent and any heating which may take place as a result of the presence of the arc increases the pressure of the atmosphere surrounding the arc and thereby tends to assist in extinguishing the arc. If the switch is used to open a circuit carrying alternating current, it is found that drawing the arc in an atmosphere of compressed gaseous insulating medium causes the arc to be extinguished at the zero point of the wave, hence the circuit is opened very quickly and with practically no surges or switching strains.

A switch constructed and operated substantially like the switch shown in Fig. 1 is shown in Fig. 2, but is constructed to permit compressed air to be used as the gaseous insulating medium in which the contacts separate. Since an arc ionizes air to a certain extent and thereby reduces its insulating value, it is desirable to empty the chambers 5 after each opening of the switch and refill with fresh air which has not been ionized and which, therefore, has its full insulating value. This result may be accomplished in many different ways, and, for purposes of illustration, I have shown each chamber provided with a venting valve 14 automatically opened during the operation of the switch, so that the ionized air produced in the chamber 5 when the switch opens, is permitted to escape and is replaced with fresh compressed air by the time the switch is closed. The venting valve 14 is automatically opened by any suitable mechanism at any desired time during the operation of the switch, preferably during the closing movement, and, merely for purposes of illustration I have shown the valve controlled by an electromagnet 15 energized from any suitable source of supply by means of a control switch 16, which is normally open and which is closed momentarily for the purpose of energizing the electromagnet 15 and thereby opening the valves during the closing movement of the switch by a pivoted projection 17 which is engaged by a lug 18 on the operating mechanism. The pivoted projection 17 is so mounted that during the opening movement of the switch and as the lug 18 moves upward, the controlling switch 16 is not actuated, but on the downward movement of the contact 2 for the purpose of closing the switch, the lug 18 engages the projection 17 and thereby rotates the controlling switch in a clockwise direction into a position to close the circuit of the electromagnets 15, thereby opening the venting valves 14. The operation of this switch is the same as that shown in Fig. 1, since the arc is quickly extinguished at the zero point if drawn in an atmosphere of compressed air at high pressure.

My invention may be embodied in many other forms than that shown and described, and I, therefore, do not wish to restrict myself to the precise arrangement disclosed, but aim to cover all modifications within the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is—

1. An electric switch comprising relatively movable coöperating contacts, means for maintaining an atmosphere of compressed gaseous insulating medium around said contacts during their separation, and means controlled by said contacts for permitting at intervals the insulating medium to escape.

2. An electric switch comprising a vessel provided with a normally closed vent, relatively movable coöperating contacts mounted to separate in said vessel, means coöperating with said contacts to control the opening of said vent, and means for maintaining in said vessel an atmosphere of compressed gaseous insulating medium during the separation of said contacts.

3. An electric switch comprising a vessel having a normally closed vent, a gaseous insulating medium normally maintained under pressure within said vessel, relatively movable coöperating contacts separable within said vessel to produce an arc therein, and means whereby said contacts control the opening of said vent to remove said insulating medium from between said contacts after the arc has been extinguished.

4. An electric switch comprising separable contacts, a vessel surrounding said contacts containing a normally compressed gaseous insulating medium, said vessel having a vent normally closed during the separation of said contacts, and means controlled by said contacts for opening said vent during the closing movement of the switch to permit the escape of said insulating medium.

5. A switch comprising relatively movable coöperating contacts, a vessel inclosing said contacts, means for supplying a compressed gaseous insulating medium to said vessel, a valve for venting said vessel, and

means for opening said valve to vent said vessel during a predetermined portion of the movement of said contacts.

6. A switch comprising a closed vessel containing compressed gaseous insulating medium, contacts separable within said vessel to produce an arc therein, and means associated with said contacts for venting said vessel after the separation of said contacts to open the switch and after the arc formed has been extinguished, whereby said insulating medium is removed from said vessel.

7. A switch comprising separable contacts, a vessel surrounding said contacts and containing compressed gaseous insulating medium, and means controlled by said contacts for permitting the insulating medium in said vessel to escape at intervals as said contacts are moved into switch closing position.

8. A switch comprising separable contacts, a closed vessel surrounding said contacts and containing compressed gaseous insulating medium, a valve for venting said vessel, and means whereby one of said contacts controls said valve to vent said vessel.

9. A switch comprising separable coöperating contacts, a vessel which surrounds said contacts and is closed during the separation of said contacts, a source of supply of gaseous insulating medium under pressure connected to said vessel, and means controlled by said contacts for venting said vessel.

In witness whereof, I have hereunto set my hand this 3rd day of February, 1910.

EZRA B. MERRIAM.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.