A. W. BURKE.

HORN GAP SWITCH AND LIGHTNING ARRESTER.

APPLICATION FILED APR. 2, 1910.

1,022,619.

Patented Apr. 9, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

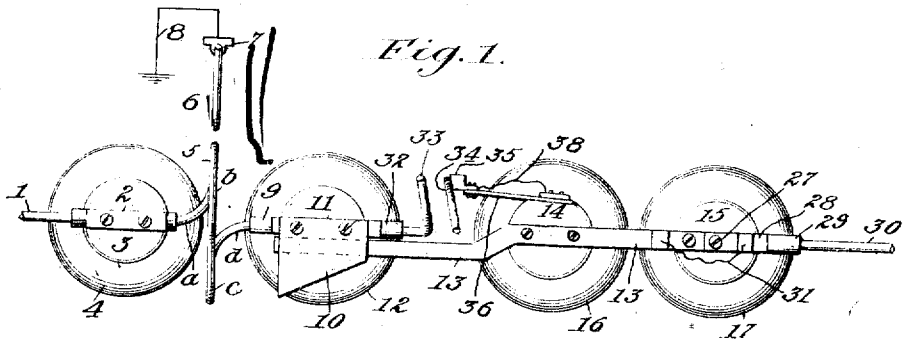
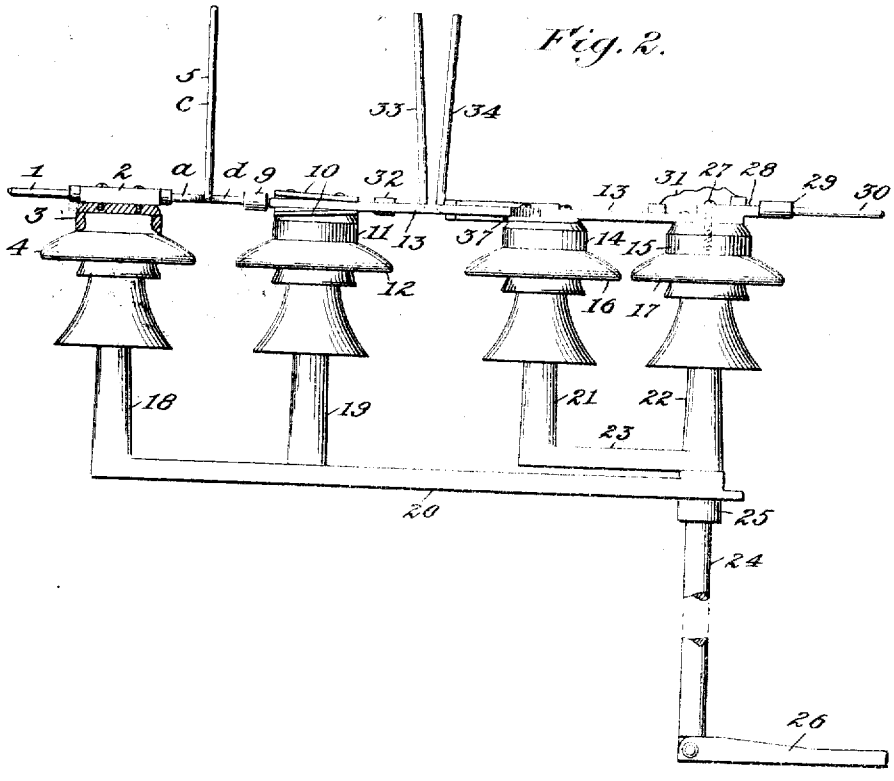


Fig. 2.



Witnesses:

C. H. Porter.

E. Daniels

Inventor:

Alfred W. Burke,

by Byrnes, Townsend & Brickenstein,

Attys.

A. W. BURKE.

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Fig. 3.

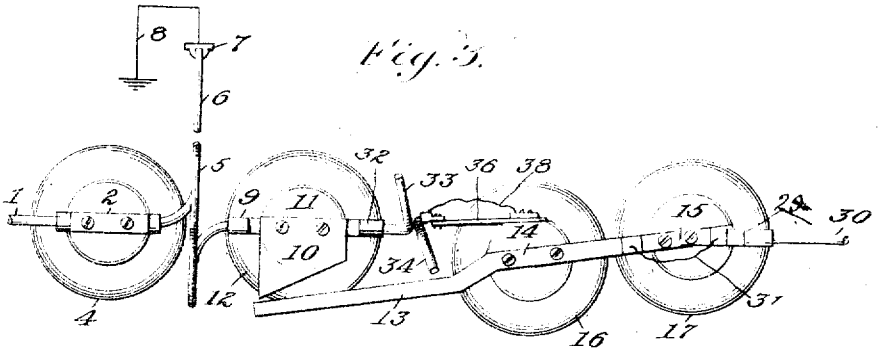


Fig. 4.

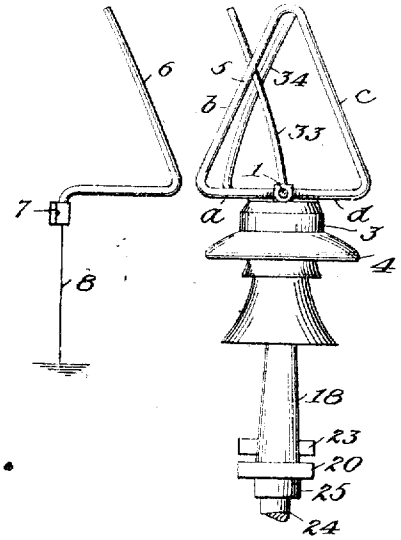
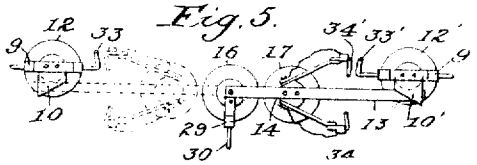


Fig. 5.



Witnesses:
C. H. Potter
C. Davids

Inventor:
Alfred W. Burke,
by Byrnes, Townsend & Brickenstein,
Att'ys.

UNITED STATES PATENT OFFICE.

FRED W. BURKE, OF PITTSBURGH, PENNSYLVANIA.

HORN-GAP SWITCH AND LIGHTNING-ARRESTER.

1,022,619. Specification of Letters Patent. Patented Apr. 9, 1912.

Application filed April 2, 1910. Serial No. 553,079.

To all whom it may concern:

Be it known that I, ALFRED W. BURKE, a subject of the King of Great Britain, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Horn-Gap Switches and Lightning-Arresters, of which the following is a specification.

This switch, with lightning arrester, is especially designed for use on high-tension transmission-lines, and for opening the circuit under load.

The switch comprises the usual pivoted blades and fixed jaws, and a pair of relatively-movable horns, or opposed diverging conductors, arranged to first engage and shunt the current as the switch is opened and to then spring out of contact and break the resulting arc, rising on the diverging horns.

The lightning arrester comprises a conductor constituting part of the circuit, bent to form a loop one side of which is inclined, and an opposed inclined grounded conductor, the loop acting as a choke-coil or reactance and the opposed diverging members constituting a horn gap and quickly breaking any arc sprung between them.

Referring to the accompanying drawings—Figure 1 is a plan view of the apparatus, with the switch closed; Fig. 2 is a side elevation of the apparatus, showing one insulator cap in section; Fig. 3 is a plan view of the apparatus, showing the switch partly opened and the shunt horns in engagement; Fig. 4 is an end view showing the lightning arrester and shunt horns; and Fig. 5 is a plan view of a double-throw switch.

In the apparatus illustrated, the incoming line 1 is secured in a socket in one end of a bronze bar 2, which is screwed to a brass cap 3 rigidly engaging the upper end of an insulator 4.

The line member of the lightning arrester consists of a bronze rod 5, one end of which is secured in a socket in the adjacent end of the bar 2, and which is bent to form a triangular loop *a*, *b*, *c*, *d*, the other end being secured in a socket 9 of the switch. Opposed to the portion *b* of loop 5 is a horn or inclined conductor 6, carried by a metal support 7 which is grounded by a line 8. The diverging metal conductors 5 and 6 constitute a horn gap, and any arc which may spring between their adjacent lower ends at once travels up along the horns and lengthens until it breaks. The looped portion of the line conductor acts as a choke-coil or reactance, forcing any lightning discharge to jump the gap between the horns and pass to earth, whereupon the resulting arc automatically breaks.

The switch comprises a pair of copper jaws 10 screwed to a brass cap 11 secured on the top of a insulator 12, and of a movable blade 13, screwed to brass caps 14, 15, secured on the upper ends of insulators 16, 17. The insulators 4 and 12 are carried by pins 18, 19, rising from a fixed support-bar 20, and the insulators 16, 17, are carried by pins 21, 22, rising from a bar 23 which is carried by the upper end of a vertical shaft 24 which is revoluble in a bearing 25 by a handle 26 at its lower end. A cap-screw 27 acting as a pivot extends downward through a hole in the end of a bar 28 and another hole in the end of the blade 13, into the brass cap 15. The bar 28 has a socket 29 receiving the outgoing line 30. The imperfect electrical joint between the blade 13 and bar 28 is shunted by a flexible conductor 31.

Secured in a socket 32 extending from the switch blades 10 is a horn or inclined bronze rod 33, and opposed to this horn is another similar one 34, the lower end of which is secured in a socket 35 riveted to a flat steel spring 36, the other end of which is riveted to the brass cap 14. The steel spring being thin and of relatively low conductance, is shunted by a flexible conductor 38. When the switch is closed and its blade is in the position in Fig. 1, the horns 33, 34 stand at a considerable distance from each other. As the switch is opened by rotating the vertical shaft 24, the bar 23 carrying the insulators 16, 17, and the switch-blade, the lower end of the horn 34 approaches the lower end of the horn 33 and engages it just before the switch blade leaves the jaws 10, thus shunting the current from the blade to the engaged horns and preventing any arcing at the jaws. As the blade is moved still farther outward, the spring 36 gradually yields until finally the horn 34 slips by and out of engagement with the horn 33, whereupon an arc immediately forms between the lower adjacent ends of these horns. But by reason of the divergence of the horns in this position, such arc immediately travels upward along the horns, the horn on the

blade also moving away from the fixed horn, whereby the arc is both automatically and mechanically lengthened and quickly broken. These shunt horns thereby constitute the only portion of the switch circuit at which an arc may form, and the arc is so quickly broken that the horns last for a considerable period. The horns are relatively inexpensive and are easily renewed, their lower ends being removably secured in their sockets, as by set screws. The switch jaws are beveled as shown in Fig. 1, so that the break at this point occurs at the extreme end of the switch-blade. The jaws being at a considerably greater distance from the pivot of the blade than are the horns 33, 34, the outward movement of the blade quickly widens the gap at the jaws, while bringing the horns into contact.

The switch can be operated electrically or mechanically, and can be used as an automatic circuit-breaker by the introduction of relays and trip-coils. For polyphase circuits, identical switches are provided for each line, the several switches being conveniently mounted in proximity.

Fig. 5 illustrates a double-throw switch employing shunt horns. In this switch, two different lines are respectively secured in sockets 9, 9', mounted on insulators 12, 12' at opposite sides of the insulator 16 on which is pivotally mounted the socket 20 receiving the line 30. The insulator 12 carries jaws 10 and the insulator 12' carries jaws 10', which are adapted to alternately receive the switch-blade 13 and connect their respective line with line 30. An arc horn 33' is mounted on the insulator 12' and a corresponding arc horn 34' is flexibly mounted on the insulator 17, being secured to its brass cap 14 on the side opposite that to which the horn 34 is secured.

I claim:

1. A switch comprising relatively movable switch members having arc horns, said horns normally out of contact but positioned to make contact before the switch is opened and to break contact after it is opened.

2. A switch, comprising fixed and movable switch-members, a fixed arc horn in circuit with the fixed switch-member, and an opposed arc horn carried by the movable switch-member, in position to temporarily engage the fixed horn as the switch is opened.

3. A switch, comprising fixed and movable switch-members, a fixed arc horn in circuit with the fixed switch-member, and an opposed arc horn flexibly carried by the movable switch-member, in position to temporarily engage the fixed horn as the switch is opened.

4. A switch, comprising fixed beveled switch-jaws, a pivoted switch-blade, a fixed arc horn in circuit with the switch-jaws, and an opposed arc horn flexibly carried by the switch-blade, between its pivot and the switch-jaws.

5. A double-throw switch, comprising two fixed switch-members connected to different lines, a movable switch-member, a fixed arc horn in circuit with each fixed switch-member, and two arc horns carried by the movable switch-member, in position to respectively coöperate with the fixed arc horns.

6. A double-throw switch, comprising two sets of fixed beveled switch-jaws connected to different lines, a pivoted switch-blade, a fixed arc horn in circuit with each set of switch-jaws, and two arc horns flexibly carried by the switch-blade, in position to respectively coöperate with the fixed arc horns.

7. A switch comprising fixed and movable switch members, a fixed arc horn in circuit with the fixed switch member, and an opposing arc horn resiliently carried by the movable switch member, the arc horns being out of contact in the closed position of the switch but arranged to make contact before the switch is opened and to break contact after it is opened.

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

ALFRED W. BURKE.

Witnesses:
EUGENE A. BYRNES,
CHARLES H. POTTER.

Corrections in Letters Patent No. 1,022,619.

It is hereby certified that in Letters Patent No. 1,022,619, granted April 9, 1912, upon the application of Alfred W. Burke, of Pittsburgh, Pennsylvania, for an improvement in "Horn-Gap Switches and Lightning-Arresters," errors appear in the printed specification requiring correction as follows: Page 1, line 60, for the word "reactance" read *impedance;* same page, line 66, for the article "a" read *an,* and line 94, after the word "position" insert the word *shown;* page 2, line 32, for the reference-numeral "20" read *29;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of May, A. D., 1912.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.