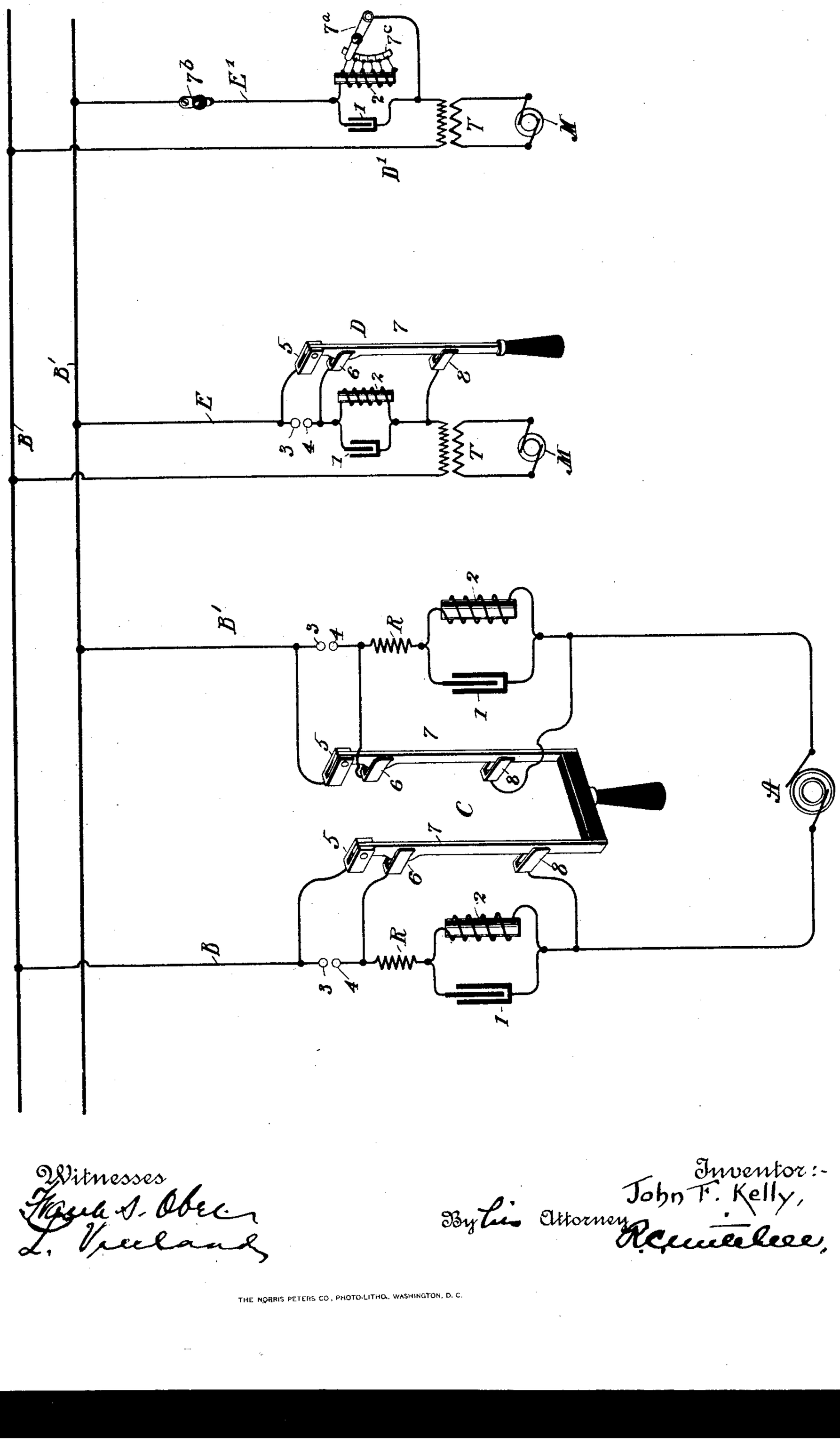
No. 749,200. PATENTED JAN. 12, 1904.

J. F. KELLY.

HIGH POTENTIAL SWITCH.

APPLICATION FILED MAY 23, 1903.

NO MODEL.



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No. 749,200. Patented January 12, 1904.

UNITED STATES PATENT OFFICE.

JOHN F. KELLY, OF PITTSFIELD, MASSACHUSETTS.

HIGH-POTENTIAL SWITCH.

SPECIFICATION forming part of Letters Patent No. 749,200, dated January 12, 1904.

Application filed May 23, 1903. Serial No. 158,414. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. KELLY, a citizen of the United States, residing at Pittsfield, in the county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in High-Potential Switches, of which the following is a full, clear, and exact description.

My invention relates to switches for high-tension circuits.

It consists of a new application of a tuned device, and has for its object to produce a simple and effective switch for interrupting such circuits without danger to the operator, the system, or the switch.

As is well known, in the operation of switches on high-tension circuits great difficulty is experienced in preventing the continued and destructive arcing between switch-terminals. This, I have discovered, is not alone on account of the normal tension, but also because the opening of the switch-terminals sets up an oscillation on the charged lines of a frequency even higher than the normal, which higher frequency is accompanied by an increased difference of potential, breaking down the resistance of the switch air-gap and allowing the generator-current to follow. With the enormous energy available in most transmission plants the destruction of the switch under these circumstances requires but an instant.

In order to prevent the effect of the abnormal oscillation, I provide a means for permitting it to be dissipated harmlessly through a circuit which will not carry the normal current. I do this by substantially interrupting the generator-current, while leaving a path for all currents of abnormal frequency which may be produced by such interruption. When such abnormal currents have passed, the circuit can then be entirely opened without any further disturbance or any danger, the generator-current flowing being very small. In the form of switch shown and described below as embodying my invention this path consists of a condenser and inductance-coil in parallel and tuned to the normal frequency of the circuit. Over this path the generator-current of normal frequency practically will not flow. If, however, an abnormal frequency exists upon the line, the path offers but little opposition to the abnormal-frequency current.

The following is a description of my invention, reference being had to the accompanying drawing, in which the figure is a diagram of an alternating-current system having switches embodying my invention.

Referring more particularly to the drawing, A is an alternating-current generator. B B′ are mains supplied thereby.

C is a switch for interrupting the mains B B′.

D is a switch for interrupting a circuit E, supplying a motor M through the transformer T.

Except for the resistance R, hereinafter referred to, the switch C acting to interrupt both legs of the circuit is a duplication of the switch D, the two parts thereof being connected together, so as to be operated by a common handle F.

D′ is a switch for interrupting the generator-current, supplemented by a separate circuit-breaker for subsequently breaking the circuit E′, if desired.

Referring more particularly to the switch, 1 and 2 are devices having, respectively, capacity and self-induction, such as a condenser and a self-induction coil. They are connected together in parallel and are tuned to the normal frequency of the alternator A.

3 and 4 are the terminals of an air-gap in series with the devices 1 and 2 and connected, respectively, to terminals 5 and 6 of a circuit-breaker.

7 is the arm of the circuit-breaker, pivoted to the terminal 5. Beyond the device 1 2 is a third terminal 8, which engages with the arm 7 of the circuit-breaker when that arm is brought to its extreme position, thereby short-circuiting or shunting the devices 1 and 2. The construction is such that when the arm 7 is moved to open the circuit-breaker the short circuit is broken at the terminal 8 a considerable time before the circuit is opened at the terminal 6. This would be the case if the ter-

minals 6 and 8 were in line and a straight switch-bar 7 were used. I have, however, shown an extension on the bar 7, entering the jaws of the contact 6, so as to cause even more delay in the break at that point.

In the operation of the switch the short circuit around the condenser and self-induction coil 1 and 2 is first substantially interrupted. This interrupts the generator-current, since, as before explained, the capacity and self-induction when properly tuned will practically block the generator-current, while permitting currents of abnormal frequency to pass. The effect of the abnormal frequency is quickly dissipated through the capacity inductance-path 1 2, after which practically no current or energy passes. The circuit may then be entirely opened by disengaging the contact 6 without any disturbance or danger. In case the switch is opened rapidly the terminals 3 and 4 will protect the switch-terminals from damage due to the line discharge. In some instances I insert a resistance R in series with the inductance and capacity to aid in frittering away the energy of the current of abnormal frequency.

In some instances it is preferable to make the circuit-breaker mechanically separate from the means for cutting the devices 1 and 2 out of and into circuit, as shown at 7^a and 7^b. In such case the generator-current can, if desired, be practically interrupted by moving the switch-arm 7^a to the point 7^c without opening the circuit-breaker 7^b. In this embodiment the choking-coil is subdivided, so that parts of it are thrown into circuit step by step prior to breaking the circuit. This is done by tapping it at various points and constructing the parts so that the contact-arm 7^a sweeps over the contacts, bringing the coil entirely into circuit only when the point 7^c is reached. By making sufficient sections the current can be reduced a little at a time and the resulting disturbance made too small to cause flashing.

My invention admits of various modifications, all of which will come within the broad idea of interrupting the generator-current by introducing into the circuit means which will afford an easy path for currents of abnormal frequency and yet oppose the normal current.

What I claim is—

1. In a high-potential switch, the combination of a circuit-breaker, a device affording an easy path for abnormal-frequency currents and a difficult path for normal-frequency currents in series with said circuit-breaker, and means for cutting said device in and out of circuit.

2. In a high-potential switch, the combination of a circuit-breaker, a device affording an easy path for abnormal-frequency currents and a difficult path for normal-frequency currents in series with said circuit-breaker, a shunt around said device, and means for breaking said shunt prior to opening said circuit-breaker.

3. In a high-potential switch, the combination of a circuit-breaker, a spark-gap whose discharge-terminals are connected respectively to the circuit-breaker terminals, a device in series with said circuit-breaker and affording an easy path for abnormal-frequency currents and a difficult path for normal-frequency currents, a shunt around said device, and means for breaking said shunt prior to the opening of said circuit-breaker.

4. In a high-potential switch, the combination of a device affording an easy path for abnormal-frequency currents and a difficult path for normal-frequency currents, and means for making and breaking a shunt around said device.

5. In a high-potential switch, the combination of a device affording an easy path for abnormal-frequency currents and a difficult path for normal-frequency currents, a resistance in series therewith, and means for making and breaking a shunt around said device and resistance.

6. In a high-potential switch, the combination of a circuit-breaker, a device in series therewith, consisting of means for producing capacity and means for producing inductance in parallel with each other and tuned to the normal frequency of the circuit, and means for cutting said device in and out of circuit.

7. In a switch, the combination of a capacity and inductance device tuned to the normal frequency of the circuit, and means for making and breaking a shunt around said device.

8. In a high-potential switch, the combination of a circuit-breaker, a device in series therewith consisting of means for producing capacity and means for producing inductance in parallel with each other and tuned to the normal frequency of the circuit, a shunt around said device, and means for breaking said shunt prior to the opening of said circuit-breaker.

JOHN F. KELLY.

Witnesses:
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