

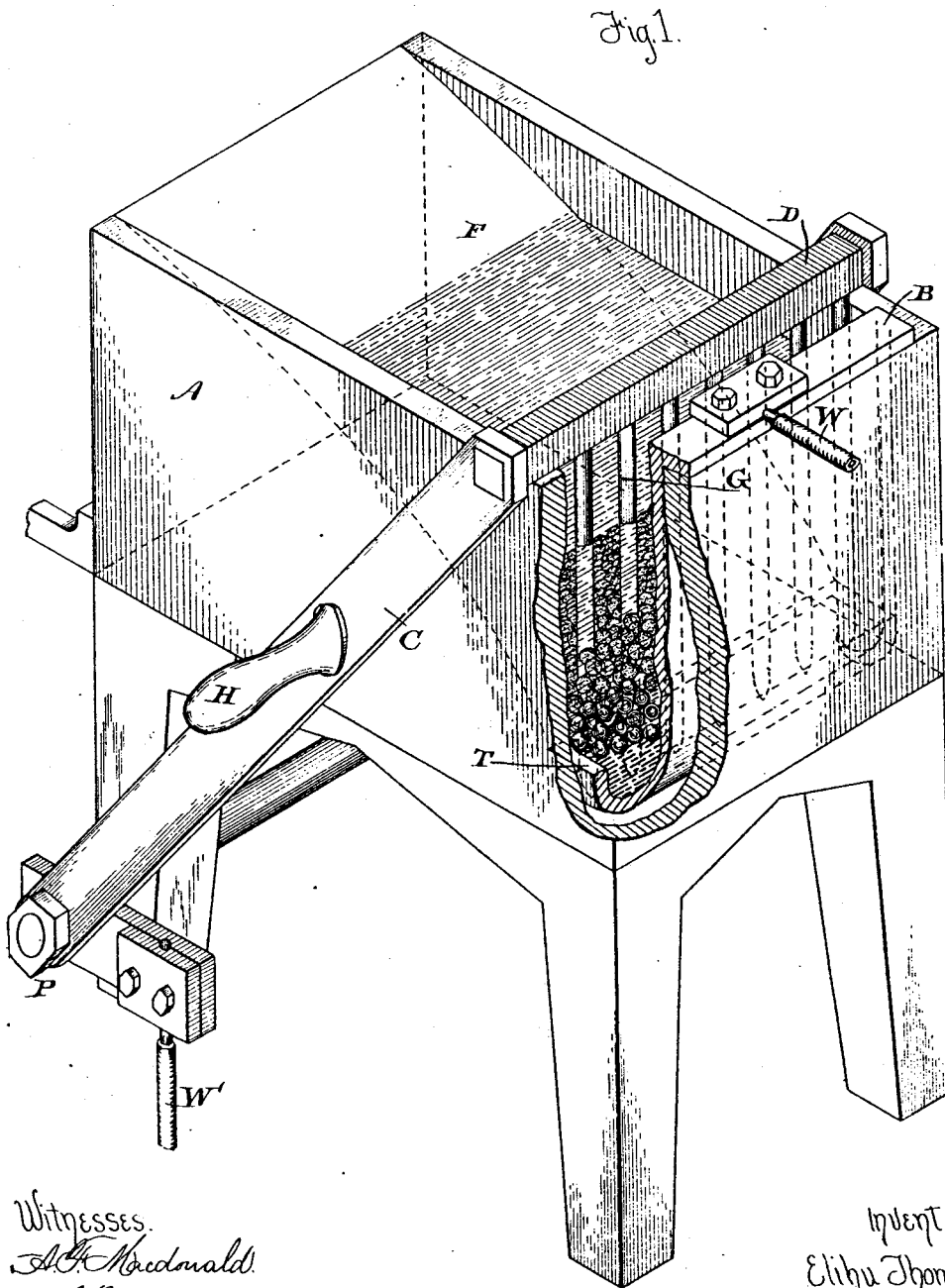
(No Model.)

2 Sheets--Sheet 1.

E. THOMSON.
ELECTRIC SWITCH.

No. 468,119.

Patented Feb. 2, 1892.



Witnesses.
A. E. Macdonald.
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Inventor .
Elihu Thompson.

by Burley Knight
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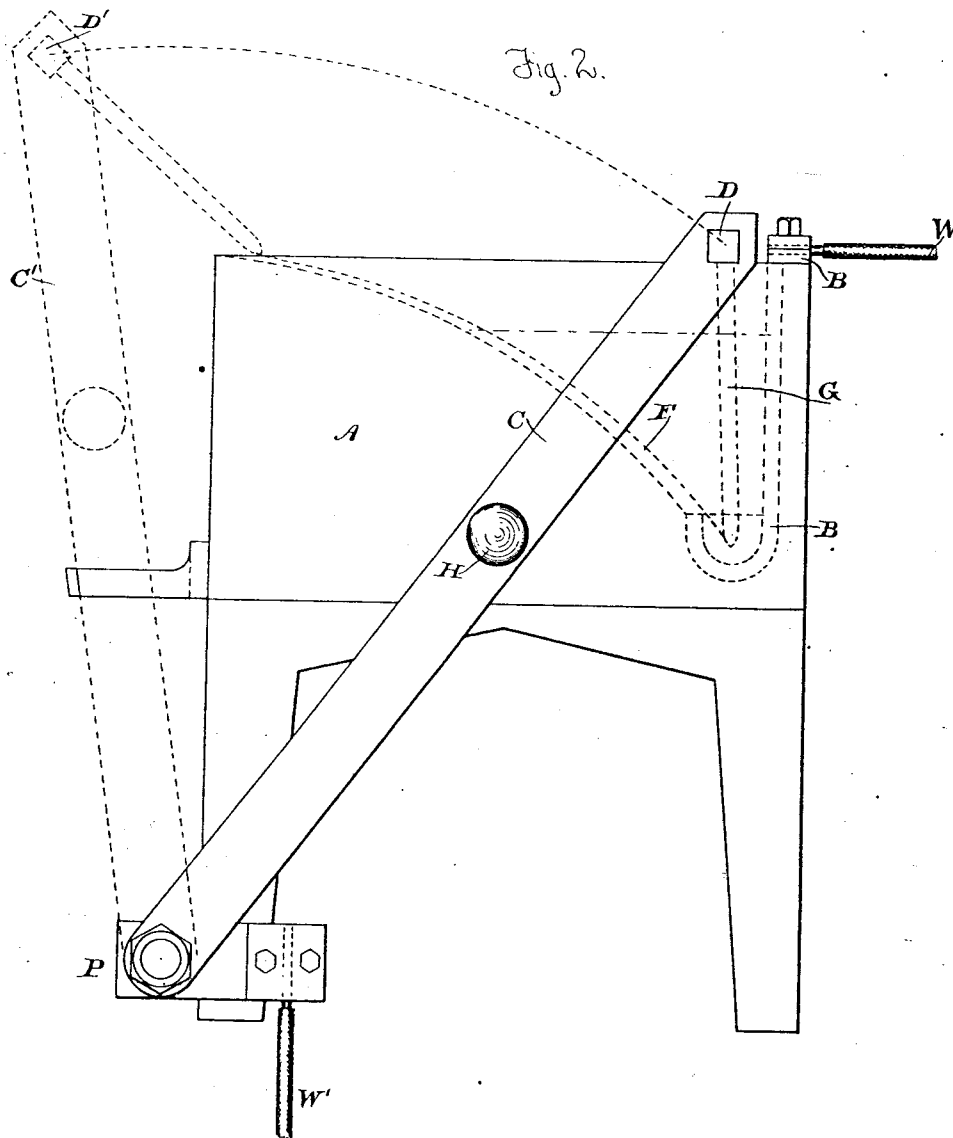
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2 Sheets—Sheet 2

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ELECTRIC SWITCH.

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Witnesses.
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J. E. McDonald

Inventor.
Elihu Thomson.
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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 468,119, dated February 2, 1892.

Application filed July 14, 1890. Serial No. 358,708. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Lynn, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

My present invention aims to do away with the difficulties often experienced in the present state of electrical engineering where it is found desirable to open and close circuits on which large currents of high potential are present. With the switches now in use it has been found that such circuits cannot be opened and closed without the presence of sparking and destructive arcs at the contacts. By my switch, herein to be described, I find that it is possible to avoid all such arcing, and to control these large currents with ease and perfect safety to the apparatus used.

One form of the invention is illustrated in the accompanying drawings, and it will be understood that in mechanical details this apparatus can be modified indefinitely, though still preserving the underlying principle upon which my invention is based, and which consists in general in causing the switch-contacts to traverse successively a less and less perfect conducting-path, so that the total resistance of the circuit when the switch is opened is gradually increased until the switch-contacts are entirely separated and the circuit ruptured. It is as though a closed path of practically no resistance between the switch-contacts was gradually converted into a path of higher and finally infinite resistance.

Figure 1 is a perspective view of the apparatus embodying my invention; and Fig. 2 is a side view of the same, showing by dotted lines the switch in its open position.

In Fig. 1, A is a receptacle of any desired and suitable form, made of insulating material, at one end of which there is a plate of conducting material B, to which is connected a wire or other conductor W, forming a part of the line-circuit. The plate B extends down into the receptacle, and is therefore in contact with the fluid contained in the receptacle shown at F. This fluid is a partial but

poor conductor of electricity—as, for instance, a solution of a salt like sodium sulphate.

The switch-arm C is provided with an operating-handle H and pivoted at P, where it is connected with the line-wire W'. A conducting-bar D is carried upon one end of the arm C, and depending therefrom is a series of metal or conducting rods G, which dip into the liquid when the switch is closed, as shown in Fig. 1. These bars may extend down so as to touch the plate B, forming solid contact therewith, or preferably the plate B is constructed with a trough-like lower edge T, in which is held a body of mercury, into which the depending bars dip, as shown.

The arrangement thus described constitutes the simplest form of my invention; but I find it desirable in most cases to place upon the mercury and under the fluid F a number of small iron or other metal balls, or they may be replaced by hard carbon balls, or, better still, the layer of iron balls may have a layer of carbon balls overlying them, the relative specific gravities of the mercury, the iron and carbon balls, and the solution keeping them in position or preventing them from admixture. "Balls" of a rounded form are preferable; but I use this term in a general sense, meaning small pieces, such that the contact or contacts G can readily pass through them, bringing more or less into circuit. In this way it will be seen that the different resistance-conductors are arranged serially in the order of their respective conductivities and form a path for the moving switch of gradually-increasing resistance as the switch is moved from the closed position shown in Fig. 1 to the dotted-line position shown in Fig. 2.

On opening the switch the break in the circuit is not a sudden one, for the depending bars G first leave the mercury, then pass through the iron balls, and then through the carbon balls and liquid, cutting each into circuit, and thereby gradually increasing the total resistance of the circuit until it is finally broken by the withdrawal of the bars entirely from the liquid. In closing the switch the operation is the reverse, the resistance being very great when the bars are immersed in

the liquid, and becoming less and less until finally good electrical connection is established when the mercury in trough T is reached. Both opening and closing are so gradual as to be accomplished promptly, but without spark, on account of the gradation of resistances provided, which gradation could not be obtained with the use of rheostats or similar devices without enormous complication. The switch is particularly useful where a current is to be interrupted, which is of great volume and in the path of which there is great self-induction, giving rise to a tendency to maintain an arc on the opening of the switch.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the switch-contacts with a series of three or more conductors of different resistances brought into or cut out of circuit serially by the switch when opening or closing the circuit in the order of their respective conductivities, as set forth.

2. The combination of the switch-contacts with means for opening or closing the circuit thereby through a conducting-path of graduated resistance, comprising, first, a good conductor serving to close the circuit; second, an imperfect or non conductor serving to open the circuit, and, third, one or more conduct-

ors of intermediate conductivity brought into or cut out of circuit during the opening or closure of the switch, as set forth.

3. The combination of the switch-contacts with balls of inferior conducting material located in the path of the moving member of the switch and cut into and out of the circuit to form a path of graduated resistance upon opening or closing the switch, as set forth.

4. The combination, in an electric switch, of a receptacle containing a conducting-liquid of low conductivity in circuit with one of the switch-contacts, and balls of better conducting material through which passes the moving contact when opening or closing the circuit, as set forth.

5. The combination of a receptacle containing a conducting-liquid of low conductivity, a trough-like plate B, containing a body of mercury forming one of the switch-contacts, and balls of better conducting material located above said mercury in the order of their respective conductivities, with the moving switch-contact comprising a pin or pins passing down through said liquid into contact with the mercury.

ELIHU THOMSON.

Witnesses:

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GEORGE H. ALTON.