No. 877,576.

PATENTED JAN. 28, 1908.

E. S. LINCOLN.

SERIES PARALLEL POLARITY CHANGING SWITCH.

APPLICATION FILED FEB. 11, 1907.

3 SHEETS—SHEET 1.

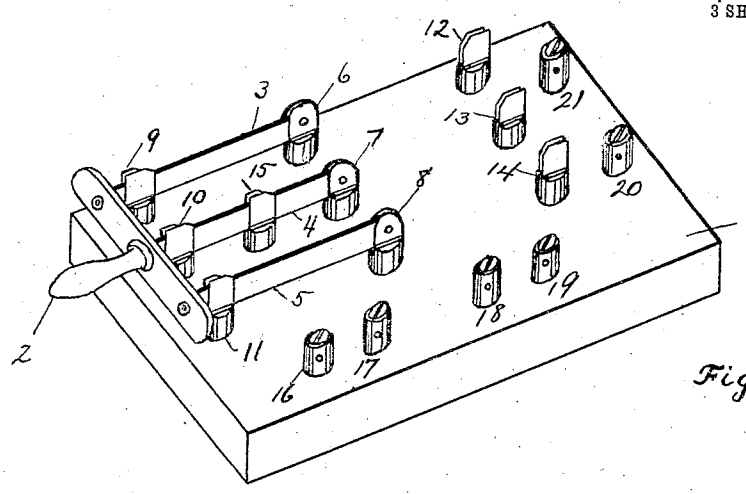


Fig. 1.

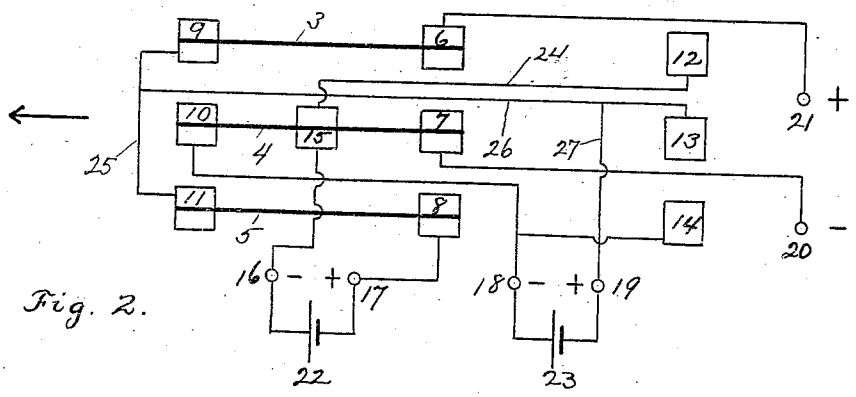


Fig. 2.

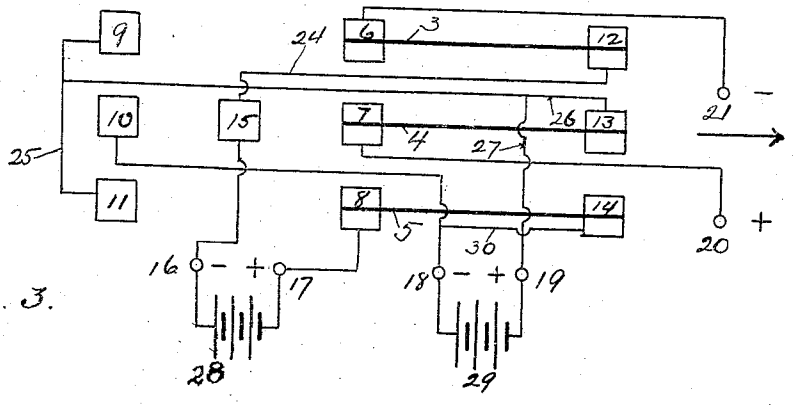


Fig. 3.

Witnesses.
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3 SHEETS—SHEET 2.

Fig. 4

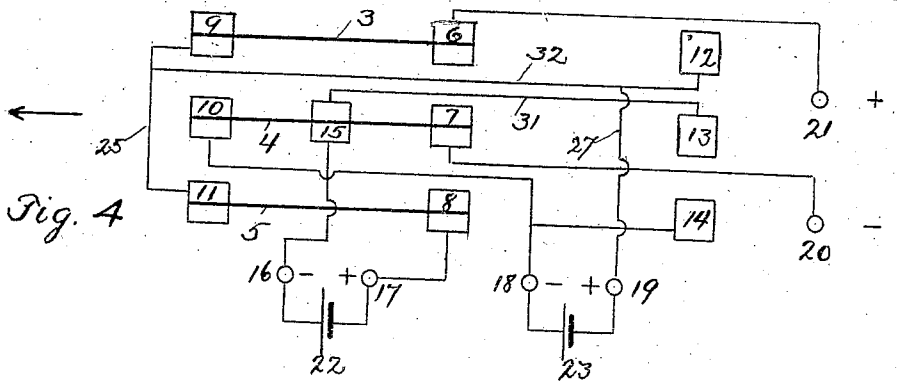


Fig. 5

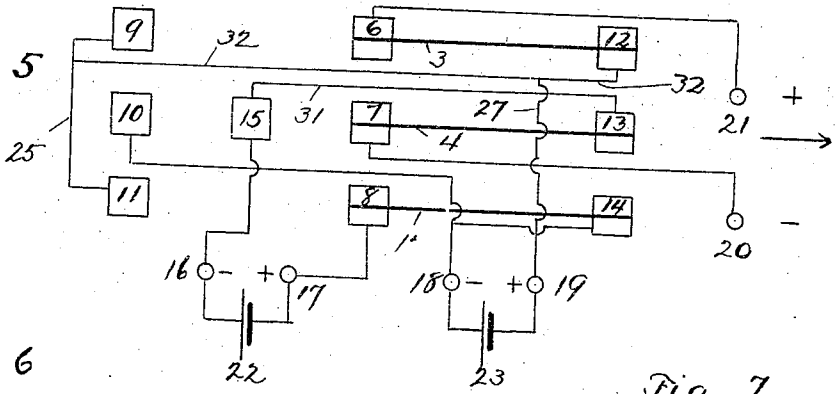


Fig. 6

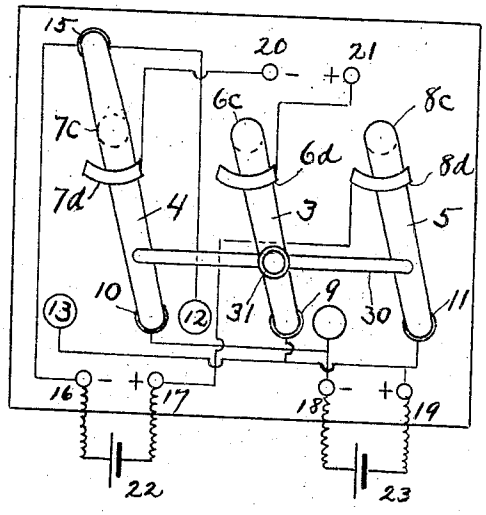
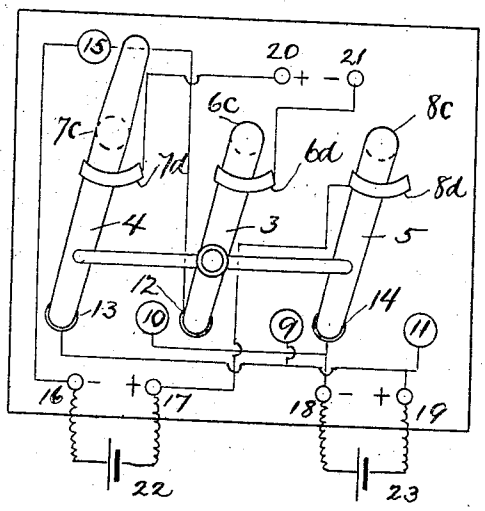


Fig. 7



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SERIES PARALLEL POLARITY CHANGING SWITCH.

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3 SHEETS—SHEET 3.

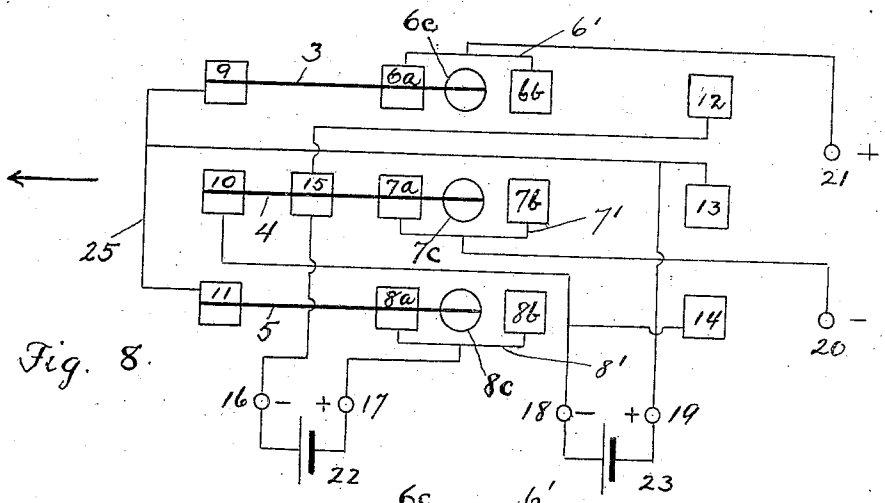


Fig. 8.

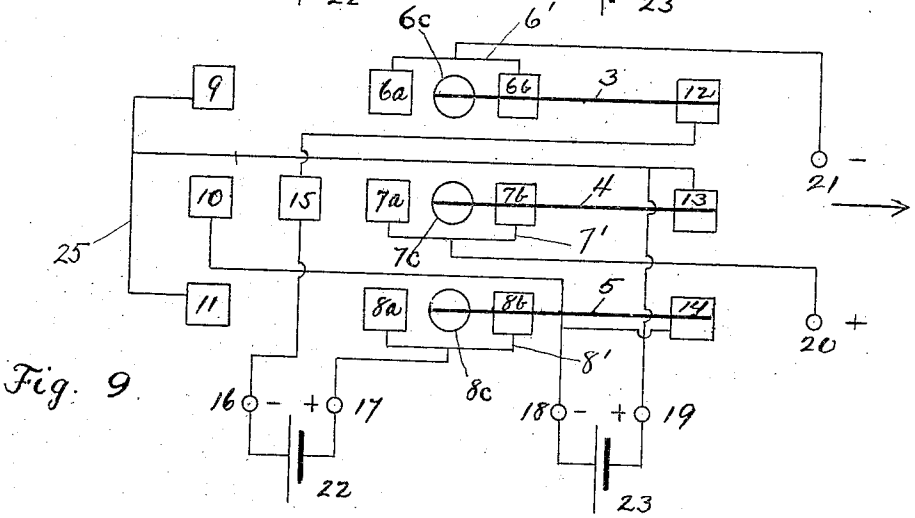


Fig. 9.

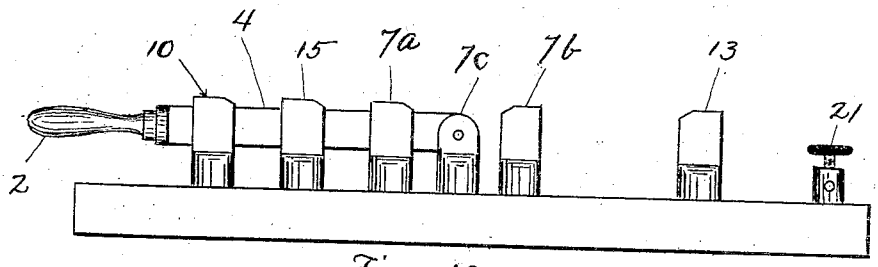


Fig. 10.

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UNITED STATES PATENT OFFICE.

EDWIN S. LINCOLN, OF BROOKLINE, MASSACHUSETTS.

SERIES-PARALLEL POLARITY-CHANGING SWITCH.

No. 877,576. Specification of Letters Patent. Patented Jan. 28, 1908.

Application filed February 11, 1907. Serial No. 356,853.

To all whom it may concern:

Be it known that I, EDWIN S. LINCOLN, citizen of the United States, residing at Brookline, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Series-Parallel Polarity-Changing Switches, of which the following is a specification.

My invention relates to double throw switches or the like, adapted in one position of the manipulating handle to place in series the batteries or other sources of electric energy which it controls, and in the other position adapted to put in parallel the said batteries; furthermore preferably reversing the polarity at the terminals of the circuit controlled by the said switch.

In the drawings, Figure 1 is a view in perspective of a switch of the "single break" type in which is embodied my invention in its preferred form. Fig. 2 is a diagrammatic figure showing arrangement and wiring of the switch elements, and illustrating the operation of the switch when switch blades are thrown to left, in the direction of arrow. Fig. 3 is similarly a diagram illustrating operation of switch when switch blades are thrown to the right, as shown by arrow. Figs. 4 and 5 are diagrams showing the wiring and illustrating the operation of a switch varying slightly from that shown in Figs. 1, 2, and 3. Figs. 6 and 7 show construction and arrangement of a switch embodying my invention in which the movable conductors swing laterally instead of vertically as in the foregoing figures. Figs. 8 and 9 are diagrams illustrating the wiring and operation of a switch of the "double break" type, embodying my invention. Fig. 10 is a side elevation of the same showing one switch blade in one of its operative positions.

In Fig. 1 my invention is shown as embodied in a switch similar in general features with the usual triple pole, double throw single break switch, having the base 1, the handle 2, preferably adapted to operate simultaneously the three switch blades 3, 4, and 5, which are pivoted at hinge posts 6, 7, and 8, or otherwise restrained at one end, and engage in one position of the switch the outer contact blocks 9, 10, and 11, and in the other position with outer contact blocks 12, 13, and 14. A supplementary contact block is provided at 15, with which switch blade 4 also engages simultaneously with outer contact block 10, when in the position shown in Figs. 1 and 2.

16, 17 and 18, 19 are two pairs of binding posts for connecting in the poles of two batteries, or other source of electric energy, which may consist of single cells, as in Fig. 2, or of cells in series as in Fig. 3. At 20 and 21 are binding posts to which may be connected the terminals of the circuit which switch controls.

The connections between switch outer contact blocks, hinge posts, battery and circuit binding posts, as well as the mode of operation of the switch, are shown in Figs. 2 and 3. In Fig. 2, the switch is shown in the position in which batteries 22 and 23 are connected in parallel. In this Fig. 2 switch handle 2 is supposed thrown to the left in the direction of the arrow, the switch blades 3, 4, and 5, shown as heavy lines in such position, putting in electrical connection respectively 6 and 9; 7, 15, and 10; and 8 and 11. A battery 22 is connected in at binding posts 16 and 17, so that, for example, 16 is negative and 17 is positive. Similarly, a second battery 23 is connected in at 18 and 19, so that these binding posts are respectively negative and positive.

From 16 a wire extends to 15 and thence a wire 24 leads to 12. 17 is wired to 8. 9 and 11 are joined by wire 25, both being in communication with 13 by means of wire 26. Binding post 18 is wired both to 10 and to 14. Binding post 19 is connected by wire 27 to wire 26, and thereby is in connection with 13 as well as with 9 and 11, or if desired said binding post 19 may be wired direct to 13. 6 leads to 21, and 7 to 20.

The operation of switch in paralleling batteries 22 and 23 is as follows. From positive binding post 17 current goes to 8 and on to 11 through switch blade 5, and into wire 25, where it is joined by current from positive pole of battery 23, which passing through the binding post 19, wires 27 and 26 is conducted to wire 25, and both currents there uniting, pass through switch blade 3 from 9 to 6 and thence to positive circuit binding post 21. Returning the current passes through negative binding post 20 to 7 and enters switch blade 4, where it divides, a part returning via 15 to negative binding post 16, and the balance returning to negative binding post 18 via 10. From the above it will be seen that batteries 22 and 23 are thus connected in

parallel, 21 being rendered the positive, and 20 the negative terminal for the circuit.

In Fig. 3 the switch is in its alternate position, handle 2 now being towards the right so that 6 and 12 are connected by switch blade 3, 7 and 13 by switch blade 4, and 8 and 14 by switch blade 5. As before 16 is connected with negative pole of battery 28, which is here shown as composed of three cells in series, 17 being connected with the positive pole of the same. Similarly negative pole of battery 29 leads to 18 and positive pole of the same to 19. Starting at 16, (which is seen to be in communication with circuit binding post 21 through supplementary contact block 15, wire 24, outer contact block 12, and through switch blade 3 to hinge post 6, which is wired to 21), current passes through battery 28 to pole 17. Thence it passes to 8, traverses switch blade 5 to 14, and comes back through wire 30 to 18. Passing through battery 29 to pole 19, current continues through wires 27 and 26 to outer contact block 13 and on through switch blade 4 to hinge post 7 and thence to circuit binding post 20. From the above it will be noticed that batteries 28 and 29 are, in this position of the switch blades, connected in series, and that 21 is in this case the negative, and 20 the positive terminal for the circuit, thus reversing the polarity of the said terminals as compared with that resulting from the alternate position of the switch blades shown in Fig. 2.

Should it be desired to place the separate sources of energy either in series or in parallel, in the alternate positions of the switch without changing the polarity at the line terminals, a slight change in the wiring is necessary. Comparing Figs. 4 and 5, which show the wiring of such a switch, with Figs. 2 and 3, it will be noted that in the former a wire 32, electrically connecting 12 with wire 25, and also connected to 19 by wire 27, replaces wire 26 of Figs. 2 and 3; which, the said figures, connects 13 with wire 25, the said wire 26 also having a branch wire 27 leading to 19. Furthermore, 15 is, in Figs. 4 and 5, in connection with 13 by wire 31, instead of being joined to 12 by wire 24, as in Figs. 2 and 3. With these changes the wiring is the same in Figs. 4 and 5 as it is in Figs. 2 and 3, and the foregoing description of the operation of the switch in paralleling the sources of energy when the conductors are in the position shown in Fig. 2 is equally applicable to Fig. 4, the reference numerals being the same in both cases. In Fig. 5, however the operation of switch differs from that of the switch shown by Fig. 3 in that binding post 21 is in the former in electrical connection with positive pole 19 of battery 23, through 6, 3, 12, and wires 32 and 27. Hence 21 is in this case positive, whereas in Fig. 3 it was negative. Also 20 is now electrically connected with negative pole 16 of battery 22 through 7, 4, 13, wire 31, and 15, and hence said binding post 20 is in Fig. 5 negative, whereas in Fig. 3 the same was positive. In all other respects the switch operates in the same manner as described in connection with Fig. 3, and serves to put said sources of energy in series without changing the polarity of the binding posts 20 and 21, with relation to the polarity of the same when the sources of energy were connected in parallel as in Fig. 4.

In the type of switch shown in Fig. 1 it may be seen that the hinge posts not only act as pivots about which the switch blades swing, but also serve as contact blocks with which the pivoted ends of said switch blades are in continual engagement. That is, in one position of the switch the movable conductors, as the switch blades may be broadly termed, put the outer contact blocks of one selective set into electrical connection with the hinge posts, or "inner contact blocks", as they may be more broadly termed. In the other position of the switch the said movable conductors also put the outer contact blocks of the other selective set, as well as the supplementary contact block, into connection with the same set of inner contact blocks; the sets of "inner contact blocks" being in this case both mechanically and electrically identical.

It is apparent that my invention may be embodied in a switch in which the sets of inner contact blocks engaged by the movable conductor in the selective positions of the switch are not necessarily both mechanically and electrically identical; as well as in one in which the said inner contact blocks are independent of the switch elements at which the movable conductors are pivoted. Figs. 6 and 7 show a switch of the latter type. In said figures, 4, 3 and 5 are the movable conductors pivoted at 7^c, 6^c, 8^c, and preferably simultaneously operable by the connecting yoke 30, provided with handle 31. When the switch handle is towards the right, as in Fig. 6, the movable conductors contact with one set of outer contact blocks, 10, 9, and 11; conductor 4 also being in contact at its other end, which is extended beyond pivot 7^c, with supplementary contact block 15. When the handle 31 is toward the left, as in Fig. 7 the said conductors contact with the alternative selective set of outer contact blocks, 13, 12, and 14. At 7^d, 6^d, and 8^d is a set of inner contact blocks which slidingly engage respectively the conductors 4, 3, and 5, being in electrical contact therewith in either position of the switch. 20 and 21 are binding posts for connecting in the circuit controlled by the switch, while 22 and 23 are two independent sources of energy respectively connected in at binding posts 16 and 17, and 18 and 19. In the position of switch shown in

Fig. 6 the sources of energy are connected in parallel, current from negative pole 16 going to 15 and thence into conductor 4, where it is joined by current from negative pole 18; the latter being connected by wire with 10, with which said conductor 4 is in contact. From conductor 4 both currents pass into 7^d, and thence to negative binding post 20. Positive pole 17 is in connection, through inner contact 8^d and conductor 5, with outer contact 11, from which a wire extends to outer contact 9, said wire being also connected to positive pole 19. Thus currents from positive poles 17 and 19 unite and pass through outer contact 9, conductor 3, and inner contact 6^d, to positive binding post 21. In Fig. 7 said conductors are swung into their left hand position. In this position it will be seen that negative pole 16 is connected to positive binding post 20 by way of supplementary contact 15, outer contact 12, conductor 3, and inner contact 6^d. Positive pole 17 of source of energy 22 is connected with negative pole 18 of source of energy 23, through 8^d, conductor 5, and outer contact 14. Positive pole 19 of 23 is electrically connected to 20, through 13, 4, and 7^d. It will thus be seen that in this position of the switch the sources of energy 22 and 23 are connected in series, and the polarity of the binding posts 20 and 21 is reversed as compared with that resulting from the switch position shown in Fig. 6.

Still another type of switch is represented in Figs. 10, 8, and 9 which show a switch of the well known "double break" type. In this switch the pivot posts 6^e, 7^e and 8^e are electrically dead, and have the movable conductors 3, 4, and 5 pivoted thereat. The outer contacts 9, 10, 11, 12, 13, and 14, as well as supplementary contact 15 correspond to similarly numbered elements in the switch shown in Figs. 1, 2, and 3; the movable conductors 3, 4, and 5 respectively engaging 12, 13 and 14, in one position, and 9, 10 and 15, and 11 in the other position. Simultaneously with outer contacts 12, 13, and 14, the said conductors engage a set of inner contacts 6^b, 7^b, 8^b, as shown in Fig. 9, while in the other position of the switch, as shown in Fig. 8, engage with a second set of inner contacts 6^a, 7^a, and 8^a simultaneously with outer contacts 9, 10, and 11. The said sets of inner contacts are electrically identical, 6^a being electrically connected to 6^b, 7^a to 7^b, and 8^a to 8^b, respectively by the wires 6′, 7′, and 8′. The electrical connections between the outer and supplementary contact blocks, battery and circuit binding posts, and the wires 6′, 7′, and 8′, are identical with those shown in Figs. 2 and 3, and described in the specification above with reference thereto, noting however that the wires 6′, 7′, and 8′, inner contacts 6^a and 6^b, 7^a and 7^b, and 8^a and 8^b, and pivot posts 6^e, 7^e and 8^e, with their respective functions, are, in the switch shown in Figs. 2 and 3, respectively combined mechanically and electrically in the hinge posts 6, 7, and 8. With the modification just noted that portion of the above specification describing mode of operation of switch shown in said Figs. 2 and 3 will be found to be equally applicable as a description of the mode of operation of the switch shown in Figs. 8, 9, and 10.

While I have hereinbefore used the term "inner" as applying to certain of the contact blocks, the term is chosen because as shown in the figures said contact blocks are located inside of, or between, the "outer" contact blocks, and it is adopted solely for the purpose of distinguishing the same from the outer and supplementary contact blocks. It is clear that the relative position of the sets of inner and outer contact blocks with reference to the pivoted ends of the conductors may be reversed, so that the contact blocks hereinbefore termed "outer", engage the conductors nearer the pivoted ends of the same, without involving any departure from my invention, so long as the "inner" contacts engaged by any one conductor in either position of the switch were electrically identical, and provided that the inner, outer, and supplementary contact blocks, and the circuit terminals were electrically connected substantially as described.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. In combination with a plurality of sources of electric energy, an electric switch adapted to electrically connect said sources of electric energy to an electric circuit, said switch having triple conductors adapted to occupy selective operative positions, a set of inner contact blocks at which said conductors are hinged, a set of outer contact blocks with which said conductors electrically engage in one operative position of the switch, a second set of outer contact blocks with which said conductors electrically engage in the second operative position of the switch, a supplementary contact block with which one of said conductors also engages in said second position of the switch, and electric connections between said sources of energy, inner contact blocks, outer contact blocks, supplementary contact block, and the circuit terminals, substantially as described, whereby in one position of the switch the said sources of energy are connected to said circuit in series, and in the second position the said sources of energy are connected thereto in parallel.

2. In combination with a plurality of sources of electric energy, an electric switch adapted to electrically connect said sources of electric energy to an electric circuit, said switch having movable conductors adapted

to occupy selective operative positions, a set of inner contact blocks with which said conductors electrically engage in either operative position of said conductors, a set of outer contact blocks with which said conductors electrically engage in one position of the switch, a second set of outer contacts with which said conductors engage in the second position of the switch, a supplementary contact block with which one of said conductors engages in the second position of said switch, and electric connections between said sources of energy, inner, outer, and supplementary contact blocks, and the circuit terminals, substantially as described, whereby in one position of the switch the said sources of energy are connected to said circuit in series, and in the second position of the switch the said sources of energy are connected thereto in parallel.

3. In combination with a plurality of sources of electric energy, an electric switch adapted to electrically connect said sources of energy to an electric circuit, said switch having movable conductors adapted to occupy selective operative positions, each of said conductors engaging in either position of the switch with an inner and an outer contact block, the inner contact blocks engaged by any conductor in one position of the switch being electrically identical with the inner contact engaged by said conductor in the other position of the switch, one of said conductors furthermore engaging in one position of the switch with a supplementary contact block, and electric connections between said sources of energy, inner, outer, and supplementary contact blocks, whereby in one position of the switch the said sources of energy are connected to said circuit in series, and in the second position of the switch the said sources of energy are connected thereto in parallel.

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

EDWIN S. LINCOLN.

Witnesses:
NATHAN B. DAY,
WILLIAM A. COPELAND.