Sept. 24, 1935. S. A. GRISWOLD 2,015,624

HEATER SWITCH AND CIRCUIT

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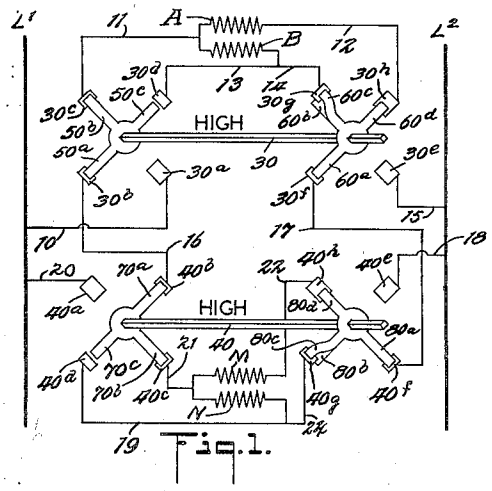



Fig. 1.

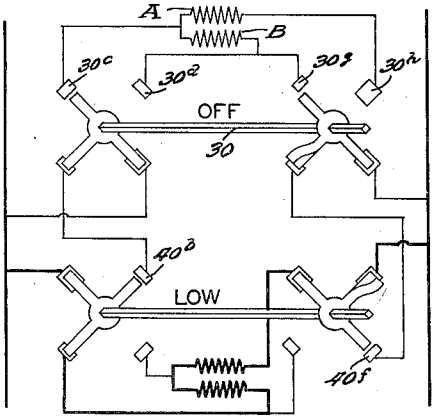



Fig. 4.

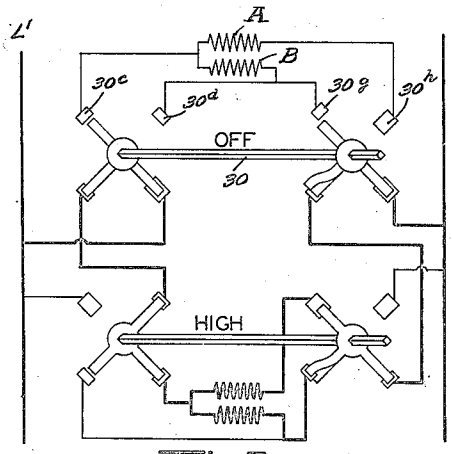



Fig. 2.

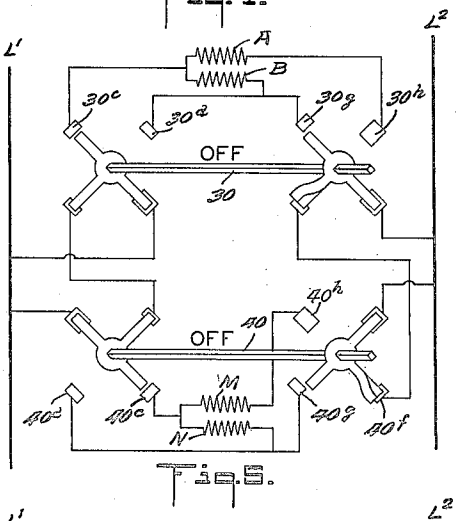



Fig. 5.

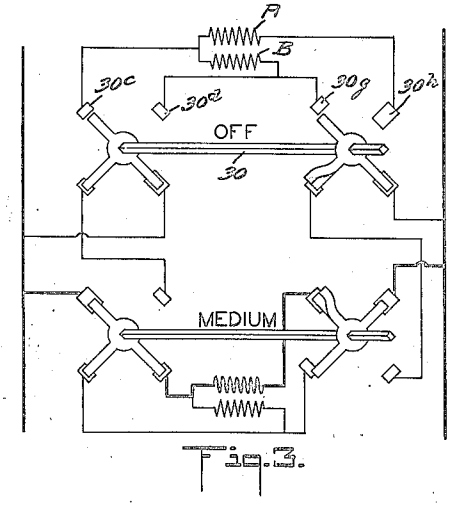



Fig. 3.

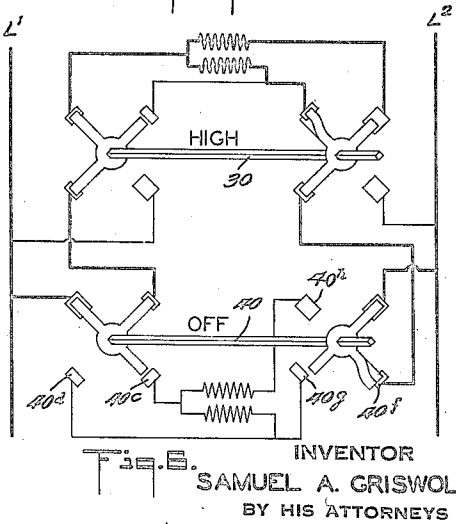



Fig. 6.

INVENTOR
SAMUEL A. GRISWOLD
BY HIS ATTORNEYS
Harman and Howard

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Fig. 11.

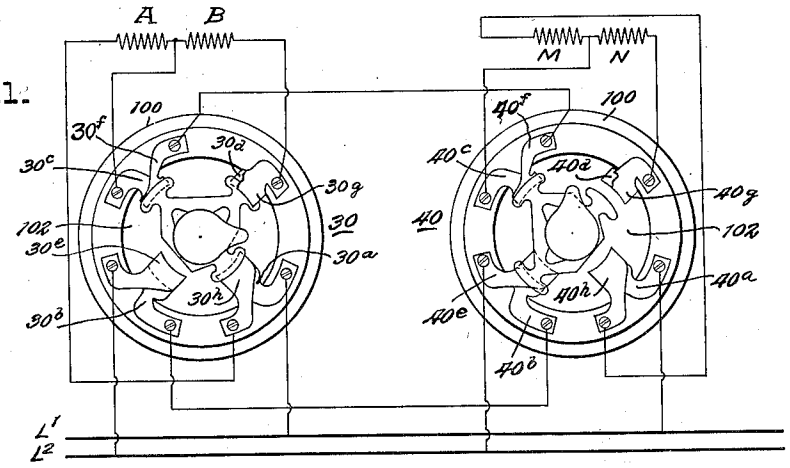



Fig. 2.

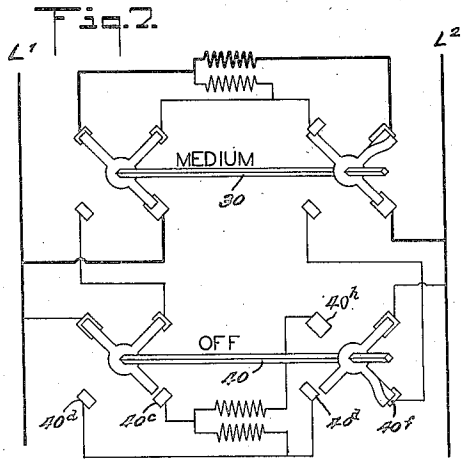



Fig. 8.

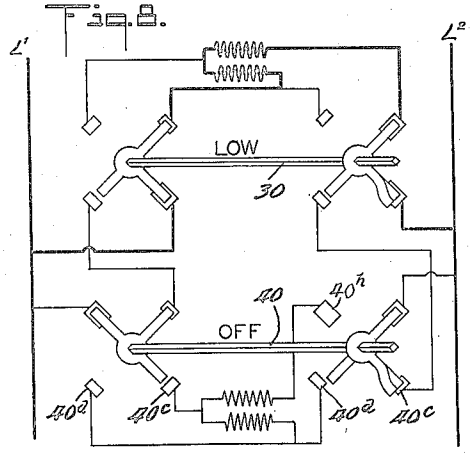



Fig. 10.

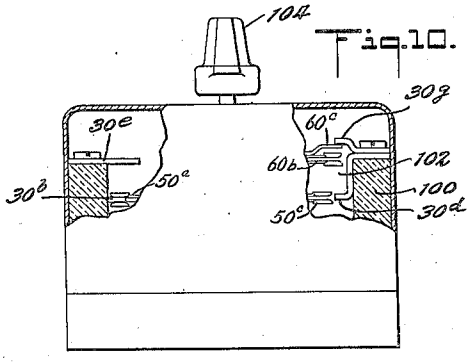
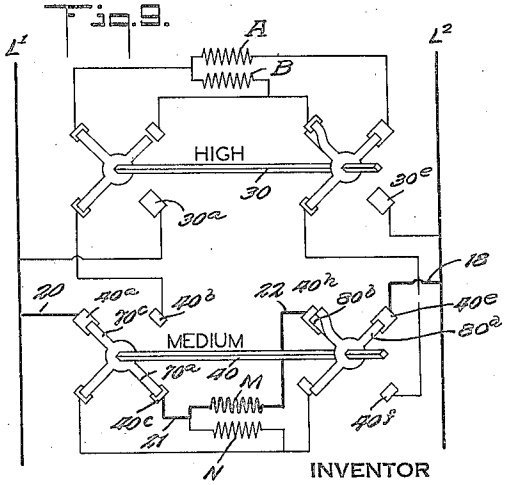



Fig. 9.




INVENTOR
SAMUEL A. GRISWOLD
BY HIS ATTORNEYS
Houston and Houston

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# UNITED STATES PATENT OFFICE

2,015,624

## HEATER SWITCH AND CIRCUIT

Samuel A. Griswold, Wethersfield, Conn., assignor to The Arrow-Hart & Hegeman Electric Company, Hartford, Conn., a corporation of Connecticut

Application October 8, 1932, Serial No. 636,931

10 Claims. (Cl. 219—20)

This invention relates to heater switches and circuits for establishing connections to give varying physical effects in electrical translating devices such as resistances, heater units, lamps or the like which are connected in the circuit.

More particularly this invention relates to a circuit containing a plurality of interconnected switches and heater units such as are commonly used in electric ranges.

It is an object of my invention to provide a circuit including a plurality of interconnected switches each of which controls connections to an electric translating device such as a heater unit, this circuit being characterized by the fact that each device or heater unit is isolated from the power lines when its switch is in circuit breaking position.

Another object of my invention is to provide a circuit including a plurality of interconnected switches each of which controls an electric translating device such as a heater unit, this circuit being characterized by the provision of connections for the prevention of excess current drain from the power lines.

Another object of my invention is to provide a circuit including a plurality of interconnected switches each of which controls connections to an electric translating device such as a heater unit in which circuit the completion of connections of one switch to its heater unit is permitted when the other switch is in any position but the position in which it establishes the connections for giving maximum heat in the heater unit which it controls, and vice versa.

Another object of my invention is to provide a circuit of the above type in which the above objects are accomplished by the use of two deck switches.

Other objects and advantages of my invention will become apparent as it is described in connection with the accompanying drawings.

In the drawings:—

Figures 1 to 9 show circuit diagrams of a pair of switches each of which primarily controls connections to a two element heating unit and is interconnected according to the principles of my invention. These figures show the switches in different positions for establishing circuit connections to give different combinations of heating effects.

Figure 10 is an elevation view partly in section of the type of switch used in my new circuit.

Figure 11 is a plan view of a pair of switches like the switch shown in Figure 10 but with the covers of the switches removed and with diagrammatic circuit connections made according to my invention.

Referring to the drawings the switches used in carrying out my invention are identical and each comprises a circular porcelain base 100 with a recess or well 102 in the center for the reception of conventional rotary snap switch mechanism of any suitable type such as that shown in the Harrington Patent 1,466,507 patented August 28, 1923. The switch mechanism is controlled manually by a handle 104 which may be of the type shown in the Carlson Patent 1,690,052 patented October 30, 1928. The arrangement of the stationary contacts about the switch base and of the movable switch contacts upon the switch spindle may be varied within the scope of my invention and need not be exactly as illustrated and hereinafter described. I prefer to use a combination of long and short stationary switch contacts which are engaged and disengaged by long and short movable switch blades as the switch is actuated. Preferably I locate the contacts in two planes with one of the contacts offset so that its contacting surface is above the upper plane so as to be engaged only by a movable switch blade especially provided for this purpose and which is offset from the other blades into the same plane as the contacting surface of the offset stationary contact.

Referring to the switch 30 which I provide primarily for controlling connections to the heating unit composed of the resistance elements A and B, the lower contacting plane includes one long contact 30*a* and three short contacts 30*b*, 30*c*, and 30*d*, each of which may be provided with conventional binding means for the wire connections of the circuit. The contacts 30*b*, 20*c* and 30*d* are 90°, 180° and 270°, respectively in advance of long contact 30*a*. The upper contacting plane includes a long contact 30*e*, a short contact 30*f*, a short contact 30*g* offset upwardly from the upper plane, and a long contact 30*h*, the contacts 30*f*, 30*g* and 30*h*, being 90°, 180° and 270° in advance of long contact 30*e*, respectively. The lower contacting plane has a movable switch member comprising three switch blades 50*a*, 50*b*, 50*c*, the blades 50*a*, and 50*b* being long and the blade 50*c* being short. The blade 50*b* is 90° in advance of 50*a* and the blade 50*c* is 180° in advance of 50*a*. The upper contacting plane contains a movable switch member having four switch blades 60*a*, 60*b*, 60*c*, and 60*d*. The blades 60*b* and 60*c* are 90° in advance of 60*a* and like 60*a* are long contacts, but the end portion of blade 60*c* is offset to lie above the end portion of 60*b* in the same plane as the con-

tacting surface of the offset stationary contact **30***g* so as to contact therewith as the switch is rotated. Switch blade **60***d* is a short blade and is 180° in advance of **60***a*.

The upper and lower movable contact members are fixedly mounted upon the switch spindle, with their blades in predetermined relation, and they rotate together in a manner well known to those skilled in the art.

In the switch as shown in Figures 10 and 11 the offset contact **30***g* is directly above the short lower contact **30***d* in the lower plane, and the long contact **30***e* in the upper plane is directly above the short lower contact **30***b* in the lower plane, but this relationship of the contacts in the upper and lower plane need not necessarily be maintained as is illustrated by the circuit diagrams of Figures 1 to 9 wherein, for the purpose of simplifying the connections of the diagram the contact **30***e* is shown as if directly above the contact **30***a*. It therefore will be obvious to those skilled in the art that the relationship of the contacts in the upper and lower planes may be varied to suit the desires of a particular manufacturer, and such variations are within the scope of this invention.

The switch **40** may be constructed exactly like the switch **30** having the same long and short contacts in each of the lower and upper planes and an offset contact **40***g* like the offset contact **30***g*. The short contacts **40***b*, **40***c*, **40***d* in the lower plane will be 90°, 180° and 270° in advance, respectively, of the long lower contact **40***a*, and the upper contacts **40***f*, **40***g* and **40***h* will be 90° 180° and 270° in advance, respectively, of the long upper contact **40***e*.

For convenience in describing this invention the four positions of the switches will be designated as high, medium, low and off positions, the high position being the position wherein a switch may complete connections for giving a maximum degree of heat from a heating unit, the medium position being the position of the switch in which the connections are completed for giving a lesser degree of heat than the maximum, but more than the least amount of heat, and the low position being the position in which connections are completed for giving the least amount of heat from the heating units, and the off position being the position in which the circuit from the power lines through the heating units is broken. As will hereinafter appear, in high heat position both elements of the resistance unit are connected in multiple across the power lines. In medium heat position only one element is connected across the lines. In low position both elements are connected in series across the power lines.

Referring now to the circuit connections, the switch **30**, as heretofore stated, is provided primarily for controlling the connections to a heating unit comprising two resistance elements A and B, while the switch **40** is provided primarily for controlling the connections to a heating element comprising two resistance units M and N. But the switches **30** and **40** are interconnected as will hereinafter be more fully described so that when both switches are in high heat position, no circuit through any element of the heating units is completed so that no current flows through either heating unit, nor can the circuit be completed for high heat to either unit so long as the switch controlling the other unit is in any position but off. Furthermore, the circuit connections are arranged, as will now be described, so that when a switch is in off position, the unit it controls will be completely isolated from the feed lines.

The heating units are fed from the power lines L1 and L2. The power line L1 is connected to lower long stationary contact **30***a* by a conductor **10** and the short contact **30***c* opposite is connected by a conductor **11** to one end of each of the heating elements A and B. The other ends of the heating elements A and B are connected by the conductor **12** to the long upper contact **30***h* and wire **14** to the short offset upper contact **30***g* respectively. This other end of the heating element B and the short offset upper contact **30***g* are connected by a conductor **13** to the lower short contact **30***d*. Alternatively the contacts **30***g* and **30***d* may be located above and in contact with one another on the switch base, as shown in Figures 10 and 11. The same applies to **40***d* and **40***g*.

The switch **30** is interconnected with the switch **40** by means of a conductor **16** connecting the lower short contact **30***b* and the lower short contact **40***b* and also by a conductor **17** connecting the upper short contact **30***f* with the upper short contact **40***f*. These contacts and conductors may be considered as interlocking means since they comprise the means for interconnecting switches **30** and **40** and causing the circuits of those switches to be interlocked.

In the switch **40** the long lower contact **40***a* is connected by a conductor **20** with the power line L1 while the short lower contact **40***c* opposite is connected by conductor **21** to one end of each of the heating elements M and N. The other ends of the heating elements M and N are connected with the long upper contact **40***h* by conductor **22** and the short offset upper contact **40***g* by conductor **24** respectively. This other end of the heating element M and the offset upper contact **40***g* may be connected with lower short contact **40***d* by a conductor **19** or as hereinbefore indicated. The upper long contact **40***e* is connected with the power line L2 by a conductor **18**.

Referring to Figure 1 in which the switches are both in the high position, it will be noted that no switch blade is in contact with the contacts **30***a*, **40***a*, **30***e*, **40***e* which are connected with the power lines. Hence there is no current through the heating elements, and it is impossible to get a high degree of heat from both heating units at the same time. This arrangement prevents drawing excess current from the power lines which might cause blowing out of a fuse or breaking down of the insulation due to the excess current.

Referring to Figures 2, 3, 4 and 5, wherein the switch **30** is in off position and the switch **40** is in high, medium, low and off positions it will be noted that the switch blades of switch **30** do not in any of these positions contact with the stationary contacts **30***c*, **30***d*, **30***g* and **30***h*. Since these stationary contacts are the only ones which are connected with the heating elements A and B, these elements are completely isolated from the power lines L1 and L2 whenever the switch **30** is in off position. This is a desirable condition since it avoids the possibility of a short circuit occurring in case a heating unit is connected accidentally with a power line or a ground. It also avoids the possibility of a person receiving an electric shock in case his hand touches a heating unit or a portion of the electric stove or pipe which is grounded.

Referring to Figures 5, 6, 7 and 8, the switch **40** is in off position and the switch **30** is in off

high, medium, and low positions, it will be noted that stationary switch contacts 40*d*, 40*c*, 40*g* and 40*h* are not connected with the switch blades and therefore the heating elements M and N are completely isolated from the power lines L1 and L2 when switch 40 is off, as was the case when the switch 30 was in off position.

Referring now to Figure 9 it will be noted that the switch 40 here has been moved 90° in advance of the high position in which it is shown in Figure 1. This position in Figure 9 of the switch 40 is for giving medium, heat in the unit composed of the elements M and N, and it will be noted that connections are established from power line L1 through wire 20, contact 40*a*, short lower blade 70*c*, long lower blade 70*a*, short lower contact 40*c*, wire 21 and heating element M, wire 22, long upper contact 40*h*, long upper blade 80*b*, short upper blade 80*d*, long upper contact 40*e*, wire 18 to the power line L2. In Figure 9 the switch 30 is in high position, but no circuit is completed through elements A and B since no switch blades engage with the contacts 30*a* and 30*e*, which are directly connected to the power line, nor with 40*b* and 40*f*, which can be connected indirectly with the power lines. By referring to Figures 1 and 3 it will be noted that, in the high and medium positions there shown for switch 40, no connections are completed from the power lines to contact 40*b* and 40*f*, and thus it appears that only when switch 40 is off can the circuit be completed by switch 30 to give high heat in elements A and B. (See Figure 6.) In like manner high heat can be obtained by switch 40 for heater elements M and N only when switch 30 is in off position.

It will be understood that when switch 30 is in high position switch 40 may be moved into medium (Figure 9) and low positions to give medium and low heat in elements M and N. The circuit connections for low position of switch 40 when switch 30 is in high position may be readily traced in the drawings with the help of the foregoing description. Likewise, can the circuits be traced when switch 40 is in high position and switch 30 is in medium and low positions, showing that medium and low heat is developed in elements A and B, when switch 40 is in high position.

From the foregoing it appears that the connections to one switch are disabled when it is in high heat position and the other switch is in any position but off, and vice versa. In other words, when the elements of one heating unit are connected in series across the lines or one element is connected alone across the lines, or one unit is in multiple across the lines, the connections for connecting the elements of the other heating unit in multiple are disabled.

Many modifications within the scope of my invention will occur to those skilled in the art. Therefore I do not limit myself to the specific form shown.

I claim:—

1. In an electric circuit, a pair of supply lines, a plurality of resistance units each comprising a plurality of resistance elements, in combination with means for connecting the elements of each of said units in multiple or in series and for establishing the connections to connect the elements of one unit in series or multiple when the elements of the remainder are disconnected or are connected in any way but in multiple, and for isolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

2. In an electric circuit, a pair of supply lines, a plurality of resistance units each comprising a plurality of resistance elements, in combination with means for connecting the elements of each of said units in multiple or in series, or connecting only one element of each unit directly across the lines and for establishing the connections to connect the elements of one unit in series or multiple or with one element across the lines when the elements of the remainder are disconnected or are connected any way but in multiple, and for isolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

3. In an electric circuit, a pair of supply lines, a plurality of resistance units each comprising a plurality of resistance elements, in combination with means for connecting the elements of each of said units in multiple or with one element directly across the supply lines and for establishing the connections to connect the elements of one unit in multiple or with only one element across the lines when the elements of the remainder are disconnected or are connected in any way but in multiple, and for insolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

4. In an electric circuit, a pair of supply lines, a plurality of resistance units each comprising a plurality of resistance elements in combination with means for connecting said units to the supply lines with their respective elements in different circuit arrangements to give different effects in said units and for establishing the connections to complete the various possible circuit arrangements in one unit when the elements of the remainder are disconnected or are connected in any way but in multiple, and for isolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

5. In an electric circuit, a pair of supply lines, a plurality of resistance units each comprising a plurality of resistance elements, in combination with means for connecting the elements of each of said units in series or with one element directly across the supply lines and for establishing connections to connect the elements of one unit in series or with only one element across the lines when the elements of the other units

are disconnected or are connected in any way but in multiple and for isolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

6. In an electric circuit, a pair of supply lines, two resistance units each comprising a plurality of resistance elements, in combination with means for establishing the connections to connect the elements of either one or the other of said units in series or multiple when the elements of the remaining unit are disconnected or are connected in any way but in multiple, and for isolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

7. In an electric circuit, a pair of supply lines, two resistance units each comprising a plurality of resistance elements, in combination with means for establishing the connections to connect the elements of either one or the other of said units in series or multiple or with one element across the lines when the elements of the remaining unit are disconnected and are connected any way but in multiple, and for isolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

8. In an electric circuit, a pair of supply lines, two resistance units each comprising a plurality of resistance elements, in combination with means for establishing the connections to connect the elements of either one or the other of said units in series or with one element across the line when the elements of the remaining unit are disconnected or are connected in any way but in multiple, and for isolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

9. In an electric circuit, a pair of supply lines, two resistance units each comprising a plurality of resistance elements, in combination with means for establishing the connections to connect the elements of either one or the other of said units in multiple or with one element across the line when the elements of the remaining unit are disconnected or are connected in any way but in multiple, and for isolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

10. In an electric circuit, a pair of supply lines, two resistance units each comprising a plurality of resistance elements, in combination with means for establishing the connections to connect the elements of either one or the other of said units in various circuit arrangements to give different effects in said units when the elements of the remaining unit are disconnected or are connected in any way but in multiple and for isolating each unit completely from the supply lines when its switch is in position to break the circuit through it, said means comprising a pair of switches each having a plurality of long and short stationary contacts, connections interconnecting said switches and said elements and supply lines, and movable contacts in said switches with long and short blades for selectively engaging the stationary contacts.

SAMUEL A. GRISWOLD.