

May 22, 1934.

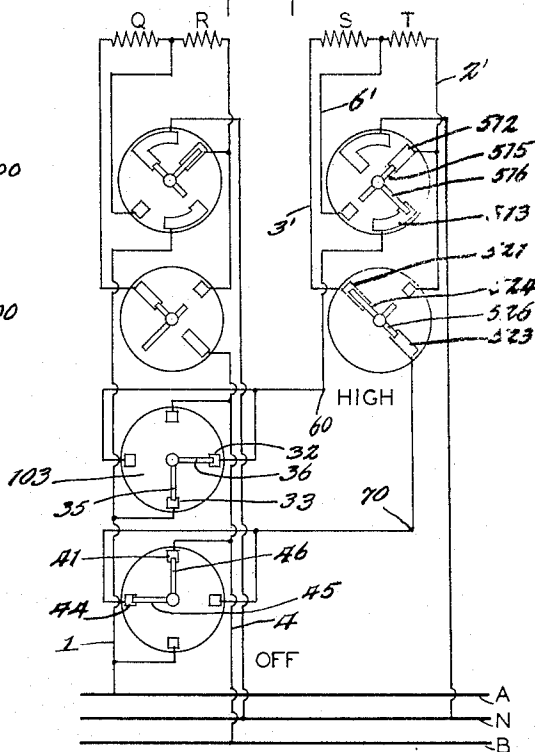
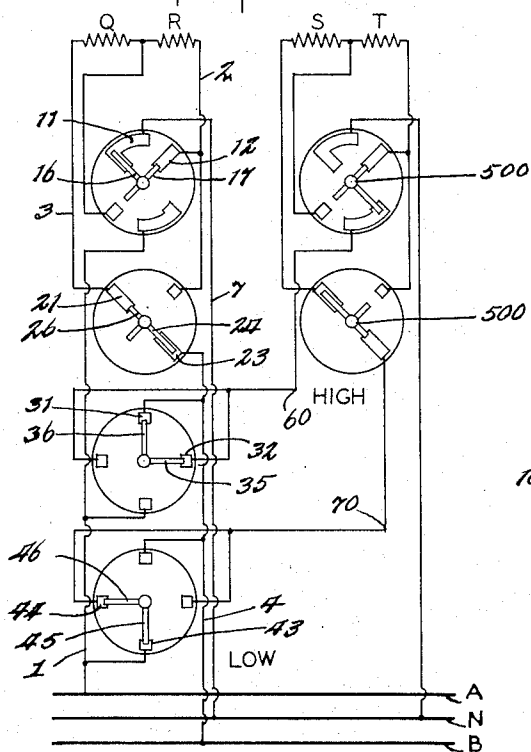
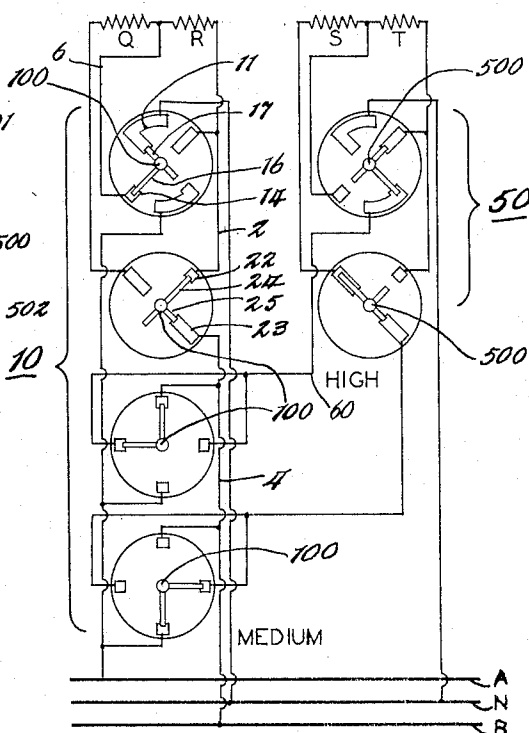
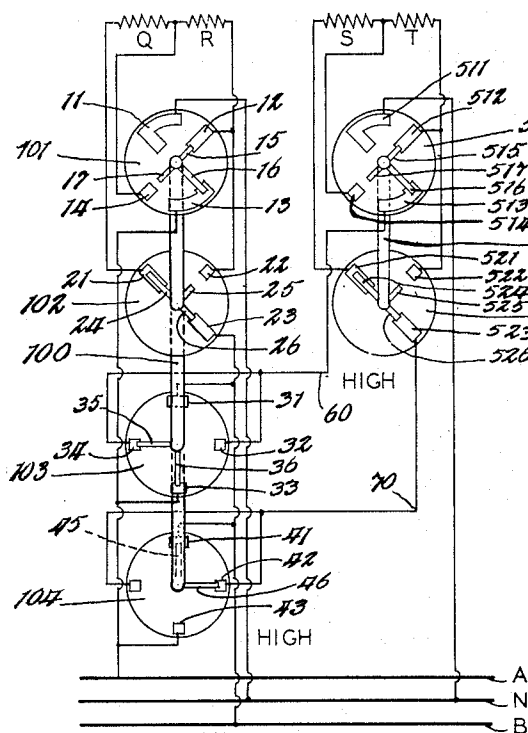
G. R. BARKSDALE

1,960,179

HEATER CIRCUIT AND SWITCH

Filed Dec. 24, 1931.

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

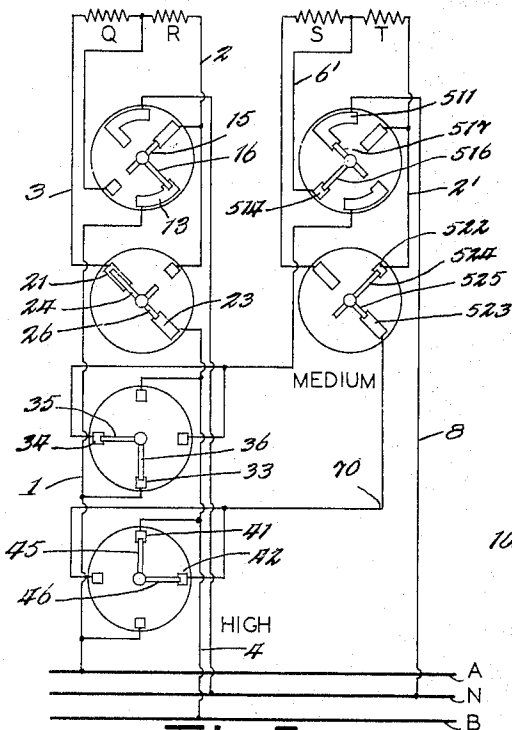


Fig. 6.

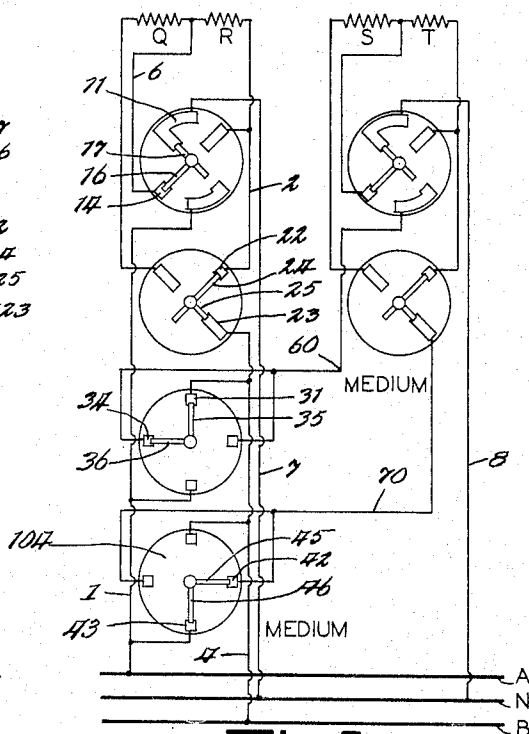


Fig. 7.

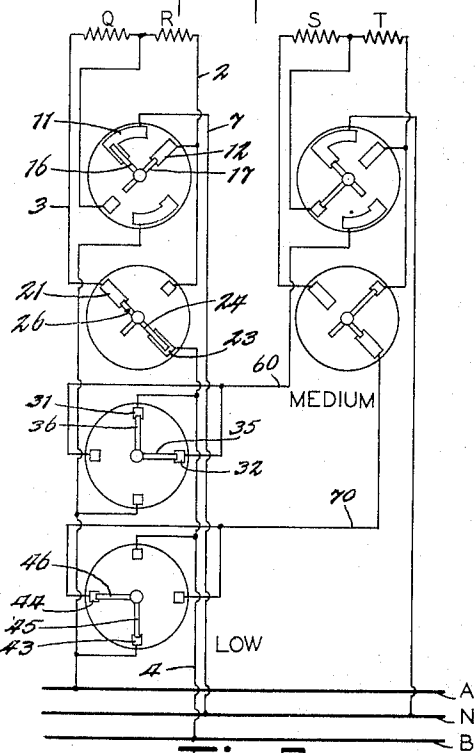


Fig. 8.

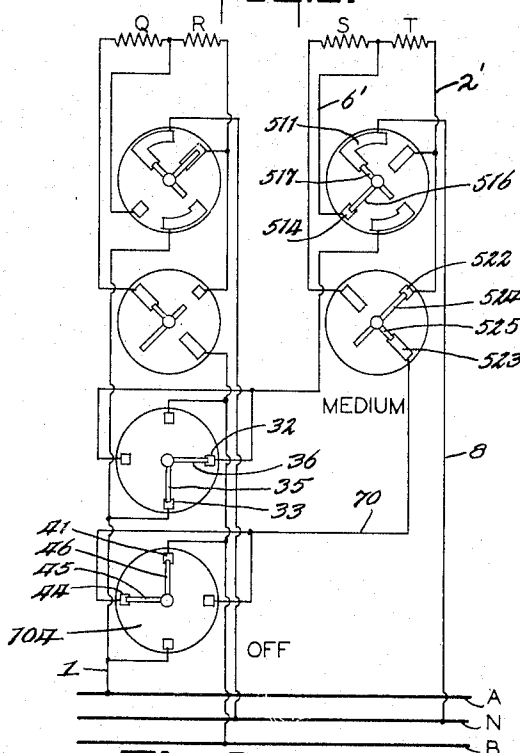


Fig. 9.

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4 Sheets-Sheet 3

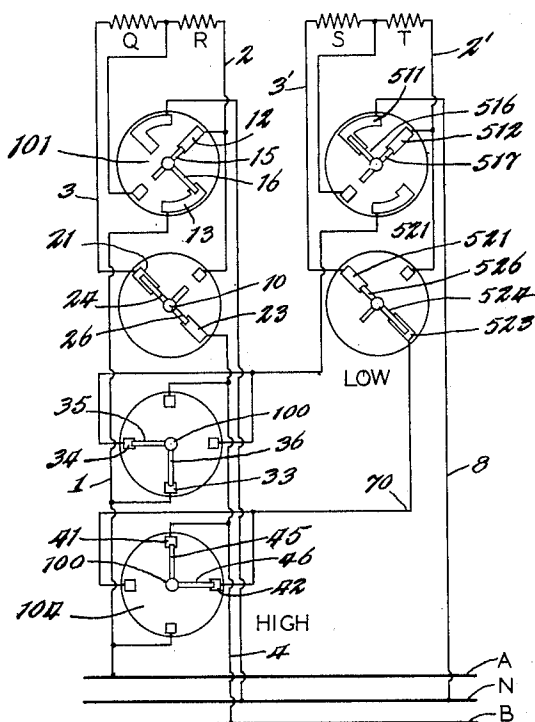


Fig. 9.

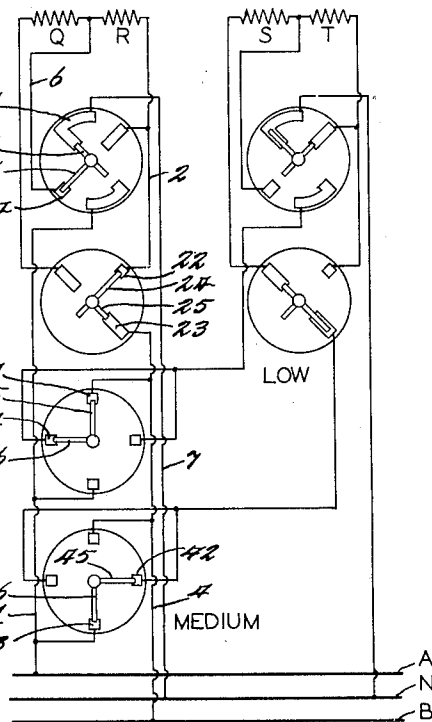


Fig. 10.

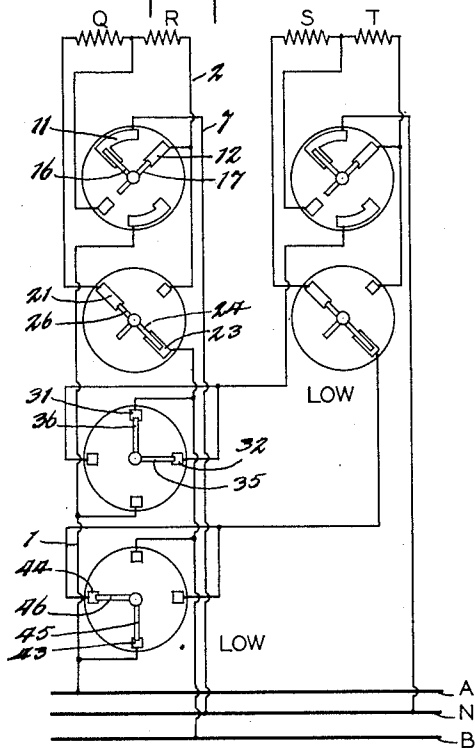


Fig. 11.

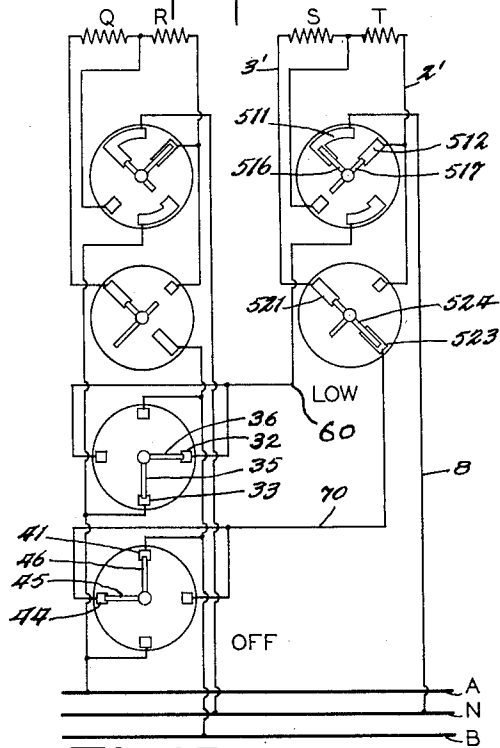


Fig. 12.

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4 Sheets-Sheet 4

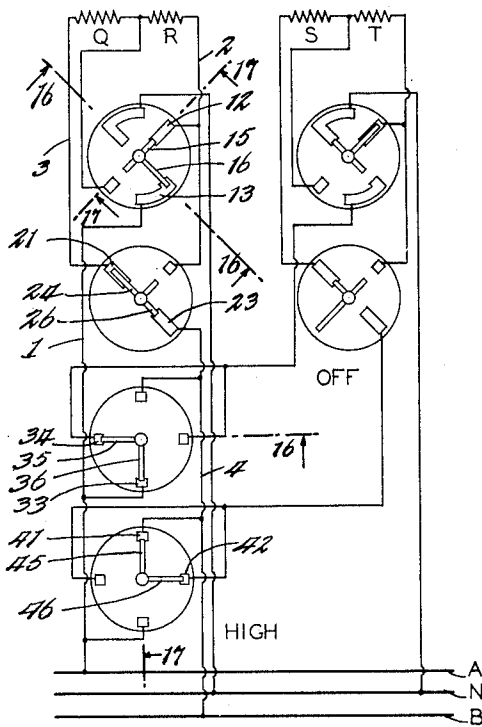


Fig. 13.

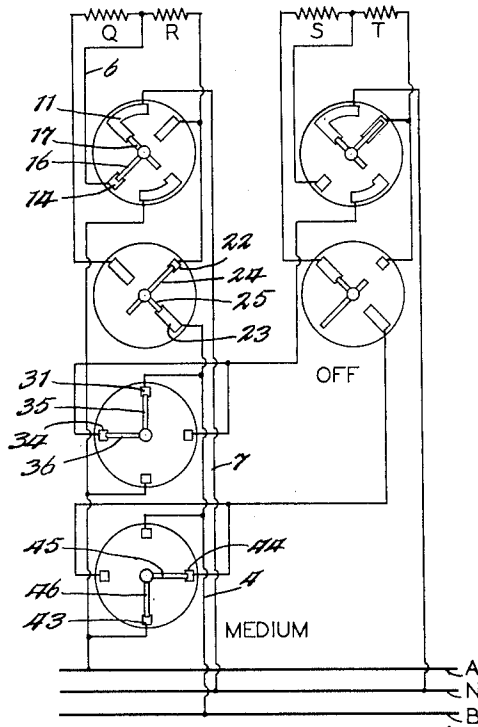


Fig. 14.

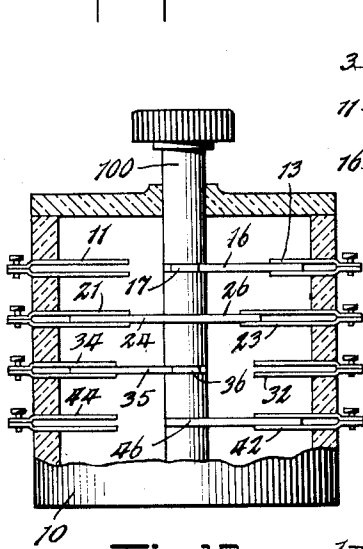


Fig. 15.

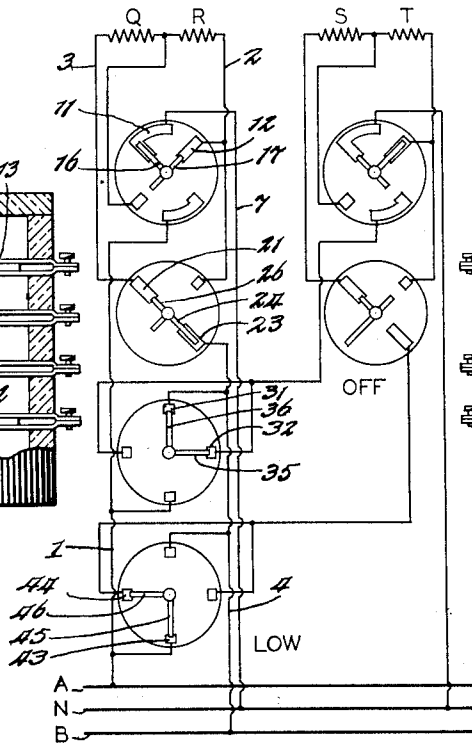


Fig. 16.

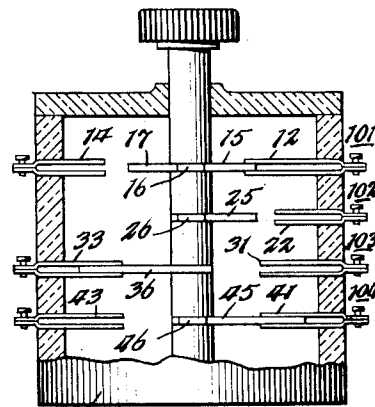


Fig. 17.

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UNITED STATES PATENT OFFICE

1,960,179

HEATER CIRCUIT AND SWITCH

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Conn., a corporation of Connecticut

Application December 24, 1931, Serial No. 583,122

12 Claims. (Cl. 219—20)

This invention relates to the combination of electric switches and translating devices, or more particularly to heater units, with circuit connections to current supply lines whereby the current supplied to the heater units may be controlled. The invention is particularly useful in electric stoves in which two or more heater units are employed.

The increase in use of electric stoves which derive their power from a three wire line is attended by the problem of properly balancing the current drawn from the source of supply so that one side of the line may not be unduly overloaded. Various ways have been devised in an attempt to solve this problem but none so far have been able to attain perfect balance.

It is an object of my invention to provide a heater circuit including means for controlling the heating units which will afford more perfect balance than any known circuits.

Another object is to make a switch having its fixed and movable contacts arranged to make connections for high, medium, or low degrees of heat or no heat in a heater unit which the switch may control, and to vary the connections between the outside wires of a three wire power line, and another heater switch and its heater unit, to provide a more perfect balance than was heretofore possible.

Other objects and advantages of my invention will be apparent as it is described in connection with the accompanying drawings:—

In the drawings:—

Figures 1 to 15 inclusive, show diagrammatically, a pair of heater switches which control two heater units, the current for which is derived from a three wire supply line. The various figures show the switches in all the positions they may occupy except the position with both switches "off".

Figs. 16 and 17 are elevation section views through a special switch having contacts arranged according to the principles of my invention. The sections are taken on mutually perpendicular planes, as shown by lines 16—16 and 17—17 of Fig. 13.

Referring to the drawings, the three wire power line A, N, B, supplies two heating units QR, and ST, each having two elements Q and R and S and T, respectively. The delivery of current to the unit QR is controlled solely by a switch 10. The delivery of current to the unit ST is controlled by the switch 50, but the arrangement of the connections between switch 50 and the power lines AB are subject to variation by the switch 10 in

order that a better balance of the system may be attained as will hereinafter more clearly appear.

The switches 10 and 50 may be rotary snap switches which can be snapped around in quarter turn steps and have a plurality of decks each deck having stationary and movable contacts. The movable switch members are all secured fixedly, in insulated relation, to a switch spindle 100 and are adapted to selectively engage the stationary switch members of the several decks as the spindle is rotated. The stationary switch members may be fixedly mounted in spaced circumferential positions, in any suitable insulating switch base, around the switch spindle. An example of a suitable type of switch mechanism is shown in the Kempton Patent No. 1,683,196 patented September 4th, 1928. The details of construction of the switches 10 and 50 are not a part of this invention, since many of the known rotary snap switch mechanisms could be used, if provided with the proper number of decks and contact elements and (referring to switch 10) arranged in the novel manner hereinafter set forth.

Assuming for the sake of illustration that the potential between lines A and B is 220 volts and line N is the neutral, then the potential between the lines N and either A or B will be 110 volts. The switches 10 and 50 are connected, as will be hereinafter described in detail, to give three degrees of heat or no heat from each of the units QR and ST as the switches are rotated through their successive quarter turns. These degrees of heat are brought about by impressing the full 220 volts across elements Q, R, in series, or S, T, in series, in the high heat positions, by connecting the units across the outside lines A, B; by impressing 110 volts across one element, R or T for example, in the medium heat positions, by connections to the outside lines and the neutral; and by impressing 110 volts across Q, R, in series, or S, T, in series, in the low heat positions, also by connections to the outside lines and neutral. There are also "off" positions of each switch. The means and connections by which the above results are obtained will now be described.

The switch 10 comprises four decks 101, 102, 103 and 104. The first and second decks 101, 102 control the connections between the feed lines A, N, B, to the two element resistance unit QR so that high, medium, and low heats may be obtained from the unit. The third and fourth decks 103, 104 control the connections between the feed lines A, N, B, and the switch 50 for the purpose heretofore indicated and hereinafter more particularly described. The switch 50 is a

two deck switch having a switch spindle 500 upon which are fixedly mounted, one above the other, two movable contact members having blades which are adapted to engage stationary contacts which are located in the planes of movement of the movable switch members. In function, in connection to the power lines and heater units, and in arrangement of its contact elements, switch 50 is identical with the switch of the Kempton Patent 1,683,196, and therefore is not further described except as is necessary to point out its relation with the other members of the circuit.

Referring particularly to switch 10 the first deck 101 has two stationary contacts 11 and 12, the latter being 90° in advance of the former, with long blades projecting radially inward from the edge of the switch. These contacts are adapted to be engaged by all of the blades 15, 16 and 17 of the movable switch member as it is rotated. The contact 11 is connected directly to the neutral wire N of the three wire supply line by wire 7 while contact 12 is connected to one end of the element R of the heating unit QR by wire 2. Diametrically opposite the long bladed contact 11 is a sort bladed contact 13 which is connected directly to the outside line A of the three wire supply line by wire 1. Diametrically opposite to the contact 12 is a short bladed contact 14 which is connected directly to the intermediate point between the elements Q and R by intermediate connecting wire 6. The movable switch member of the deck 101 comprises two short blades 15 and 17, extending in opposite directions from the switch spindle, and a long blade 16 is arranged 90° in advance of the short blade 15. The short blades are not of sufficient length to engage the stationary contacts 13 and 14.

The second deck of this switch has two long bladed stationary contacts 21 and 23 in diametrically opposite positions around the switch spindle and a short bladed contact 22 arranged 90° in advance of contact 21. The movable switch member of this deck 102 comprises a long contact blade 24, which is adapted to engage all the stationary contacts as the spindle is rotated, and two short blades 25 and 26 which are arranged 90° and 180° respectively in advance of the long blade 24. The long contact 21 is connected directly to the outside end of the heating element Q by wire 3 while the short contact 22 is connected to the outside end of the heating element R by wire 2. The long contact 23 is connected to the outside line B of the three wire supply system by wire 4.

Referring to switch 50 the size and arrangement of the contacts of this switch and the connections to the heater unit ST are the same as the first two decks 101, 102 of switch 10 and their connections to unit QR. The connection of contact 511 to the neutral line N is also the same as the connection between contact 11 and the neutral, but the power lines AB are not directly connected to the contacts 513 and 523 as in the case of contacts 13 and 23. Since the connections between the stationary contacts and the resistance elements and the power line N are identical, it would be undesirable to have the connections to the power lines A, B, identical also, because when the switches were in "medium" and "low" positions there would be a heavy unbalancing of the system since all the current would be drawn from one side of the line and the neutral.

Therefore I have added the third and fourth

decks to switch 10 and have connected the power lines A and B to these decks and have connected wires 60 and 70 between them and switch 50 in the manner about to be described so that when the switch 10 is in "medium" and "low" position the elements of the heating unit QR which it controls will be connected between the neutral and the opposite power line from that to which the unit ST is connected when switch 50 is in "medium" and "low" positions or when switch 10 is in "high" or "off" positions.

The third and fourth decks of the switch each have four stationary contacts of equal size spaced 90° apart around the deck, and movable switch members each comprising two arms one of which is 90° in advance of the other and each of which is of sufficient length to engage the stationary contacts in its own deck. In deck 103 the stationary contact 31 is connected with the supply line B by wire 4. The contacts 32 and 34 are connected together and to the wire 60 for delivering current to the short contact 513 of the switch 50 from the outside feed lines A, B. The contact 33 is connected with supply line A by wire 1.

In deck 104, contacts 42 and 44 are connected together and with a wire 70 for delivering current to the long contact 523 of switch 50 from the outside feed lines A, B. Contacts 41 and 43 are connected respectively with the supply lines B and A by wires 4 and 1.

The remaining connections to the switch 50 are as follows: Long contact 512 in the deck 501 and short contact 522 in deck 502 are connected to one end of the heating element T by wire 2'. The intermediate point between elements S and T is connected to short contact 514 in deck 501 by wire 6' while the outside end of the heating element S is connected with long contact 521 of deck 502, by wire 3'.

By virtue of the structure and connections just described in certain positions of the switch 10, the wires 60 and 70 are connected to the lines A and B respectively while in certain other positions of switch 10 wires 60 and 70 are connected to lines B and A, respectively. By means of this ability to shift the power line connections between wires 60 and 70, I am able to obtain much more perfect balancing than has heretofore been possible, particularly when unit QR is of large capacity, say 2000W and unit ST is of smaller capacity, say 1200W.

The circuit between the power lines and the heater QR, established by the first two decks of switch 10, can be easily understood by reference to the diagrams. In Figures 1, 5, 9 and 13, the switch 10 is in high heat position, the outer ends of the heater unit QR being connected to lines A and B as follows: Current flows from line A through wire 1 (see Fig. 5) to contact 13, through blades 16 and 15, through long contact 12 and wire 2 to element R, through elements R, Q through wire 3 to long contact 21, through blades 24, 26 long contact 23 and wire 4 to power line B.

In Figs. 2, 6, 10, 14, the medium heat position of switch 10, the circuit is as follows:— From line B through wire 4, long contact 23, blades 25, 24, short contact 22, wire 2, through element R through intermediate connecting wire 6, short contact 14, long blade 16, short blade 17, long contact 11, through wire 7 to the neutral N, of the power lines.

In Figs. 3, 7, 11, 15, the low heat position of the switch 10, the connections established are: from power line B, through wire 4 to long contact 23, through blades 24, 26 and contact 21, 150

through wire 3 and heater unit QR, through wire 2, long contact 12, blades 17, 16, long contact 11, wire 7 to neutral wire N of the power line.

Referring now to the connections established by switch 50, in Figs. 1, 2, 3, 4, the switch is in high heat position. Current coming from one outside power line, goes through deck 103 of switch 100 to wire 60 then to short contact 513, long blade 516, short blade 515, long contact 512 wire 2' to element T, through element S and wire 3', through long contact 521, long blade 524, short blade 526, long contact 523, to wire 70, then through deck 104 to the outside power line.

Figs. 5, 6, 7, 8, show switch 50 in position for establishing connections to give medium heat. Current from the power line is delivered to wire 70 through deck 104, then it goes through long contact 523, short blade 525, long blade 524, short contact 522, connection 2', heater element T, intermediate connecting wire 6', short contact 514, long blade 516, short blade 517, long contact 511 and neutral-connecting wire 8.

Figs. 9, 10, 11 and 12 show switch 50 in position to give low heat connections. Current coming through deck 104 goes through line 70 to long contact 523, long blade 524, short blade 526, long contact 521, wire 3', unit ST, in series, wire 2', long contact 512, short blade 517, long blade 516, long contact 511, and neutral-connecting wire 8 to the neutral line N.

When switch 10 is in either "high" or "off" position, and switch 50 is in either "high" or "off" position at the same time, there is no problem of balancing the load because there is no connection with the neutral in any of these positions. Therefore it is only necessary to have the "medium" and "low" connections arranged so that the current drain will not be all on one side of the line when the switches are in "medium" or "low" positions. As hereinbefore indicated decks 103, 104 are provided to avoid this difficulty. Appropriate connections are made thereto so that when the switch 10 is in "high" and "off" positions (perfect balance position for unit QR) lines 60 and 70 will be electrically connected to A and B respectively as shown in Figs. 1, 4, 5, 8, 9, 12 and 13.

In Figs. 1, 5, 9 and 13, i. e. when switch 10 is in "high" position, contact 33 (which is permanently connected to power line A through wire 1) is connected to contact 34 (to which line 60 is connected) by blades 36, 35; and contact 41 (which is permanently connected to power line B by wire 4) is connected to contact 42 (to which line 70 is connected) by blades 45, 46. No current passes through line 60 in Figs. 5, 9 and 13, however because in Fig. 13 the switch 50 is in "off" position, while in Figs. 5 and 9, the current for "medium" and "low" heat in unit ST is obtained by connecting the unit to the neutral and power line B as described.

In Figs. 4, 8 and 12, i. e. when switch 10 is "off" the contact 33 (which is permanently connected to power line A through wire 1) is connected to contact 32 (which is connected with line 60) by blades 35, 36, and contact 41 (which is permanently connected to power line B through wire 4) is connected with contact 44 (to which line 70 is connected) by blades 46, 45. Again no current passes through line 60 in Figs. 8 and 12, because the current for the "medium" and "low" heat in unit ST is obtained by connecting the unit to the neutral N and power line B, as described.

In Figs. 2, 3, 6, 7, 10, 11, 14 and 15, the switch

10 is in "medium" and "low" heat positions and lines 60 and 70 are connected to power lines B and A respectively.

In Figs. 2, 6, 10 and 14, i. e. when switch 10 is in "medium" position contact 31 (which is connected to power line B through wire 4) is connected to contact 34 (to which line 60 is connected) by blades 35, 36; and contact 43 (which is permanently connected to power line A through wire 1) is connected with contact 42 (to which line 70 is connected) by blades 46, 45. Again in Figs. 6, 10 and 14, no current flows through line 60 because in Fig. 14, switch 50 is in the "off" position while in Figs. 6 and 10 current for the "medium" and "low" heat in unit ST is obtained by connecting the unit to the neutral N and power line A, as described.

In Figs. 3, 7, 11 and 15, i. e. when switch 10 is in "low" position contact 31 (which is permanently connected to power line B by wire 4) is connected to contact 32 (to which wire 60 is connected) by blades 36, 35; and contact 43 (which is connected to power line A by wire 1) is connected to contact 44 (to which line 70 is connected) by blades 45, 46. Again, however, in Figs. 7, 11 and 15 no current flows through line 60 because in Fig. 5 the switch 50 is in "off" position and in Figs. 7 and 11, the current for "medium" and "low" heat in unit ST is obtained by connecting the unit to power line A and neutral N, as described.

From the foregoing, it will be apparent that in the "medium" and "low" positions of switch 50 shown in Figs. 6, 7, 10 and 11, i. e. when switch 10 is in "medium" or "low" position the unit ST is connected with neutral N and power line A while on the other hand in the "medium" and "low" positions of switch 50 shown in Figs. 5, 8, 9, 12, i. e. when switch 10 is in "high" or "off" position, the unit ST is connected with neutral, N and power line B. The unit ST is therefore shifted from its position across N—A to a position across N—B. This shift is particularly advantageous when a third switch constructed exactly like switch 50 is connected to the power lines A, N, B, in just the opposite way from the first two decks of switch 10. That is, with the stationary contact equivalent to 513 connected directly to the power line B (instead of A as in switch 10) and with stationary contact equivalent to 11 connected directly to power line A. Even when this third switch is used, as in practical use of this invention it often will be, the three switches will never be in a position where all the units or elements thereof through which current is passing will be connected between the same power line and neutral, at the same time. When the third switch controls a low capacity unit, say 1000W, then when all the switches are in "medium" or "low" positions, the balancing will be very nearly the ultimate or perfect balance. Also when switch 10 is "off" and switch 50 and the third switch are at "medium", then the system will closely approach a perfect balance, whereas in prior combinations marked unbalancing occurred when two such units were in "medium" position at once.

Thus it will be apparent that I have made a circuit and switch combination for control of electric heating units which has marked advantages over similar circuit combinations of the prior art.

I do not limit my invention to the specific connections illustrated, since many changes

within the scope of my invention will occur to those skilled in the art.

I claim:—

1. An electric circuit comprising a plurality of translating devices, and a plurality of circuit controlling means, in combination with a three line power supply, said circuit controlling means being adapted to establish different connections between said devices and said supply lines to give different effects from said devices, and means controlled by one of said circuit controlling means for reversing the connections between another of said circuit controlling means and said supply lines.
2. An electric circuit comprising a plurality of heating units, and a plurality of circuit controlling means, in combination with a three wire supply line, said circuit controlling means being adapted to establish different connections between said heating units and said supply lines to give different degrees of heating, and means controlled by one of said circuit controlling means for reversing the connections between another of said circuit controlling means and said supply lines.
3. An electric circuit comprising a plurality of heating units, and a plurality of circuit controlling means, in combination with a three wire supply line, said circuit controlling means being adapted to establish different connections between said heating units and said supply lines to give different degrees of heating, and means controlled by one of said circuit controlling means for reversing the connections between another of said circuit controlling means and said supply lines, only when said one circuit controlling means is in certain positions.
4. An electric circuit comprising a plurality of translating devices, and a plurality of circuit controlling means, in combination with a three wire power line, each of said circuit controlling means being adapted to establish connections between said devices and said supply lines to give three different effects from said devices, and means to automatically reverse the connections between said supply lines and one of said circuit controlling means during the times when another of said circuit controlling means is in position to give two of said effects.
5. An electric circuit comprising a plurality of translating devices, a separate circuit controlling means for each of said devices, in combination with a three line power supply, said circuit controlling means being adapted to establish connections between said devices and said supply lines to give a maximum effect or two intermediate effects or no effect in each of said devices, and means controlled by one of said circuit controlling means to automatically change the connections between said other circuit controlling means and the power lines so that when the circuit controlling means are in positions to give the intermediate effects the translating devices will not be connected to the same two of the power lines.
6. An electric circuit comprising a plurality of heating units, switches for each of said units, in combination with a three wire power supply line, said switches being adapted to connect said heating units with the power lines to give high, medium or low degrees of heat, and means actuated by one of said switches, upon movement into "medium" and "low" positions to establish connections between the power line and said other switch opposite to the connections established

when said first switch is in "high" or "off" positions.

7. An electric circuit comprising a plurality of heating units, switches for each of said units, in combination with a three wire power supply line, said switches being adapted to connect said heating units with the power lines to give high, medium or low degrees of heat, and means acting automatically upon movement of one of said switches into "medium" or "low" positions to make connections so that the unit controlled by the other switch is not connected, when said other switch is in "medium" or "low" positions, between the same two of the power lines as the unit controlled by said first switch.
8. An electric circuit comprising two heating units, switches for controlling said units in combination with a three wire supply line, said switches being adapted to make connections to impress full potential on each unit or half potential on part or the whole of either or both units and to cut off the units from the source, and means, actuated upon movement of one of said switches into position to impress less than full potential on the whole unit controlled thereby, to establish connections between the other switch and the power lines whereby, when said other switch is in position to impress less than full potential on the unit it controls, that unit will be connected on the opposite side of the power line from the unit controlled by said one switch.
9. An electric circuit comprising two heating units, a pair of switches having a plurality of decks, each deck having movable and fixed contacts, in combination with a three wire supply line, one of said switches controlling connections to one of said units to give high, medium and low degrees and to disconnect that unit, certain decks of the other of said switches controlling connections to the other of said units to give high, medium and low degrees of heat, and to disconnect said unit, certain other decks of said other switch changing the connections between the power lines and said first switch when said other switch is moved into certain positions.
10. An electric circuit comprising two heating units, a pair of switches having a plurality of decks, each deck having movable and fixed contacts, in combination with a three wire supply line, one of said switches controlling connections to one of said units to give high, medium and low degrees of heat and to disconnect that unit, certain decks of the other of said switches controlling connections to the other of said units to give high medium and low degrees of heat and to disconnect said other unit, certain other decks of said other switch shifting the connections between the power lines and said first switch when said other switch is moved into "medium" or "low" position so that said units are connected between the neutral and different outside power lines when said first switch is moved into "medium" or "low" position.
11. An electric circuit comprising a plurality of translating devices, a plurality of circuit controlling means controlling the effect produced by said devices, in combination with a three wire power line, and means for reversing the relation of two of said power lines to one of said circuit controlling devices, said reversing means being operable by another of said circuit controlling devices.
12. An electric circuit comprising a three wire power line, a plurality of translating devices, a plurality of circuit controlling devices for giving three different current effects in each of said

translating devices and disconnecting them from said power lines, and means for establishing a certain circuit relation between said power line and one of said circuit controlling devices when the other of said circuit controlling devices is in "off" position or positions to give maximum current effect in the unit controlled by it, said circuit establishing means serving also to reverse said established relation when said other circuit controlling means is in its other two positions.

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