No. 608,211. Patented Aug. 2, 1898.

J. F. McELROY.

SYSTEM FOR HEATING BY ELECTRICITY.

(Application filed Nov. 16, 1892.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

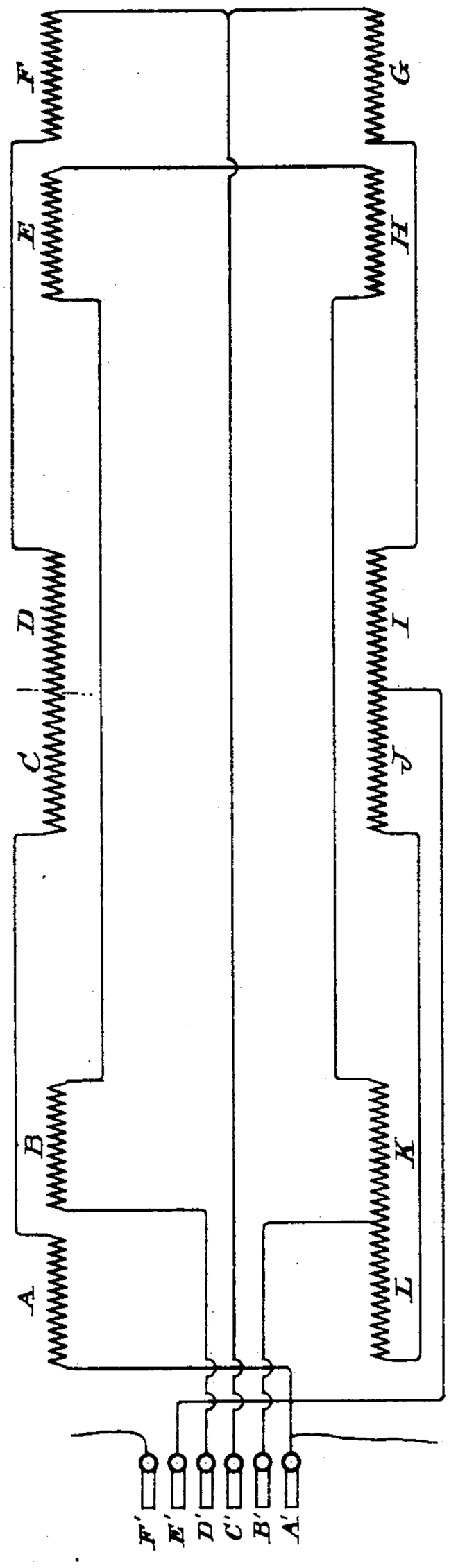

Fig. 2.

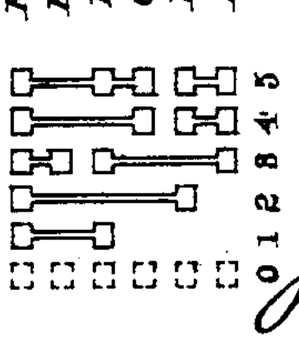

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Fig. 3

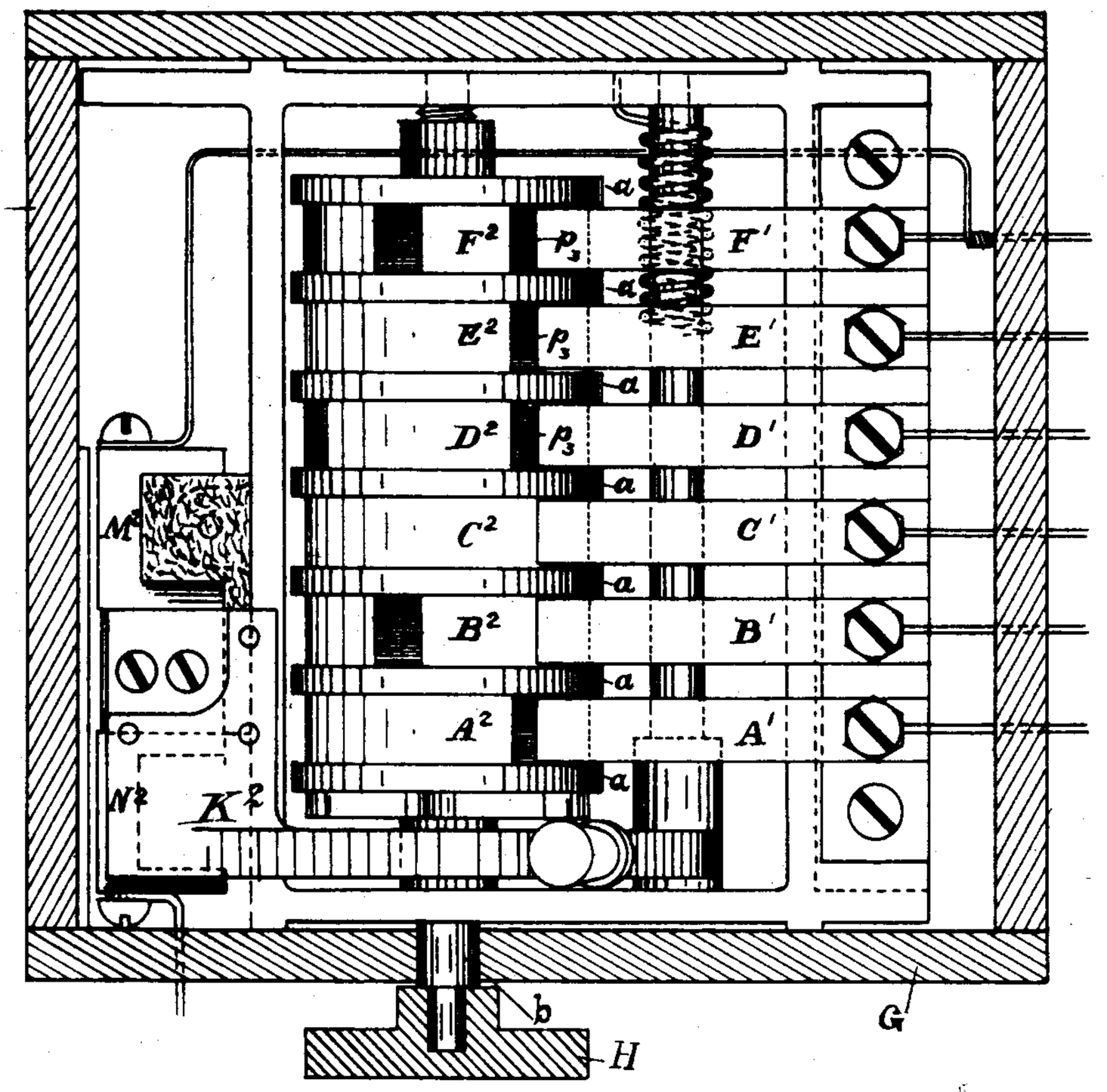
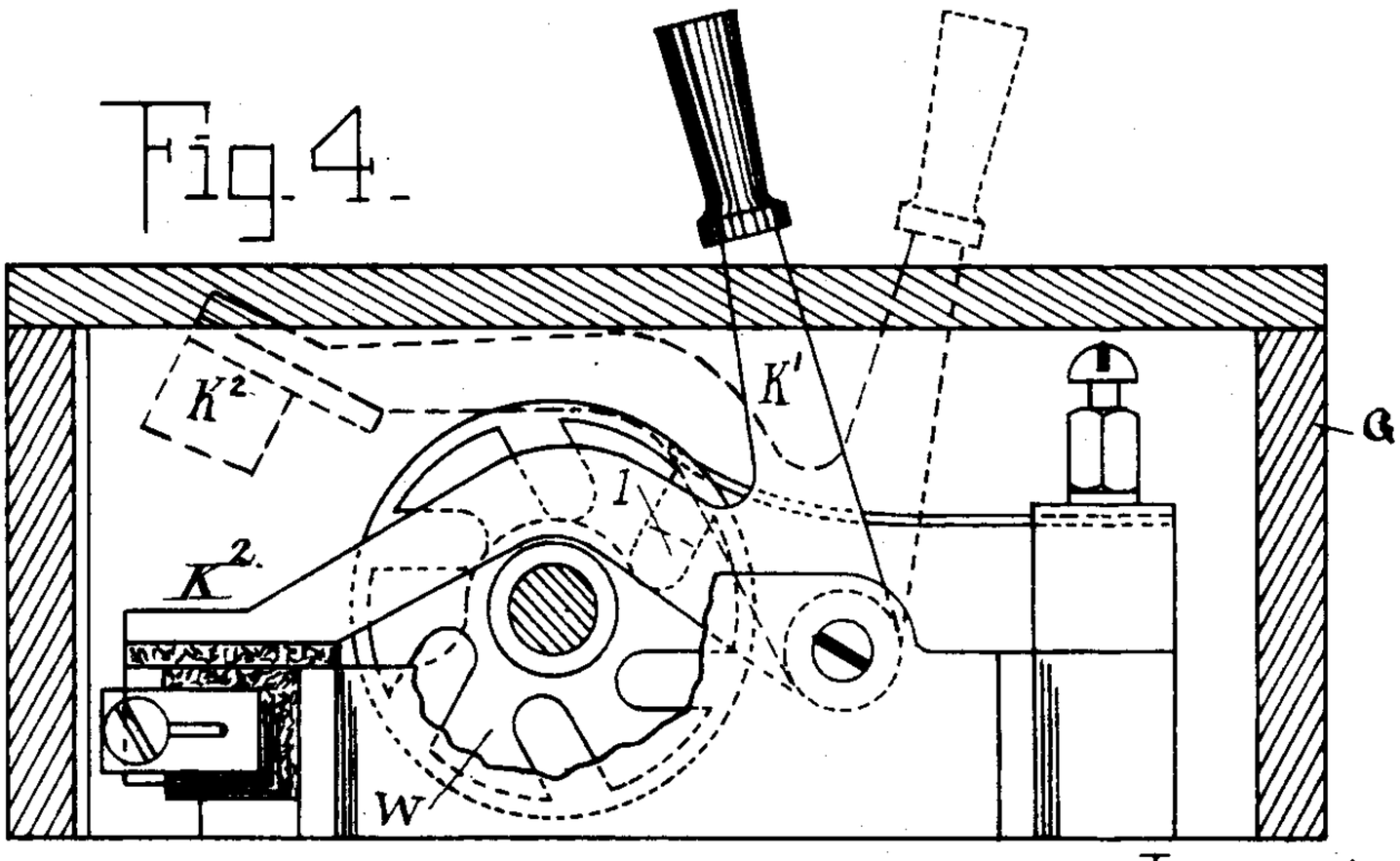


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SYSTEM FOR HEATING BY ELECTRICITY.

SPECIFICATION forming part of Letters Patent No. 608,211, dated August 2, 1898.

Application filed November 16, 1892. Serial No. 452,136. (No model.)

To all whom it may concern:

Be it known that I, JAMES F. MCELROY, a citizen of the United States, residing in the city and county of Albany, State of New York, have invented a new and useful Improvement in Systems for Heating Cars by Electricity, of which the following is a specification.

My invention relates to improvements in mechanisms and systems for electric heating; and the object of my invention is to produce a system for heating an apartment in which a number of electric heaters are so connected and arranged in reference to each other and to an electric switch that the apartment in which they are placed may be heated symmetrically and the temperature regulated as desired, my invention being particularly adapted for use in street and railway cars. I accomplish this object by means of the arrangement of heaters and connections illustrated in the accompanying drawings, in which—

Figure 1 is a plan of the wiring and heaters placed in a car. Fig. 2 is a diagrammatic illustration of the switch. Fig. 3 is a plan of the switch, and Fig. 4 is an end elevation of the switch.

Similar letters refer to similar parts throughout the several views.

In order that a car may be warmed uniformly, it is desirable to place the heaters in such a position that heat shall be emitted into the apartment on both sides and at each end and midway between the ends on each side, while in other apartments a distributing arrangement suitable thereto should be provided, and it is also desirable to so arrange the heaters in reference to each other that when more or less heat is required the increase or decrease shall take place in all parts of the apartment equally. Otherwise one portion of the apartment would be too hot, while another portion more remote from the source of heat would be too cold, as is the case where a stove or a single heater is used, and I have therefore provided a system in which the intensity of the heat may be raised or lowered in all parts of the apartment equally, making every part of the apartment of the same degree of warmth.

Referring to the drawings, A, B, C, D, E, F, G, H, I, J, K, and L each represent an electric heater-section which I preferably locate in the car in the following manner: On one side of the car, near the end of the car and preferably beneath the car-seat, I place a single heater-section A, which I connect to the out or ground-wire A′. I also connect the heater-section A to the heater-section C, placed about midway between the ends of the car on the same side with the heater-section A, the heater-section C being connected with a similar heater-section D, placed adjacent thereto and forming a double heater or heater composed of two heating-sections. The heater-section D is connected with the heater-section F, placed at the opposite end of the same side of the car with the heater A. The heater-section F is connected with the heater-section G, located on the opposite side of the car and at the same end thereof. The heater-section G is connected with the heater-section I, which, with the heater-section J, forms a double heater about midway between the ends of the car on the side occupied by the heater-section G. The heater-section J is connected to the heater-section L, placed on the opposite side of the car from the heater-section A, the heater-section L being connected with the heater-section K and forming therewith a double heater composed of two sections, the heater-section K being connected with the heater-section H on the same side of the car, near the end occupied by the heater-section G. The heater-section H is also connected with the heater-section E directly opposite. This heater-section E is connected with the heater-section B on the same side of the car and near the heater-section A. The heater-section B is also connected to the electrical conductor D′.

A′, B′, D′, E′, and F′ are electric conductors arranged in connection with an electric switch, the conductor F′ being connected with the trolley in the system as used upon a car propelled by electricity and the conductor A′ being connected with the out or ground wire. The conductor C′ is connected with the wire which unites the heater-sections F and G, running through the center of the car and meeting the connecting-wire midway between said heater-sections. The conductor B′ is

connected with the double heater-sections L and K, and the conductor E′ is connected with the double heater-sections J and I. As thus arranged I am enabled to heat the car to correspond to any desired temperature and to regulate it as desired.

I show in Figs. 3 and 4 a switch which is more particularly described in an application for patent thereon executed and filed in the United States Patent Office simultaneously herewith, which application has matured in Letters Patent No. 499,363, dated June 13, 1893; but I do not limit myself to any particular form of switch. The switch shown consists of a cylinder composed of a series of disks A^2, B^2, C^2, D^2, E^2, and F^2, separated from each other by narrow partitions *a*. This cylinder is mounted in a suitable frame G upon a spindle *b*, which has keyed to it at one end a knob H′. At one end of the cylinder and secured thereto is arranged a notched wheel W. A bell-crank lever K′ is suitably mounted, carrying at one end a contact-making portion K^2, arranged to make connections between the posts M^2 and N^2, which bell-crank lever K′ is also provided with a lug *l*, adapted to engage with the notches in the wheel W for the purpose of locking the cylinder. The post N^2 is connected by wire to one pole of the battery, or where it is used in an electric car to the trolley, and the post M^2 is connected by a wire to the metal spring or conductor F′, the spring F′ being attached to an insulated bolt in the frame of the box at one end, the other end being in contact with the disk F^2 on the cylinder. In a similar way the springs E′, D′, C′, B′, and A′ are arranged in contact with the corresponding disks in the cylinder. Each of the disks on the cylinder is provided with one or more metal plugs p^3, which are suitably connected, as shown in the diagrammatic view Fig. 2, the metal plugs being thus united in various series. Thus in the disk A^2 there are three plugs, in the disk B^2 three, in the disk C^2 two, in the disk D^2 three, while the disk E^2 has one, and the disk F^2 five. The figures at the bottom of Fig. 2 refer to the various series of metal plugs on the disks and show how they are connected.

By the operation of the bell-crank lever K′ the circuit is made and broken. When the circuit is complete, the portion K^2 being in position between the posts M^2 and N^2, the cylinder is locked, the lug *l* in the notches of the wheel W preventing the movement of the cylinder. In order to change the position of the cylinder and thus operate the switch, it is necessary to break the circuit with the bell-crank lever.

Referring to Fig. 1, the location of the heaters in the car is such that they are symmetrical in regard to their arrangement in reference to each other and to their position in reference to the heating-surface of the car. By this system, when the connections are made, as shown in series 1, referring to the figures at the bottom of Fig. 2, F′ and D′ are connected with the plugs in the disks F^2 and D^2, and the current passes first to the heater-section B and thence to the heater-sections E, H, K, L, J, I, G, F, D, C, and A and out at the ground-wire, having all of the twelve heater-sections in series. When the second series is in connection, the current passes through the spring B′ to the heater-section L and thence to the heater-sections J, I, G, F, D, C, and A and out the ground-wire, having eight heater-sections in series, which is two-thirds of the heater-sections in the car. When the third series is in connection, the current passes through the spring E′ to the heater-sections I, G, F, D, C, and A and also to the heater-sections J, L, K, H, E, and B, making two series of six heater-sections each, the total heating-surface being divided into two equal parts and these parts placed in multiple with reference to each other, it being noticed that the plugs in the disk with which the conductors F′ and E′ come in contact are united, and also that the plugs on the disk with which the conductors D′ and A′ come in contact are united. When the fourth series is in connection, the current enters through the conductor C′, from which it passes through the wire in the center of the car connected with the heater-sections F, D, C, and A, and also with the heater-sections G, I, J, and L, making two series of four heater-sections each, two-thirds of the heating-surface being divided into two equal parts and these parts placed in multiple with reference to each other. In this series it is noticeable that the plugs in the disk with which the conductors F′ and C′ make contact are united, and also that the plugs with which the conductors B′ and A′ are connected are united. In the fifth series the electricity enters through the conductor D′ and thence passes to the heater-sections B, E, H, and K and through the conductor C′, from whence it passes to the heater-sections F, D, C, and A, and also to the heater-sections G, I, J, and L, making three series of four heaters each, the total heating-surface being divided into three equal parts and these parts placed in multiple with reference to each other, and in the fifth series it is also noticeable that the plugs in the disk with which the conductors F′, D′, and C′ connect are united, and the plugs in said disk with which the conductors B′ and A′ connect are united.

In heating up a car it is desirable to place the heaters in such a connection that the largest flow of current will be obtained in order that the car may be rapidly heated. The last-described arrangement of the electric conductors is preferable for that purpose, and when the car becomes warm and ready to go out of the shop onto the road then the other positions requiring a less amount may be used, depending upon the condition and temperature of the atmosphere.

It should also be observed that this arrangement provides a large multiplicity of heater-

sections for a single car, there being no less than twelve in the example shown. This multiplicity of sections is required to give a proper distribution of heat in a car wherein the sections must be arranged not only at points along the length of the car, but also on both sides of the car, since it has been found essential to place the heaters under the car-seats, where a large concentration of heat at one point would injure the woodwork and burn the clothing of the passengers, or at least make them uncomfortably warm, while the necessarily small heater-section at one point would be incapable of heating both sides of the car. This requires a greater number of sections than would be practically available if the same required total amount of heat were secured by sections having such dimensions and such lengths of wire that they could be connected directly to the main supply-conductors in multiple with one another. Hence I use sections smaller than could be safely connected directly to the line conductors and always maintain two or more of them, taken, respectively, from the different heaters, in series with one another. For example, in the arrangement shown above there are four of these small heater-sections always in series. Thus the car-circuit between conductors A′ and C′ contains the sections A, C, D, and F, the car-circuit between conductors D′ and B′ contains the sections B, E, H, and K, and the car-circuit between conductors C′ and B′ contains sections L, J, I, and G.

My switch for varying the connections is so constructed and so related to the several circuits that in approaching the multiple arrangement each multiple-arc branch shall never include less than these four heater-sections in series, which in this series relation are adapted to receive the maximum current allowable, and which are also, as described, distributed at different points along both sides of the car and in different heaters. Thus it might be said that each multiple branch with four heater-sections in series constitutes the unit of regulation, while the individual heater-sections are the units of distribution. By this means I secure an adequate range of regulation and at the same time an adequate and practically constant distribution of the heat throughout the length and breadth of the car with no undue concentration at any one seat.

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

1. In an electric-heating system, the combination and arrangement of a plurality of heaters, consisting respectively of a plurality of heating-sections, some of said sections in said heaters so connected that they may be supplied in one circuit and the remaining sections in said heaters in another circuit, whereby different sections in the same heater may be connected in different circuits, with an electric switch, by means of which the connections may be varied, substantially as described.

2. In an electric-heating system, the combination and arrangement of a plurality of heaters, consisting respectively of a plurality of heating-sections, with single heaters consisting of but one heating-section, so connected that the single heaters may be placed in either circuit in which the heating-sections in the heaters containing a plurality of heating-sections may be placed, with means for varying the connections, substantially as described.

3. In an electric-heating system, the combination and arrangement of a plurality of heaters, consisting respectively of a plurality of heating-sections, sections in each heater being connected with sections in the other heaters in such a manner that one section in one heater is connected with a section in another heater, so that the sections in the same heater will be separately arranged in separate circuits, with means for varying the connections, substantially as described and for the purposes set forth.

4. In an electric-heating system, a plurality of heaters, each made up of a multiplicity of heater-sections, each of the heater-sections arranged to be connected up in separate circuits, with means for varying the connections, substantially as described.

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