(No Model.)

2 Sheets—Sheet 1.

W. F. WARNER.

ELECTRIC HEATER.

No. 559,553. Patented May 5, 1896.

Fig. 1.

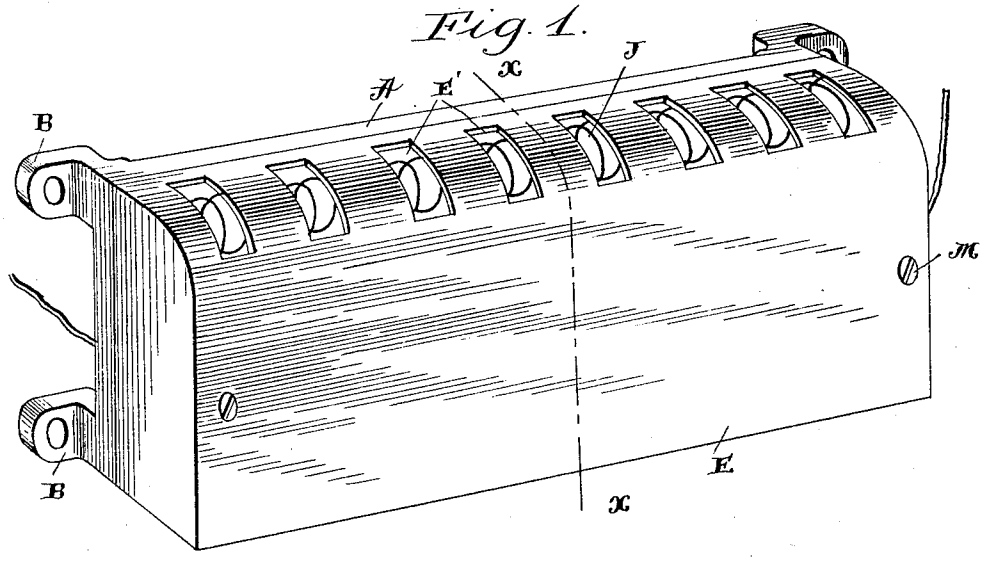


Fig. 3.

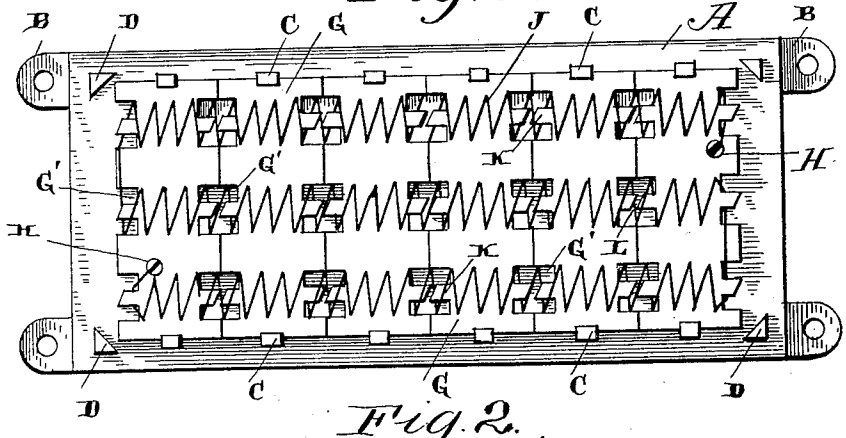
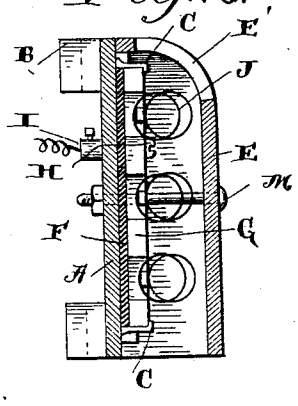


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

W. F. WARNER.

ELECTRIC HEATER.

No. 559,553. Patented May 5, 1896.

Fig. 4.

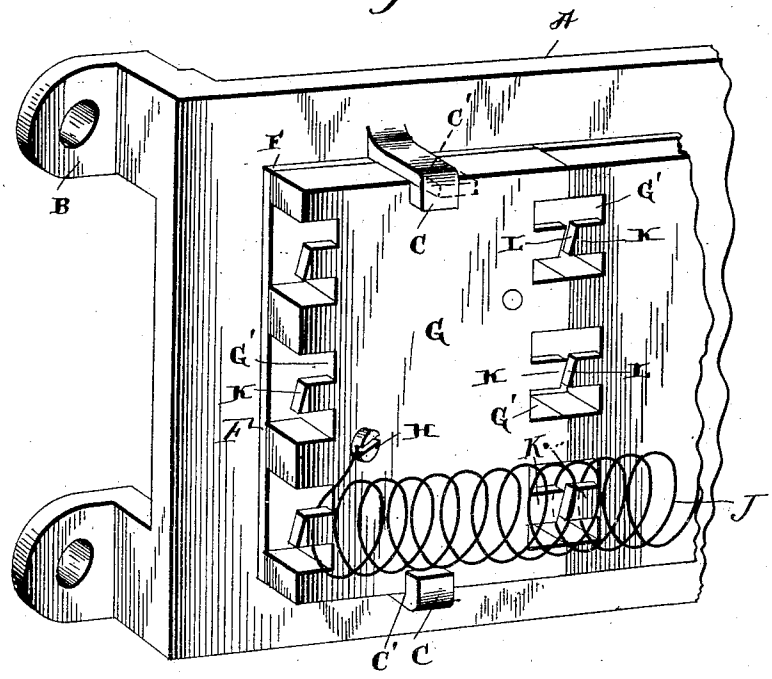
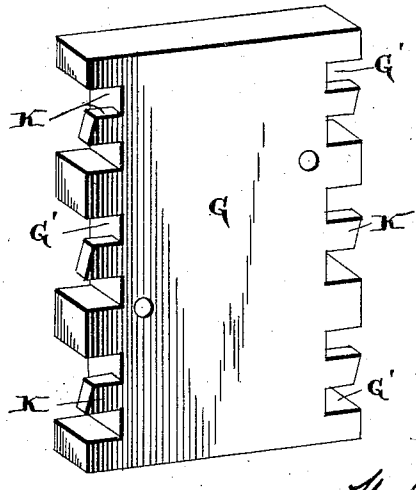


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM F. WARNER, OF MUNCIE, INDIANA, ASSIGNOR OF ONE-HALF TO WILLIAM J. HILLIGOSS, OF SAME PLACE.

ELECTRIC HEATER.

SPECIFICATION forming part of Letters Patent No. 559,553, dated May 5, 1896.

Application filed August 2, 1895. Serial No. 557,980. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. WARNER, a citizen of the United States, residing at Muncie, in the county of Delaware and State of Indiana, have invented certain new and useful Improvements in Electric Heaters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in electric heaters, such as are used for heating street-cars, &c.; and the objects of my invention are to construct a heater that will be inexpensive to manufacture and not liable to get out of order. I attain these objects by the mechanism illustrated by the accompanying drawings, in which—

Figure 1 is a perspective view of my heater complete. Fig. 2 is a vertical section taken on line X X of Fig. 1. Fig. 3 is a side elevation of the interior of my heater with the outer or front casing removed. Fig. 4 is a perspective view of one end of the back plate and interior of my heater, drawn on a larger scale than the first-described figures; and Fig. 5 is a detail view.

Similar letters refer to similar parts throughout the several views.

A is the base or back plate of the heater having a foot or fastening-lug B at each of the four corners, and the lugs are made out of alinement of the plate, so as to hold the plate A away from the wall, to which it is secured, as shown in Figs. 1, 2, and 4. The said plate A is made of thin metal and is provided with stop-lugs C, which are made on or cast to the said plate. At all four corners of the said plate *a* corner-stop D is provided to assist in holding the cover or front plate E in position when the heater is all complete, all as shown in the drawings.

The parts of my heater consist of the front and back plates, asbestos lining, insulator-sections, and the incandescing-wire or filaments, and the parts are constructed and arranged as follows: Between the insulator-blocks G and the back plate A, I place a sheet of asbestos F to prevent any heating of the said back plate. The blocks G are made of a non-conducting material, such as glass or porcelain, each one being a duplicate of the other in size and shape. These blocks are secured to the back A upon the asbestos sheet so that their ends match together, as shown in Figs. 3 and 4, each block being supported by a lug C above and below the said block. The lugs are preferably cast on the plate A, all of which is malleable iron, and they stand out at right angles with the plate when first cast, as indicated by dotted line in Fig. 4. They are afterward bent over at the point C′, so as to hold the blocks G in position, all as shown in Fig. 4.

I show in Fig. 3 a heater of a size containing six of the blocks G; but any number may be used, according to size. In each end block G a wire-connecting bolt H is secured, passing through the block and through the back A, at which place the circuit-wire is connected by an ordinary connection I, these bolts serving for the double purpose of holding and preventing the blocks G from working endwise and forming the circuit connection at each end of the frame.

The filament-wire J is connected to one of the bolts H. Then being formed in a coil it is passed across the blocks G to the other end of the frame, and at each place where it crosses from one block to another it does so directly over the openings formed by the notches G′ in the blocks, and the two points K K of the adjoining blocks are shaped so as to form incline openings or spaces L between the two ends. (Most clearly shown in Fig. 4.) Two or more coils of the wire J are inserted through the opening L and caught back of and around the points K K. (Most clearly shown in Fig. 4.) It will be seen that by forming the openings L at an incline they correspond with the coil in the wire and that the coil can be readily removed from the projections K when it is necessary to remove one of the blocks and placed over the projections when a block is replaced without uncoiling the wire. In this manner the coiled filament J is secured to the non-conducting blocks G, and the coils may pass across the blocks any number of times, according to size and arrangement, the design shown being made to cross three times. The filament-wire is all of

one piece, being looped from one row to another at each end of the frame and caught under the points K, as shown in Fig. 3. I prefer to make the blocks G of porcelain and to make them all of the same pattern, so that in case of a break of one or more they may be replaced by removing the bolt H and removing the coil from the points or projections K through the incline openings L and sliding the others over to replace the broken one, each block being also provided with the two bolt-holes, as shown in Fig. 5; but the holes are not used except when the block occupies an end position in a set. This removable feature of the blocks I regard as an important feature of my invention, inasmuch as I intend to use my heater in cars, and the blocks being necessarily made out of porcelain or other breakable material are apt to become cracked or broken owing to the constant jar of the cars in moving.

The front plate or cover E is made oval or rounding at the top and is provided with openings E′, through which the heated air passes and escapes by the natural circulation of the air when the heater is in operation, as indicated by the arrows in Figs. 1 and 2. The cover E is supported on the back A by resting on or against the four corner-studs D and by the bolt M, passing through the said plate, all as shown in Figs. 1 and 2. Suitable wire connections, switches, &c., are arranged for supplying and regulating the current, and when the heater is in operation the cold air enters at the bottom of and between the casings A and E, the space between the two plates being entirely open, all as indicated by the arrows in Figs. 1 and 2. The air passes up through the heater and circulates freely through the coils of heated wire, thereby becoming heated as it passes through. The wires J, being secured as herein described, are not liable to come in contact with each other, and they will retain their positions perfectly at all times, and being loosely secured allows them to contract or expand to any degree without affecting their fastenings.

Having thus described my invention, I claim the following and desire to secure the same by Letters Patent:

1. In an electric heater, the combination with the casing and a conductor-coil, of a series of blocks forming a non-conducting surface detachably secured to the back of the casing and formed with a notch at each end, a projection extending from the notches and of a length less than the length of the notches and provided with inclined ends forming an inclined opening between the ends of the projections of the adjacent sections through which the coil is adapted to be passed, substantially as described.

2. In an electric heater, the combination with the casing and a conductor-coil, of a series of blocks forming a non-conducting surface secured in the casing and having a notch at each end, a projection extending from the block within the notches leaving an opening between the ends of the projections of the adjacent sections through which the coil is adapted to be passed when wound upon the projections, substantially as described.

3. In an electric heater, the combination with a casing and a conductor-coil, of a block forming a non-conducting surface secured in the casing and having a notch at each end and a projection extending out from the notch around which the conductor-coil is adapted to be passed when the block has been secured to the casing, substantially as described.

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

WILLIAM F. WARNER.

Witnesses:
W. J. HILLIGOSS,
J. R. POLK.