A. HARTH.

ELECTRIC HEATER.

APPLICATION FILED JUNE 4, 1918.

1,307,198.

Patented June 17, 1919.

3 SHEETS—SHEET 1.

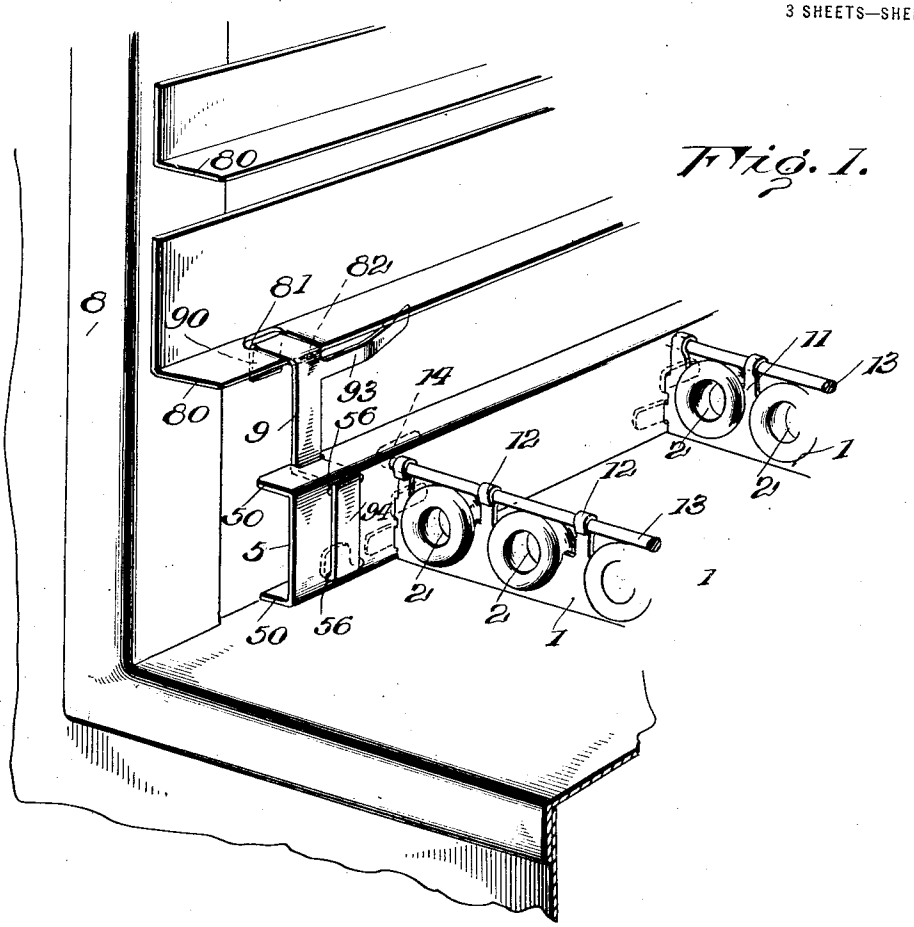


Fig. 1.

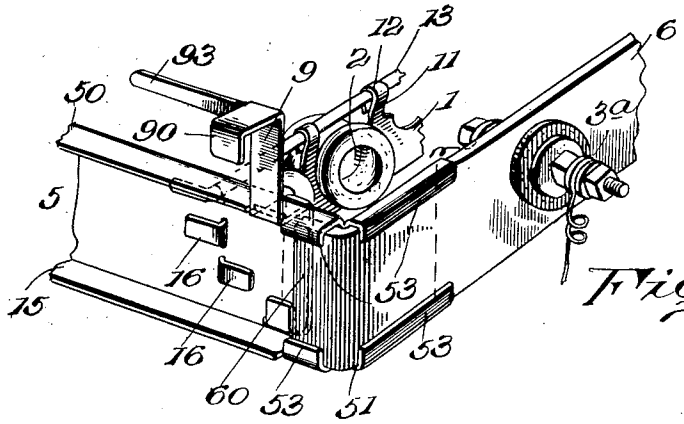


Fig. 7.

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3 SHEETS—SHEET 2.

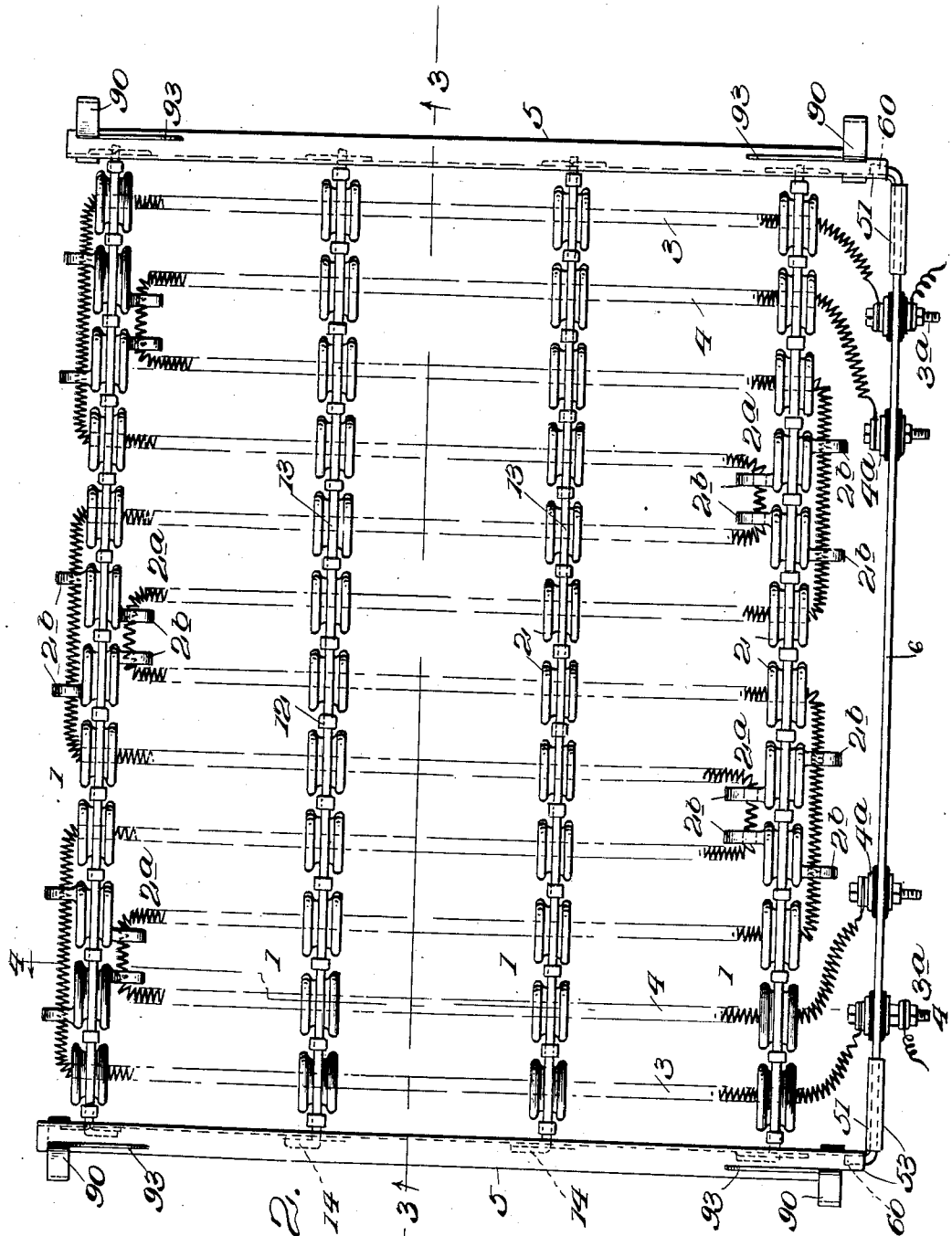


Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

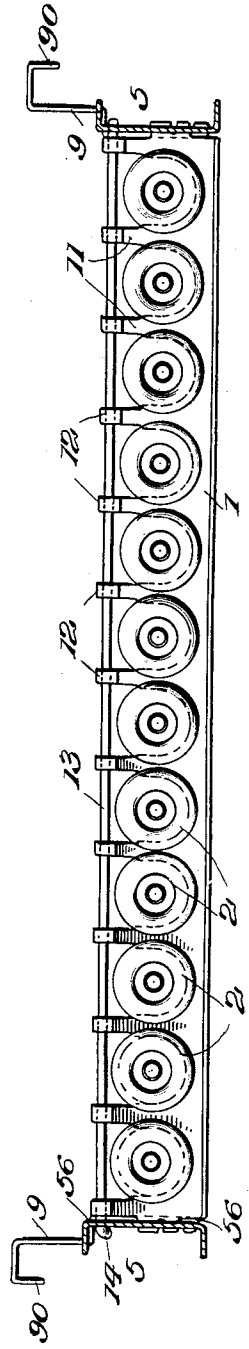


Fig. 4.

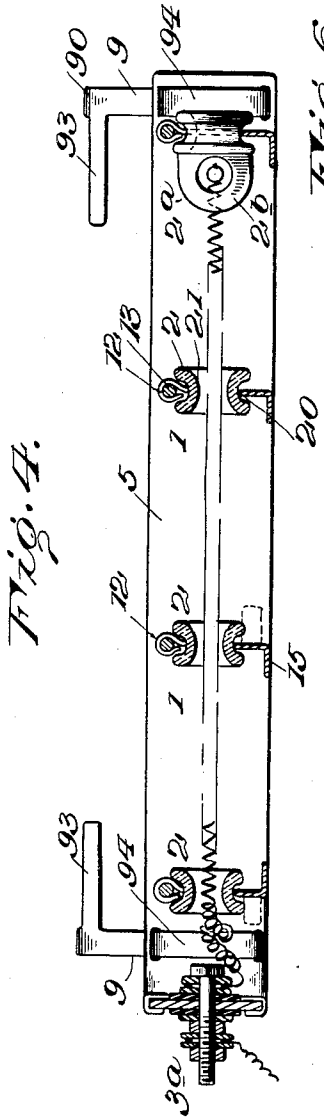


Fig. 6.

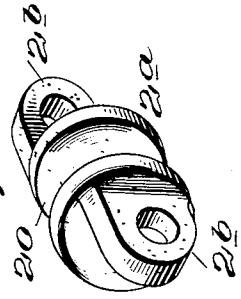
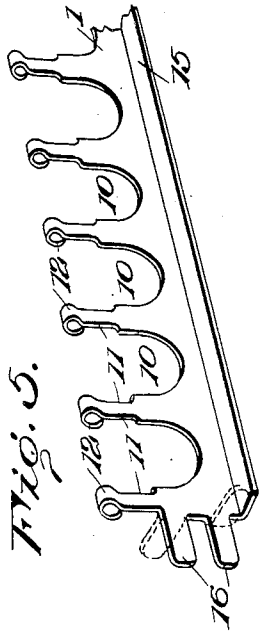


Fig. 5.



Inventor

August Harth

By Kuhn & Peck Attorney

UNITED STATES PATENT OFFICE.

AUGUST HARTH, OF CHATHAM, NEW JERSEY.

ELECTRIC HEATER.

1,307,198. Specification of Letters Patent. Patented June 17, 1919.

Application filed June 4, 1918. Serial No. 238,114.

To all whom it may concern:

Be it known that I, AUGUST HARTH, a citizen of the United States of America, and resident of Chatham, county of Morris, and State of New Jersey, have invented certain new and useful Improvements in Electric Heaters, of which the following is a specification.

This invention relates to certain improvements in electric heaters and more particularly concerns improvements in so-called heating units for electric ranges, ovens and the like; and the objects and nature of the invention will be readily understood by those skilled in the art in the light of the following explanation of the accompanying drawings illustrating what I now believe to be the preferred mechanical expressions or embodiments of my invention from among other forms, constructions and arangements within the spirit and scope thereof.

An object of the invention is to provide certain improvements in electric heating units for the purpose of reducing the cost of producing and assembling the parts and elements of such units.

A further object of the invention is to provide certain improvements in electric heating units for the purpose of avoiding the use of riveted joints and connections in the assembly of the structural elements of such units.

Another object of the invention is to improve the construction of the insulator racks and supporting frames of electric heating units and the means employed in securing together such frame elements and racks.

Another object of the invention is to provide an improved construction of insulator or spool rack for electric heating units whereby the spools can be readily assembled in and are rendered easily removable from such rack.

A further object of the invention is to improve the supporting frame structure for the spool or insulator racks of electric heating units.

A further object of the invention is to provide improved means for supporting and confining electric heating units in ovens, ranges and the like.

A further object of the invention is to provide an improved structure and arrangement for suspending electric heating units from the shelf supporting ledges of ovens, ranges and the like, and for locking the suspending means against accidental displacement from said ledges.

A further object of the invention is to provide an efficient and improved arrangement of the medium or half heating resistor coils or convolutions with respect to the full heating resistor coils or convolutions for the purpose of approximately uniformly distributing both the medium and full heating convolutions throughout the electric heating unit.

A further object of the invention is to provide improved means for supporting and maintaining the positions of the resistor coils or convolutions in electric heating units, and of relatively arranging the medium and extra or full heating convolutions of the resistor for the uniform distribution of heat throughout the unit when the convolutions are connected with the power circuit for only medium or half heat as well as when all of the convolutions are connected with the power circuit for full or high heating.

The invention consists in certain novel features in construction and in combinations and arrangements as more fully and particularly set forth and specified hereinafter.

Referring to the accompanying drawings:—

Figure 1, is a perspective view showing parts partially broken away, and illustrating an electric heating unit of my invention suspended and locked in an oven or range.

Fig. 2, is a top plan of the unit.

Fig. 3, is a section on the line 3—3, Fig. 2.

Figs. 4, 5, 6 and 7 are detail views and sections.

In the particular embodiment of my invention illustrated by the accompanying drawings for purposes of explanation, the unit consists of several parallel transverse spaced insulator or spool racks 1, carrying the spools or insulators 2, 2^a, supporting the electric heating resistor coils or convolutions 3, 4, with the racks secured at their ends to a pair of frame or supporting side bars 5, which side or longitudinal bars are secured at their front ends to a terminal or front cross bar 6, carrying the terminals 3^a, 4^a, for the resistor coils or convolutions 3, 4.

Each spool rack consists of an elongated angle plate or bar 1 approximately throughout its length formed with a series of closely

arranged notches or sockets 10 opening vertically through its top edge. These sockets are separated by vertical tongues 11 forming alined eyes 12.

The common axial line of said eyes is parallel with the longitudinal axis of the bar 1.

The top edge of the bar 1 between the bases of the tongues 11 forms semi-circular or rounded depressions constituting the closed lower ends of the sockets 10 to fit and receive the insulators. Each insulator is usually composed of porcelain or other suitable insulating material and is of spool-like formation with an exterior circumferential central groove or depression 20 and a central eye or bore 21.

Each socket 10, loosely and removably receives an insulator with the top edge of the plate 1 entering the groove of the insulator and maintaining the insulator against fore and aft movement from the rack. The vertical depth of each socket below the common axial line of the eyes 12, is greater than the exterior diameter of the intermediate or grooved portion of any insulator, but is less than the exterior diameters of the end portions of any insulator. Hence, the insulators can be locked in the rack against upward releasing movement therefrom, by suitable means arranged above the insulators and between said eyes. For this purpose, I provide a locking rod or wire 13, removably passed through all of the eyes 12 of the rack and extending tangentially across all of the insulators in said rack and entering the grooved portions thereof. This removable locking rod or keeper preferably extends through perforations in the frame bars 5, alined with the eyes, and one end 14 of the rod is preferably bent laterally to form a stop at the outer side of the adjacent frame bar while the other end of the locking rod is left straight to permit removal and insertion of the rod. In assembling, the insulators can be dropped vertically into sockets of the rack and when all are in place, the locking rod can be inserted through one of the frame bar perforations and slipped or threaded through all of the eyes 12 of the rack and through the perforation in the other frame bar. The insulators, of the rack will then be all locked loosely in position by the one rod which can be as easily removed to permit removal of any one or all of the insulators of the rack.

The racks of the unit are similar in so far as the features described are concerned, and any desirable number of such racks can be employed in a unit spaced any suitable distances apart, although I happen to show four such racks in the present instance.

I prefer to form each angle rack plate or bar by stamping or pressing a blank from sheet metal with the longitudinal stiffening flange 15 along the lower edge thereof and the U-shaped sockets cut in the top edge portion thereof and the intervening material forming elongated flat parallel tongues which by a later process can be curled or rolled upon themselves to form the eyes 12. This blank is preferably formed with longitudinally projecting flat straight end tongues 16, each end of the blank having a pair of spaced tongues. These tongues 16 are utilized for securing the racks and frame side bars together by passing the tongues through slots in said bars and then bending the tongues of each pair in opposite directions tightly against the outer face of the bar. The racks and bars can be thus assembled and tightly secured together without employing riveting or other fastening or welding methods requiring expensive machinery and highly skilled operators.

The frame side bars 5 are preferably in the form of channel irons each having its upper and lower horizontal longitudinal flanges 50 arranged at the outer side of the bar. These side bars are preferably pressed from suitable sheet metal, and suitable dies or other means can be employed to cut the various slots and perforations required in each bar.

The cross or terminal bar 6 is usually composed of a piece of flat metal at its ends suitably united to the front ends of the side bars to coöperate therewith in forming a rigid frame although all features of my invention are not limited to any particular frame formation.

In the particular example illustrated, the ends of the terminal and frame side bars overlap for substantial distances and the flanges of the side bars are utilized for rigidly clamping and securing the various bar ends together. To this end, the extremities of the terminal bar are bent at right angles to form rearward extensions or ends 60. The front ends of the side bars are also bent laterally at right angles to form front inward extensions 51, the flanges 50 being severed at the bending line to permit such formation. The three bars are then brought together with the extensions 60 parallel with and fitting the outer side faces of bars 5 between the edge flanges thereof and with the extensions 51 fitting and parallel with the rear face of bar 6 and the flanges of the extensions fitting the edges of bar 6. The three bars are then rigidly secured together by bending the flanges 53 of bars 5 and their extensions down onto the outer faces of bar 6 and its extensions 60.

The heating unit is preferably provided with supporting means for suspending the same within a cooking range, oven or the like, from flange or ledges fixed within such oven or range. For instance, I show part of an electric oven or range 8 in which

fixed pairs of opposite parallel ledges or flanges are horizontally arranged to support any suitable slides, grills, shelves, baffle plates and the like.

In the drawing, I show several flanges or ledges 80 of such pairs.

The heating unit of my invention is arranged and constructed to be suspended from and supported in a horizontal position by one pair of such flanges, and the flanges of such pair are provided near their front and rear ends with vertical slots 81, and depressed portions forming top sockets 82 leading from the sockets to the exposed longitudinal edges of the flanges. The front and rear end portions of the side bars of the heating unit are provided with vertical upstanding arms or hangers 9, having their outer ends bent outwardly with their extremities turned down to form hooks 90.

The depending ends of the hooks are arranged to enter the slots 81 and the horizontal or transverse portions of the hooks to fit down in the sockets 82 approximately flush with the top surfaces of the flanges 80 with the vertical shanks of the hangers depending past the exposed edges of the flanges and supporting the unit in a horizontal plane below the flanges. The hooks in the slots and sockets will hold the unit against horizontal movement and yet the particular flanges supporting the unit are left unobstructed at their top faces for receiving and supporting any suitable shelf, baffle plate, grill, etc., immediately above the heating unit.

I provide means for locking the unit against such accidental vertical movement as might detach the hooks from the flanges. For instance, I show each upstanding arm or hook shank 9 formed with a stop extension or arm 93 projecting horizontally from the upper end of the shank a distance above and parallel with the adjacent side bar.

These stop arms are so arranged as to move down past the exposed edges of the unit-supporting flanges of the range, when the unit drops to operative position as its hanger hooks enter the flange slots and depressions during the operation of fitting the unit in the range or oven. When the unit has thus been arranged in operative position, the free ends of the stop arms 93 can be slightly bent laterally to extend under the unit-supporting flanges and will thus engage the under surfaces of said flanges and prevent such upward movement of the unit as will disengage the hanger hooks from the slots.

In case of need, however, the stop arms can be bent to disengage their free ends from the under sides of the flanges, and permit upward movement of the unit to disengage the hangers from the flanges and removal of the unit from the oven or range.

These stop arms are hence more or less flexible to permit bending thereof as described.

In practice, blanks to form the unit suspending hangers are usually pressed or stamped from suitable sheet metal which can be afterward bent to the necessary formations to complete and attach the hangers. I also preferably attach these hangers to the unit frame side bars without the use of rivets or welding. For instance, I form the side bars with a pair of upper and lower slots 56 for each hanger.

Each hanger blank has an elongated flat shank or body 94 which is threaded through said slots and bent and fitted to the bar to form a rigid supporting connection therewith. Each hanger preferably extends down at the outer side of the frame bar and is bent laterally to fit under the top flange of said bar and pass through the upper slot in the bar, and is then bent to extend down along the inner face of said bar to the lower slot through which it extends with its free end bent upwardly against the outer face of the bar.

However, I do not wish to limit myself to such specific manner of securing the hanger to the unit frame.

However, economy in manufacture and assembling is gained by utilizing parts that can be pressed from sheet metal and assembled by merely fitting and bending without the use of rivets or screws, as punch presses can be thereby utilized to the maximum, and durability and strength are attained in the completed product.

The several transverse spool or insulator racks hold the insulators arranged in longitudinal rows parallel with the side frame bars and with the insulators of each row in alinement.

The resistor or electric heating material is supported by these insulators and extends therethrough, and I do not wish to limit certain features of my invention to any particular arrangement or formation of the resistor.

However, I have devised certain improvements in the resistor, and in the specific example illustrated, I show the resistor composed of two lengths or series of convolutions of spirally wound or coiled resistance wires 3, 4, and certain so-called bridging insulators for maintaining the convolutions of one series properly spaced from those of the other series.

The resistor is arranged to present a series of longitudinal spaced lengths of exposed resistance wires approximately uniformly arranged throughout the length and breadth of the unit. Also, each separate series of convolutions is approximately uniformly spaced and distributed throughout the length and breadth of the unit so that if

either series is in circuit, and the other dead, the heat generated thereby will be distributed throughout the unit. This result is attained by arranging the convolutions or loops of one series between those of the other series in alternation from one side of the unit to the other. In other words, the convolutions of one series alternate with the convolutions of the other series completely across the unit.

For instance, the series of convolutions or coils 3 is formed by resistance wire at one end electrically connected to one insulated terminal 3^a and at the other end electrically connected to the other insulated terminal 3^a with the intermediate portion of the wire electrically separated and insulated from wire resistance 4 and strung along certain of the rows of insulators to form lengths and convolutions, loops or coils extending from front to rear and distributed from one side of the unit to the other.

In the particular design shown, the wire 3 forms a straight length through the first row of insulators at the left of the unit, and then bridges the second and third insulator rows at the rear of the unit but forms a forwardly extending loop or convolution of two lengths along the fourth and fifth insulator rows, then bridges the sixth and seventh insulator rows but forms another forward and return loop along the eighth and ninth insulator rows; bridges the tenth and eleventh insulator rows at the rear, and forms a return length or coil through the last insulator row and at the front is coiled to the opposite terminal 3^a.

The corresponding and alternating series of loops or convolutions 4 is formed by the intermediate portion of resistance wire at one end electrically coupled to one insulated terminal 4^a and at the other end to the opposing insulated terminal 4^a. In the design shown, the wire 4 forms rearwardly extending and return loops along the second and third, sixth and seventh, and tenth and eleventh insulator rows, and at the front bridges the intervening insulator rows.

In order to maintain the necessary spacing and insulation between the transverse or bridging portions of the separate resistor elements 3, 4, at the front and rear of the unit, I have provided insulators 2^a of the same spool formation as insulators 2 but formed with forwardly and rearwardly projecting transversely arranged resistor wire receiving eyes 2^b. The axes of the oppositely projecting eyes 2^b of each insulator 2^a are at right angles to the axis of the bore of said insulator. The resistor wire does not pass through the bores of the insulators 2^a as these insulators are usually arranged in pairs at the ends of certain rows with the inwardly extending eyes receiving the wire forming the closed ends of loops or convolutions and the outwardly extending eyes receiving the transverse portions of the other wire where it bridges insulator rows.

By the resistor arrangement shown, the unit can be heated to partial or medium capacity by throwing the power circuit through either wire 3 or 4 while leaving the other wire dead or out of circuit, and yet the heat thus generated will be uniformly distributed throughout the unit. To heat the unit to full capacity both wires 3 and 4 are thrown into the power circuit, and then also the heat will be likewise distributed throughout the unit.

It is evident that various changes, modifications and variations might be resorted to, that parts and features might be omitted or others added, without departing from the spirit and scope of my invention, and hence I do not wish to limit my invention to the exact disclosures hereof but consider myself entitled to all such changes and departures as fall within the spirit and scope thereof.

What I claim is:—

1. An electric heat unit comprising rows of alined insulators, the end insulators of certain rows having forwardly and rearwardly extending transverse resistor holding portions, an electric resistor arranged along some of said rows and supported by the insulators thereof and transversely bridging the intervening rows of insulators, and another electric resistor arranged along said intervening rows of insulators and supported thereby and transversely bridging the rows of insulators occupied by said first mentioned resistor, the transversely extending lengths of said resistors being held by said forwardly and rearwardly extending holding portions of said end insulators.

2. An electric heating unit comprising rows of alined tubular insulators, certain of said insulators having transversely arranged projecting eyes, and electric resistor wires arranged along said rows and supported by said insulators and at the ends of the rows having transverse lengths passing through said eyes.

3. An electric heating unit comprising a frame including a terminal bar and side bars, the terminal bar having angular end extensions fitting the side faces of the side bars, the side bars having lateral end extensions fitting a side face of the terminal bar and edge flanges bent to clamp said bars together, insulator racks carried by the side bars, insulators carried by said racks, and an electric resistor carried by said insulators.

4. An electric heating unit for ovens, ranges and the like, provided with suspending hangers for operatively engaging and supporting the unit from shelf supporting ledges within the range or oven.

5. An electric heating unit for ovens,

ranges and the like, provided with suspending hangers for operatively engaging and supporting the unit from shelf supporting ledges within the range or oven, said hangers provided with means to be bent into position beneath said ledges to serve as stops against vertical movement of the unit.

6. An electric heating unit for ovens, ranges and the like, comprising a supporting frame provided with upstanding hangers at their upper ends forming out turned hooks and having stop fingers.

7. An electric heating unit having upstanding supporting hangers formed at their upper ends with out turned hooks with depending bills, in combination with an oven, range or the like having internal opposite supporting flanges for shelves and the like certain of said flanges having slots to receive said hook bills and top depressions to receive the out turned portions of said hooks.

8. Electric heating unit comprising a frame provided with upstanding supporting hangers adapted to be hooked over shelf supporting flanges in ovens, ranges and the like, said hangers having elongated ends secured to the frame bars by bending, substantially as described.

9. An electric heater unit comprising a frame embodying opposite spaced side bars; insulator racks extending between and at their ends fitted to said bars and each composed of a plate having open-top insulator spool sockets and intervening upwardly projecting fingers at their upper extremities bent to form locking-rod-supporting eyes, and a longitudinally-removable locking rod extending through said eyes and bridging the spaces between the upper ends of said fingers and upheld thereby, said rod being movable through a frame bar for application to and removal from said eyes; spool-like insulators loosely arranged in said sockets and below said rod; and electric resistor means threaded through said insulators.

10. An electric heater unit comprising a frame having side bars; insulator racks extending between and at their ends confined to said bars and each composed of a plate having a longitudinal series of insulator spool retaining depressions with upwardly projecting vertical fingers from the vertical portions of the plate between said depressions, the upper ends of said fingers forming eyes, and a longitudinally-removable locking rod extending through said eyes, one of said side bars having an opening through which said rod is movable, one end of said rod being accessible at the exterior of said bar; spool-like insulators loosely arranged in said depressions, said rod being supported by said eyes above said spools; and electric resistor means threaded through said spools.

11. An electric heater unit comprising a frame provided with an insulator rack composed of a plate having a longitudinal series of open-top insulator spool retaining depressions with elongated upwardly projected fingers between said depressions and at their upper ends forming locking-rod-supporting eyes, and a longitudinally-removable locking rod passing through said eyes; spool-like insulators loosely confined in said depressions, said eyes upholding said rod above said spools; and electric resistor means supported by and loosely extending through said insulators.

Signed,

AUGUST HARTH.