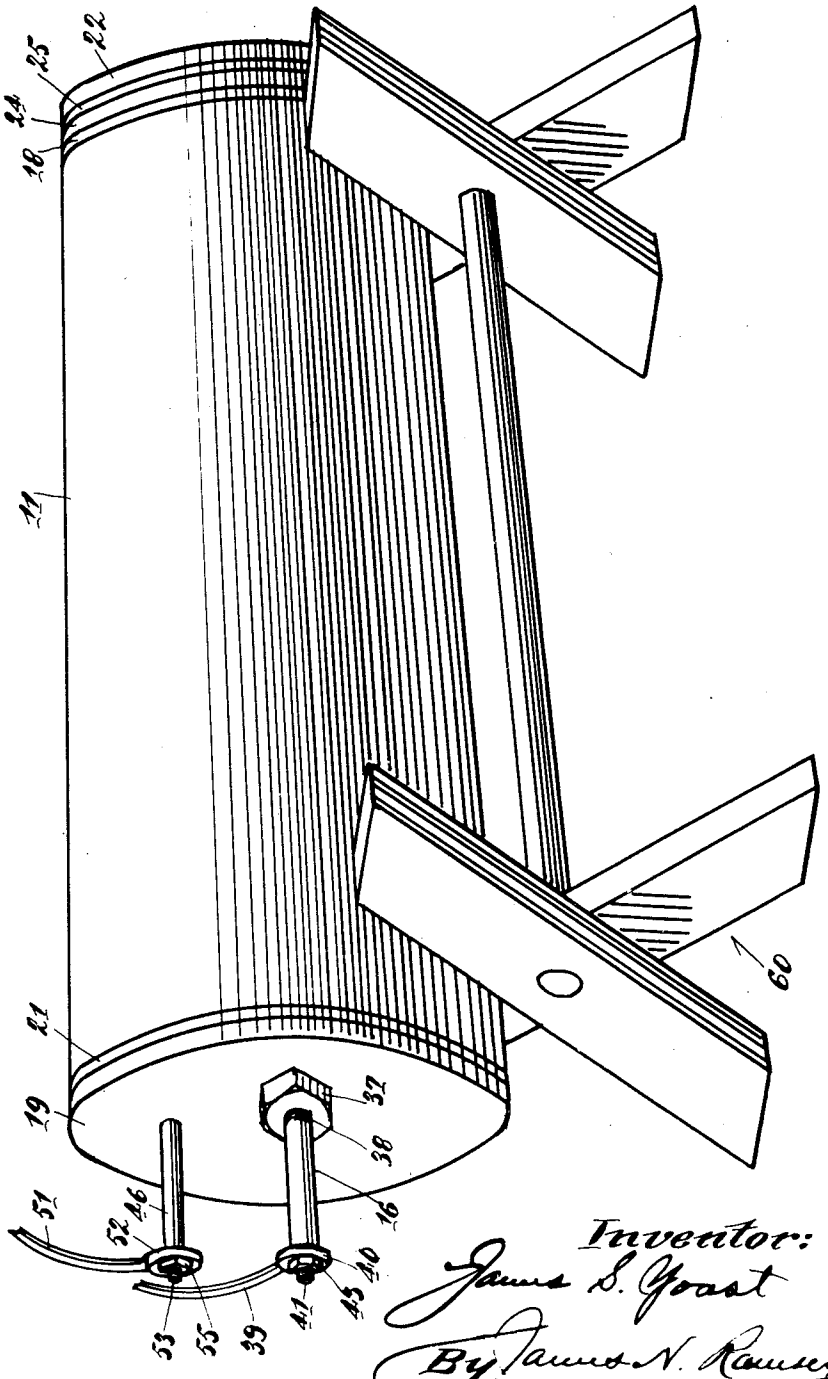
Dec. 26, 1922.

1,440,202

J. S. YOAST.
ELECTRICAL HEATING UNIT.
FILED APR. 21, 1921.

2 SHEETS-SHEET 1

Fig. 1.




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2 SHEETS-SHEET 2

Fig. 3.

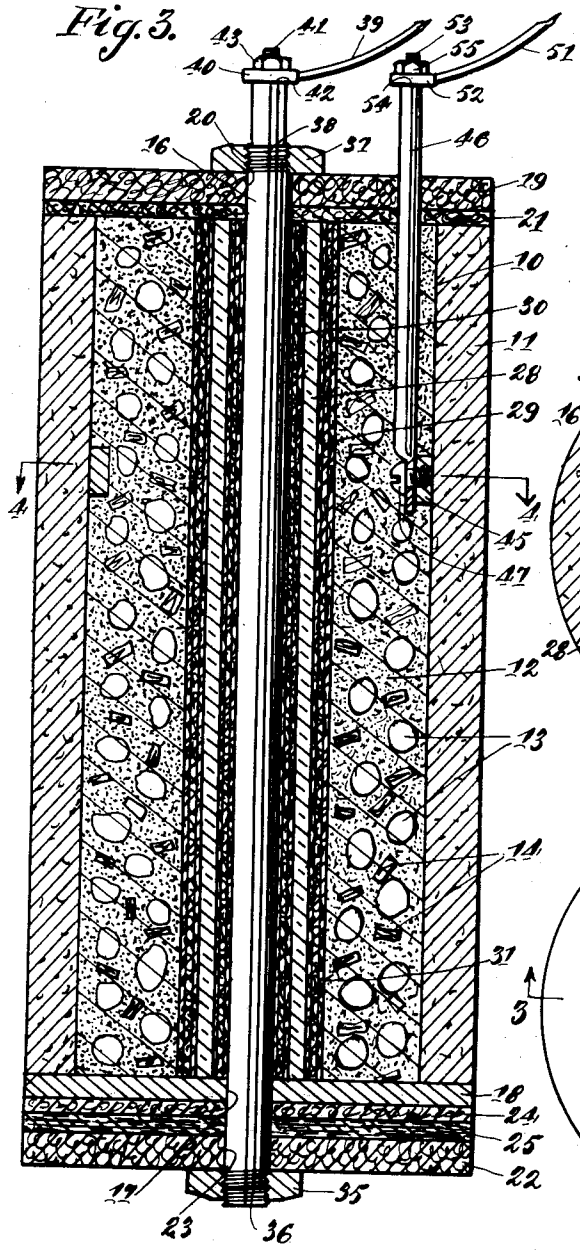
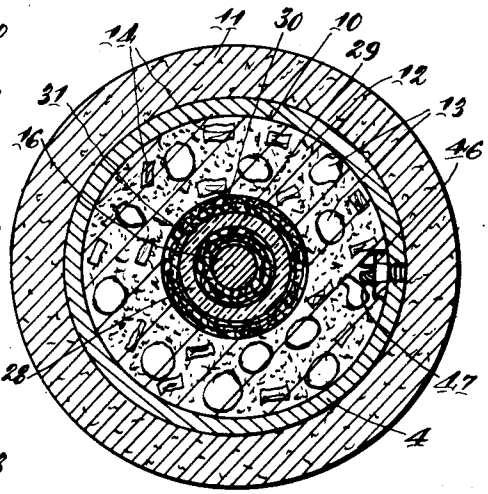



Fig. 4.



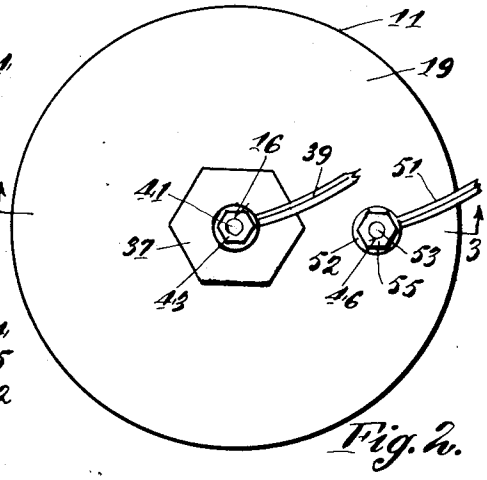




Fig. 2.

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Patented Dec. 26, 1922. 1,440,202

# UNITED STATES PATENT OFFICE.

JAMES S. YOAST, OF CINCINNATI, OHIO.

## ELECTRICAL HEATING UNIT.

Application filed April 21, 1921. Serial No. 463,353.

*To all whom it may concern:*

Be it known that I, JAMES S. YOAST, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Electrical Heating Units, of which the following is a specification.

My invention relates to electrical heating units, for generating radiant heat by passing an electrical current therethrough. My invention contemplates the generation of heat by passing an electric current through a loosely packed body consisting of conducting material in powdered form homogeneously mixed with a powdered refractory material to form a resistance element.

The object of my invention is the provision of a readily portable electrical heating unit of extremely cheap and simplified construction for the economical production of heat by electric current.

My invention consists in a loosely packed resistance element and a refractory container therefor, further, in the manner of conducting the current to the resistance element, and in the core by which the heat generated is reflected outwardly.

My invention further consists in the parts and combination and arrangement thereof as herein described and claimed.

In the drawings:

Fig. 1 is a perspective view of one of my improved heating units mounted on a support.

Fig. 2 is an end view of the same.

Fig. 3 is a central longitudinal section of the same, taken on the line 3—3 of Fig. 2.

Fig. 4 is a vertical cross section of the same, taken on the line 4—4 of Fig. 3.

My improved heating unit comprises a loosely packed electrical resistance medium 10, contained in a cylinder 11 of porous and refractory earthenware, such as fire clay. The resistance medium acts as the heating element and may consist of a powdered electrical conductor of high resistance 12, having pieces of non-conductor, 13, preferably of refractory material, such as pebbles, interspersed therethrough. I prefer to form the powdered conductor of 16 to 20 parts by weight, flake graphite, 5 to 7 parts powdered cement, and 5 to 7 parts, pulverized clay, homogeneously mixed with 5 to 7 parts powdered and lump charcoal indicated at 14. 16 to 20 parts by weight of pebbles is evenly distributed throughout the powdered conductor. It will be observed that the graphite and the charcoal are good electrical conductors, but the small particles of clay and cement mixed therewith separate the conducting material in such a manner as to form a multiplicity of small arcs therebetween. The powdered charcoal serves the purpose of coating the small particles of refractory material and also the pebbles, with a conducting coating. By packing the material loosely, a further evolution of heat is had by the imperfect contact made between the several elements thereof. The pebbles serve the purpose of reducing the cross sectional area of the conductor and distribute the current uniformly throughout the mass, and also to take up the heat and radiate the same as generated.

To conduct electric current to the resistance medium, a rod 16 preferably of iron, passes through the center of the unit and has one of its ends tightly fitted in a hole 17 of a disc 18 preferably of conducting material, such as copper. The disc 18 serves to close one end of the cylinder and is in electrical contact with the resistance medium. The other end of the cylinder is closed by a disc 19 of non-conducting material, such as asbestos stone composition, and has a hole 20 therein through which the rod passes. A layer 21 of fibrous asbestos sheet is received between the disc 19 and the end of the cylinder to serve as a packing, whereby leakage of the finely powdered material is avoided and also serves as a cushion to provide for expansion when the unit becomes heated.

The copper disc 18 is insulated against external contact as by a disc 22 of asbestos stone composition, and is held in place thereover as by having the rod 16 pass through a hole 23 therein. A layer 24 of asbestos fibrous material, and several layers of mica indicated at 25 are received between the copper disc and the asbestos stone disc.

Means are provided whereby the heat generated in the resistance medium is reflected in an outward direction, and at the same time insulates the iron rod from the resistance medium. Thus a glass tube 28 is received about the rod. A wrapping 29 of fibrous asbestos sheet is made about the rod, and a second wrapping 30 of fibrous asbestos sheet is made about the glass tube. The first named wrapping acts as a packing be-

tween the rod and the tube, and the second named wrapping acts as a packing between the tube and the resistance material. In this manner, the glass tube is safeguarded against breakage when the contents of the cylinder expand under the action of heat. The glass tube is a good non-conductor of electricity and also a non-conductor of heat. In this manner, the rod is protected from the intense heat created in the resistance member. The glass tube and the asbestos wrappings form a core 31 which serves to reflect the heat generated in an outward direction.

To convey the current from the resistance member, a collector ring 45 preferably of copper is imbedded therein, adjacent the end opposite to the copper disc. A rod 46 is secured to the ring as by a screw 47, and passes to the outside of the unit through the disc 19. An outleading conductor 51 has a terminal 52 thereon, received over a reduced threaded end 53 of the rod 46, and clamped against a shoulder 54 by a clamp nut 55.

The discs and cylinder are held together as by a clamp nut 35 received over a threaded end 36 of the rod 16, and against the asbestos stone disc 22. A second clamp nut 37 is received over the threaded portion 38 of the rod and against the asbestos stone disc 17. By drawing up the clamp nuts 35 and 37, the several parts of the unit are firmly held together. The layers of fibrous asbestos readily permit expansion of the parts without injury thereto.

An inleading electrical conductor 39 has a terminal 40 thereon, received over a reduced threaded end 41 of the rod 16 and clamped against a shoulder 42 by a clamp nut 43.

In operation, current is led to the iron rod by means of the conductor 39 and passes to the copper disc 18 in contact with the resistance medium and generates intense heat by action previously described. The current is then collected by the copper ring 45 and passes through the rod 46 to the outleading conductor 51. The heat generated is reflected outwardly towards the porous refractory cylinder, by the core 31. The porous cylinder gathers the heat and radiates the same into the atmosphere, or the interior of the oven or furnace in which it is placed. By employing the reflecting core, the resistance member is prevented from fusing adjacent to the center, as has been the case with devices of this kind heretofore.

My improved heating unit can be readily inserted into any device where heat is required, such as a furnace, stove or grate, and can also be used for industrial purposes, such as enameling or baking ovens.

My improved unit can be employed for heating in exposed places, for instance, by placing the same on a stand 60 (see Fig. 1) of non-combustible material. In this manner, a room may be readily heated without the evolution of smoke or undesirable gases. My improved unit thus forms a ready means of obtaining radiant heat, requiring no attention whatever, and without the usual troublesome inconvenience incident to other heating devices.

What I claim as new and desire to secure by Letters Patent, is:

1. In an electrical heating unit, a container of heat-radiating refractory material, a body of electrical resistance material held in said container adapted to generate heat by the passage of electric current therethrough, means to conduct current to and from said resistance material, and a non-conducting core surrounded by said resistance material, whereby the heat generated therein is reflected.

2. In an electrical heating unit, a porous earthenware container, a body of electrical resistance material loosely packed within said container, a heat reflecting core surrounded by said resistance material and comprising a rod of electrical conducting material, a glass tube received about said rod whereby said body of resistance material is insulated therefrom, a wrapping of asbestos sheet about said rod, a second wrapping of asbestos sheet about said tube, a disc of non-conducting refractory material closing one end of said cylinder, a non-combustible packing between said disc and said cylinder, a disc of electrical conducting material closing the other end of said cylinder in electrical contact with said rod and said resistance material, a second disc of refractory material on the outside of said last named disc, a second non-combustible packing between said conducting disc and second disc, means to hold said disks and cylinder together, a ring of conducting material imbedded in said resistance material, an electrical connection secured to said ring and extending through said first named refractory disc, and an electrical connection on said rod.

3. In an electrical heating unit, an electrical resistance element comprising a loosely packed conducting material, consisting of five to seven parts by weight powdered clay, sixteen to twenty parts by weight flake graphite, five to seven parts by weight powdered cement, five to seven parts by weight powdered charcoal, and sixteen to twenty parts by weight lumps of refractory material.

4. In an electrical heating unit, an earthenware container, a body of resistance material held therein adapted to generate heat by passing an electric current therethrough, and consisting of a mixture of five to seven parts by weight powdered clay, sixteen to

twenty parts by weight flake graphite, five to seven parts by weight powdered cement, five to seven parts by weight powdered charcoal, and sixteen to twenty parts by weight lumps of refractory material, means to convey electric current to and from said resistance material, and a heat reflecting core within said body of resistance material.

5. In an electrical heating unit, a body of loosely packed conducting material adapted to generate heat by passing an electric current therethrough, an earthenware cylinder in which said body of resistance material is held, a disc of non-conducting refractory material closing one end of said cylinder, a disc of conducting material closing the other end of said cylinder, a rod of conducting material passing through said body of conducting material and insulated therefrom and in electrical contact with said conducting disc and said body of conducting material, means whereby said first named disc and second named disc are clamped against said earthenware cylinder, a tube of refractory material surrounding said rod within said cylinder adapted to reflect heat generated within said resistance body, a body of conducting material imbedded in said loosely packed body of conducting material, an electrical connection on said rod, and an electrical connection on said body of conducting material imbedded in said loosely packed body.

6. In an electrical heating unit, an electrical resistance unit consisting of a loosely packed mixture of carbonaceous and refractory material for the purposes specified.

JAMES S. YOAST.