Nov. 18, 1924. 1,515,729

E. E. CLEMENT

ELECTRICAL HEATER

Filed May 13, 1921 2 Sheets-Sheet 1

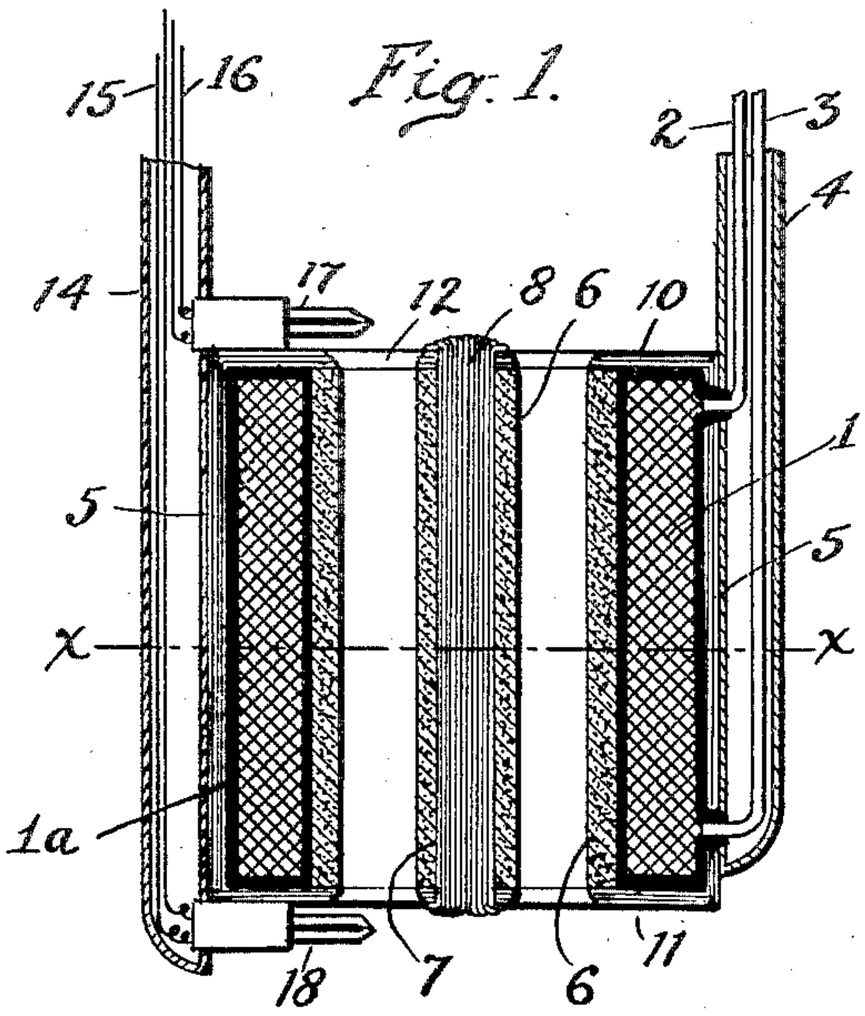

Fig. 1.

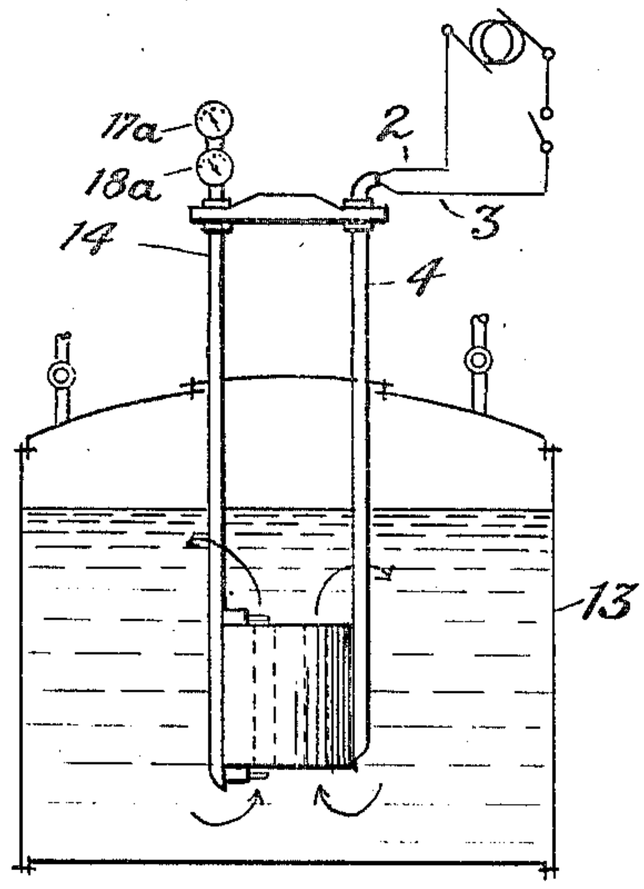

Fig. 4.

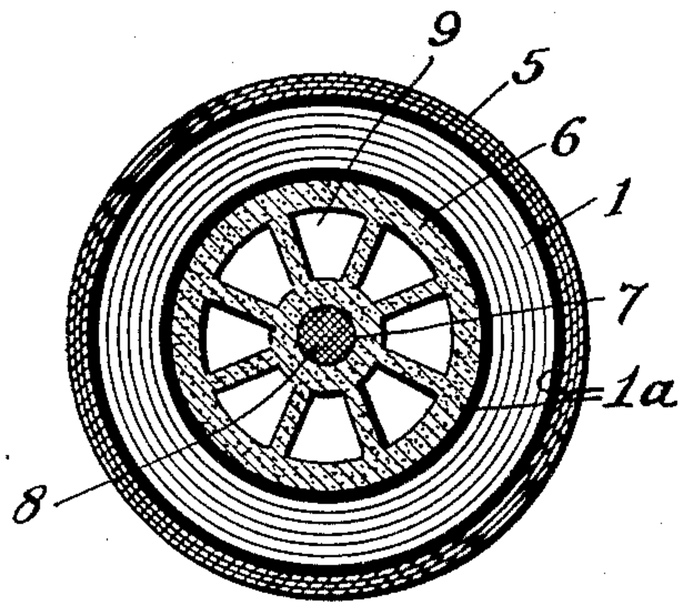

Fig. 2.

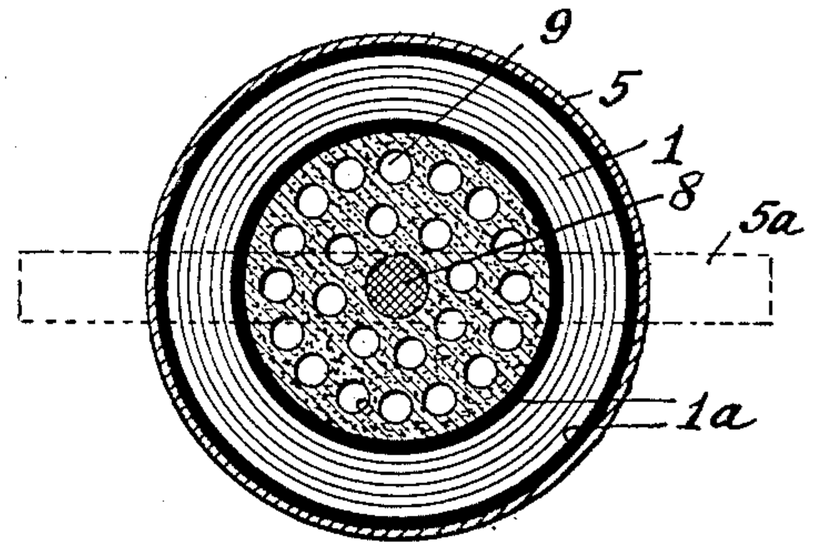

Fig. 3.

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E. E. CLEMENT

ELECTRICAL HEATER

Filed May 13, 1921

1,515,729

2 Sheets-Sheet 2

Fig. 5.

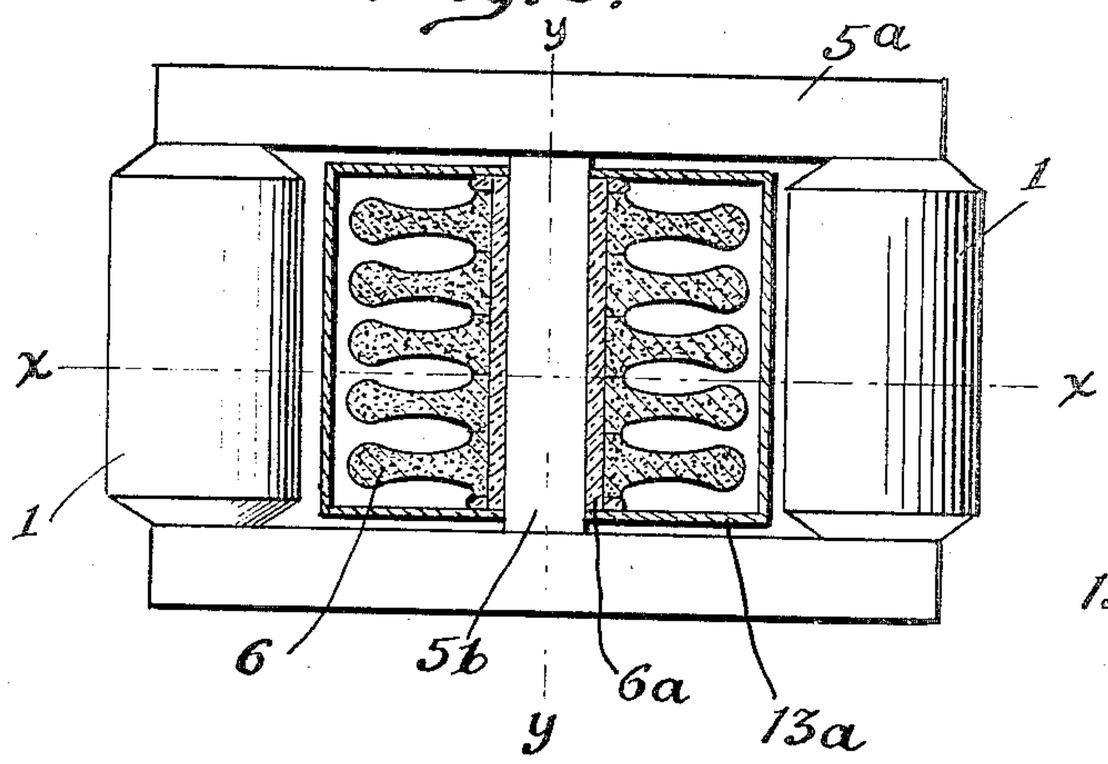


Fig. 6

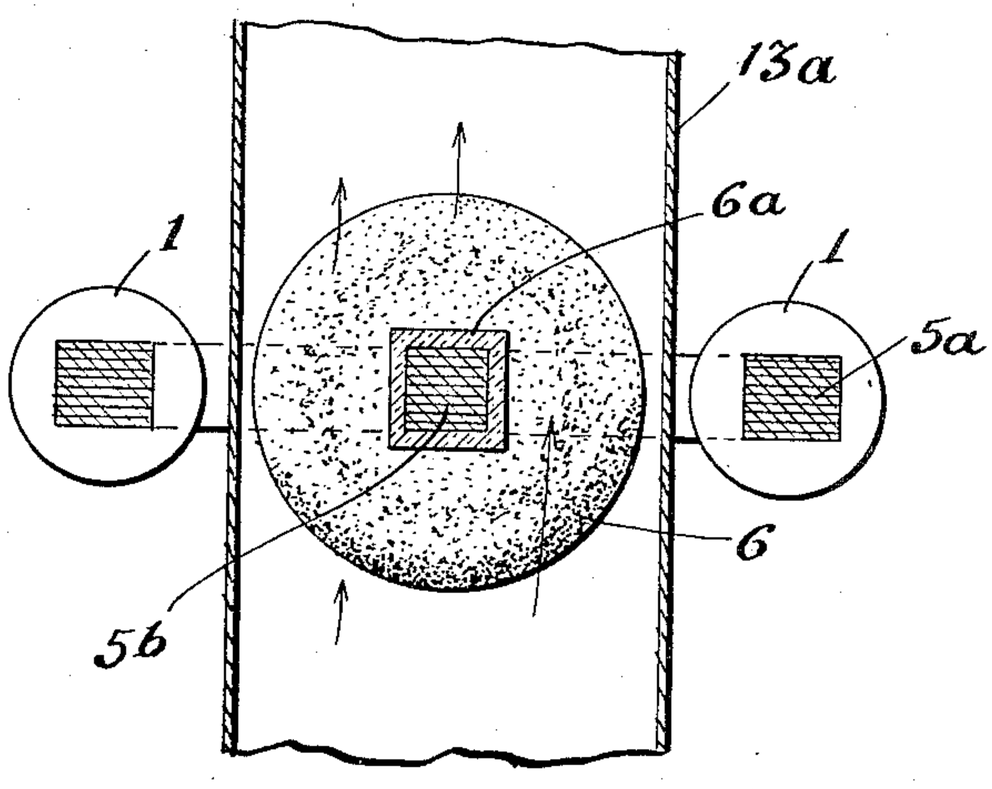
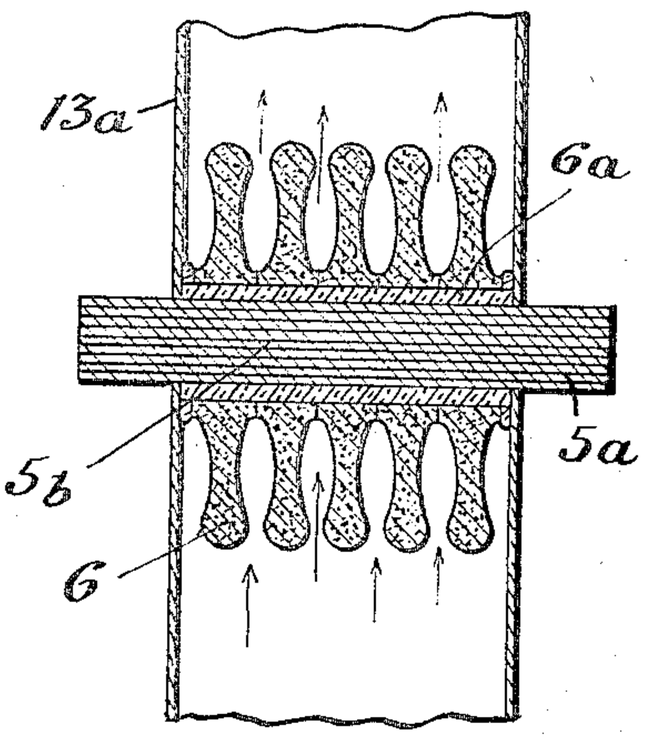


Fig. 7.



Inventor

Edward E. Clement

Patented Nov. 18, 1924. 1,515,729

UNITED STATES PATENT OFFICE.

EDWARD E. CLEMENT, OF OCEAN CITY, NEW JERSEY.

ELECTRICAL HEATER.

Application filed May 13, 1921. Serial No. 469,220.

To all whom it may concern:

Be it known that I, EDWARD E. CLEMENT, a citizen of the United States of America, residing at Ocean City, in the county of Cape May and State of New Jersey, have invented certain new and useful Improvements in Electrical Heaters, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to electrical heaters and has for its object the production of a self-contained heat unit with a wide range of adaptability and especially useful for heating fluids.

The invention comprises a transformer with a primary energizing winding, a mass of carbon forming a closed secondary conductor, and a closed magnetic circuit through said primary and secondary.

My invention is illustrated in the accompanying drawings in which,

Fig. 1 is a vertical axial section through a form of heater unit particularly adapted for relatively low temperatures;

Fig. 2 is a section on the line *x*—*x* of Fig. 1;

Fig. 3 is a section similar to Fig. 2 showing a modified form of openings in the heating mass;

Fig. 4 shows the device of Fig. 1 applied to the heating of a liquid;

Fig. 5 is a horizontal section through a modified form of unit specially adapted for high temperatures; and

Figs. 6 and 7 are vertical sections on the lines *x*—*x* and *y*—*y*, respectively, of Fig. 5.

Referring first to Figs. 1, 2 and 3, 1 is the energizing or primary winding having terminals 2 and 3 led through an iron pipe 4 secured to the outside jacket 5. 6 is a mass of carbon in the form of a cylinder having a central opening 7 to receive the subdivided iron core 8, and a plurality of channels 9 to permit circulation of the fluid to be heated. Figs. 1 and 2 show these channels in one form and Fig. 3 in another. Any suitable form may be employed which leaves sufficient mass to carry the heating current, and exposes sufficient surface to carry away the heat efficiently. The core 8, jacket 5 and heads 10 and 11, all laminated or subdivided soft iron, form a closed magnetic circuit, the heads in Fig. 1 being perforated at 12 over the channels 9.

To protect the conductors leading current to the energizing winding 1, I have indicated in Figs. 1 and 4 a pipe 4, through which the conductors 2 and 3 are led. A similar pipe 14 contains conductors 15—16 leading from suitable temperature meters 17 and 18 to indicating devices shown in Fig. 5 as dials 17^a and 18^a. 13 is a tank of liquid.

Referring to Figs. 5, 6 and 7, 5^a designates a core of laminated soft iron with primary energizing windings 1, 1, and masses or discs 6 of carbon, located on the central member 5^b of the core, preferably with an interposed insulation 6^a of heat resistant material such as porcelain, lava or mica. The member 5^b extends across a vertical metal enclosed chamber 13^a which may be either a pipe containing the material to be heated, or a tubular enclosure within a main tank. In either case the most efficient heating operation may be attained by providing for free circulation of the material around and past the member 5^b and masses 6 as indicated by the arrows.

Advantages in the use of this form of unit are that the entire external surface of the carbon mass or masses can be employed as heating surface, that the coils are kept away from the point of development of heat and can be cooled by conduction and radiation. Hence this form of unit is especially useful for high temperatures and heavy service. For such service, all parts of the unit must be made to withstand temperatures up to approximately 650° C., and fireproof insulation must be employed throughout.

I claim:

1. An electrical heater comprising a primary energizing winding, and a short circuited secondary of carbon.

2. An electrical heater comprising a primary energizing winding, and a short circuited secondary of carbon, together with a closed magnetic circuit for said primary and secondary.

3. An electrical heater comprising a primary energizing winding, and a short circuited secondary of carbon, together with a closed magnetic circuit for said primary and secondary, the mass of material constituting the secondary of the transformer having exposed surfaces for conducting away the heat generated in the mass.

4. An electrical heater comprising a core, a mass of carbon surrounding a portion

of the core and forming a closed secondary conductor, and an energizing winding surrounding a portion of said core.

5. A self-contained heating unit comprising a closed magnetic circuit with an energizing winding and a resistance element directly related to each other and to said magnetic circuit as primary and secondary, respectively, said resistance element being provided with radiating flanges lying in the direction of current flow therein.

In testimony whereof I affix my signature.

EDWARD E. CLEMENT.