B. VAN STEENBERGH.

ELECTRIC HEATER.

APPLICATION FILED DEC. 11, 1914.

1,144,801.

Patented June 29, 1915.

Fig. 1.

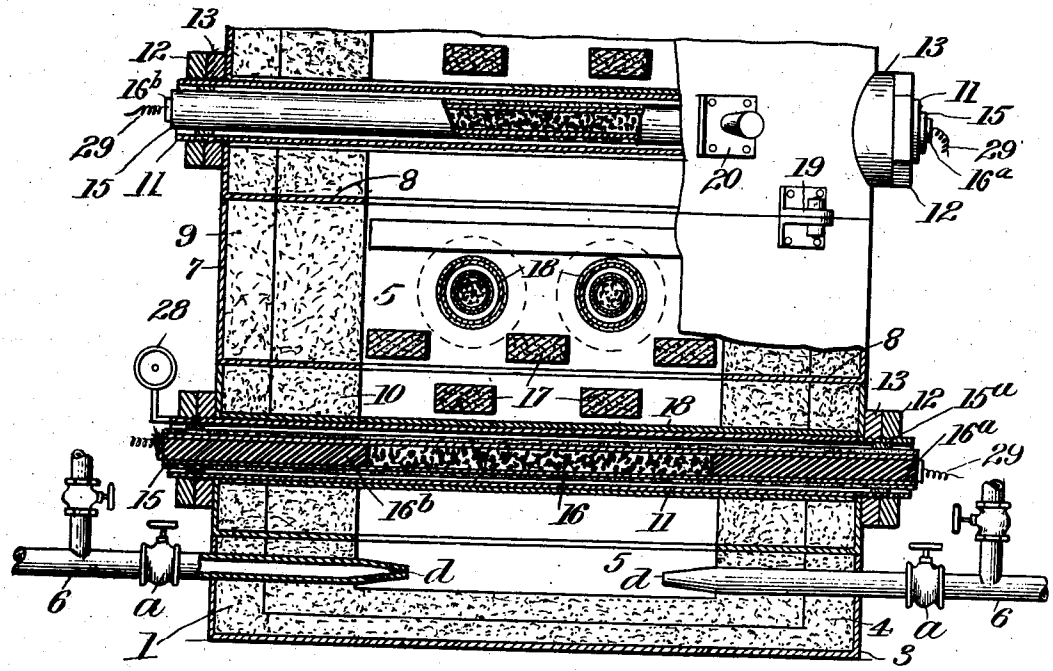


Fig. 2.

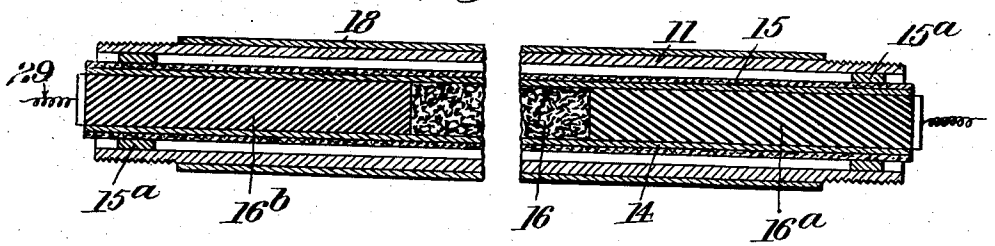


Fig. 3.

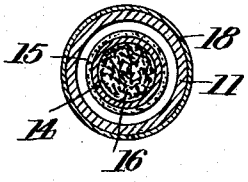
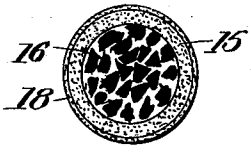


Fig. 4.



Witnesses

C. M. Walker.

Edward W. Holmes.

Inventor

Burhans Van Steenbergh

By E. B. Clark

Attorney

UNITED STATES PATENT OFFICE.

BURHANS VAN STEENBERGH, OF GOSHEN, NEW YORK.

ELECTRIC HEATER.

1,144,801. Specification of Letters Patent. Patented June 29, 1915.

Original application filed July 2, 1914, Serial No. 848,600. Divided and this application filed December 11, 1914. Serial No. 876,643.

To all whom it may concern:

Be it known that I, BURHANS VAN STEENBERGH, a citizen of the United States, residing at Goshen, in the county of Orange and State of New York, have invented certain new and useful Improvements in Electric Heaters, of which the following is a specification.

This invention relates to electric heaters adapted more particularly for use in generating carbureted hydrogen from hydrocarbon oil, but also suitable for general application for electric heating purposes.

The object of my invention is to provide a convenient and effective electric heater, preferably in the form of a tube or cylinder, having an effective insulation, but good heat conducting material between the resistance material and the container tube, and the exterior surface of the latter having a catalytic agent coating of suitable metallic-oxids.

One of the special objects of my invention is to provide means whereby the deposition or partial deposition of carbon, by destructive decomposition of hydrocarbon oil upon the heating surface will be prevented, thereby maintaining the illuminating quality of the gas generated of constant candle power, and effecting great economy in the operation of a gas generating apparatus.

The matter constituting my invention herein will be defined in the claims.

The details of construction of my improved heater are shown in the accompanying drawing, in which—

Figure 1 represents a sectional elevation of part of an electric gas generator, showing my heater mounted therein. Fig. 2 represents a longitudinal section of a heater on enlarged scale, with a part broken away. Fig. 3 represents a transverse section of a heater. Fig. 4 represents a transverse section of a heater of modified construction.

This is a division of my copending application, Serial No. 848,600, for apparatus for manufacturing carbureted hydrogen gas. The heater is designed and constructed more particularly for use in an electric gas generator, but may be applied to other heating purposes.

The generator 1 is constructed of unit sections composed of a plate-iron shell 7 having an inwardly-projecting flange 8, an asbestos insulating lining 9 and a fire-brick lining 10. Pipes 6, each having a valve *a* and a spray nozzle *d* project into the chamber 5, and serve for supplying hydrocarbon oil or vapor and steam to the heated surfaces for making gas. Any desired number of my electric heater tubes 11 are mounted in the walls of the generator and are clamped together in place by nuts 12, bearing on washers 13 having inner concave faces adapted to fit the curved surface of the shell 7. The shell and lining may be rectangular in cross section, permitting the use of flat washers.

A card-board cylinder or tube 14 is provided and has applied to its outer surface a coating paste composed of finely ground silica and finely ground carbonate of lime mixed with sodium silicate diluted with water to form a pasty mass. This paste is molded around the cylinder and then allowed to harden. This forms an insulating jacket 15 which will be applied next to the outer iron tube 11. In the interior of the card-board cylinder is placed a mass of granular carbon 16, and into the ends are inserted hard carbon electrodes 16^a, 16^b so as to compress the mass of granular carbon to the desired extent and thus establish a connection of resistance material between the electrodes. The electric heater thus produced is placed within the iron tube 11 and the outer coating serves as an insulator between the resistance material and the metal, and prevents short-circuiting of the electric current. To further insulate the heating member from the metal tube, suitable dielectric rings 15^a are located preferably adjacent to the ends of the tube 11. When the electric current is passed through the heater the card-board will be burned away, becoming carbonized and forming in effect part of the electric conductor.

In making gas by the splitting of hydrocarbon oil into rich gases of the olefin series it is important to provide a catalytic agent coating on the surfaces of the electric heaters to prevent destructive decomposition of the oil and the consequent deposit of carbon on the heaters, entailing a loss of illuminants and fouling the heaters. For this catalytic agent coating I preferably employ a paste composed of metallic oxids—such as oxids of calcium, magnesium, barium and strontium—one or more, mixed with dilute silicate of sodium. The paste is applied to form a coat 18 on the outer

surface of the iron tube 11. This catalytic coating prevents the iron, when heated to incandescence, from spoiling the illuminating quality of the gas by causing deposition of carbon; it also aids by catalytic action in splitting up the oil into gases of high illuminating quality—such as gases of the olefin series including ethylene (C_2H_4), acetylene (C_2H_2) and methan (CH_4).

By aid of properly regulated heat with auxiliary help of a catalytic agent coating, as above described, in a heated state the paraffins in heated oil vapor may be split chemically so as to produce large percentages of permanent gases of the olefin series and of the acetylene series, both of which are far more valuable as illuminants than are the paraffin gases. Hence the marked advantage of my catalytic agent coating 18 on the iron tubes 11. The coating is fire proof. The coating of silicate and lime on the interior card-board cylinder is a good conductor of heat and an effective insulator of electricity. The electrodes and resistance material being inclosed in tubes, the heat is evenly distributed, so that there is no liability to burn or destructively decompose oil and form lamp black or hard carbon, as would occur if the oil was supplied in direct contact with refractory resistance material through which an electric current was being passed.

A plurality of tile or fire brick bars 17 are located in the heating chambers 5 adjacent to the electric heaters and will become heated by heat radiated from the latter. These tiles serve by their extended heated surfaces to help split the oil into fixed gases.

The unit sections may be connected by ears 19 and bolts, and may be provided with outwardly projecting lugs 20 to which hooks and chains may be attached for elevating the section.

A thermostat 28 may be connected with any of the heaters, and an electric conductor 29 will be connected with each electrode and supplied with current from a suitable source of energy.

Instead of the cardboard cylinders used in making the insulating cylinders, as above described, I may use thin wood veneer or some other material which will become carbonized by passage of an electric current through the heater.

A modified form of electric heater is shown in Fig. 4, in which is embodied a fire-clay tube 15^b, burned at a temperature of about 3,000° F. as a substitute for the metal tube 11 and interior insulating tube 14, 15 shown in Figs. 2 and 3. The tube 15^b may be five inches, more or less, in diameter with walls about one inch thick. The interior will be filled with granular carbon resistance material 16 and carbon electrodes forced into the ends as above described. The electrodes will compress the particles of carbon to the desired degree to establish electric connection between the electrodes. An oxid paste is applied as an exterior catalytic coating 18 for the purpose above described.

The body of granular carbon compressed between the ends of the electrodes 16^a forms a resistance, by means of which a succession of small or short electric arcs are produced, thus converting the electric energy into heat, thereby heating the tube at that part filled with the granular carbon from the inside to the surface. The heat is localized within the fire-brick walls of the generator or unit sections due to the much greater resistance offered by the granular carbon than that which is offered by the carbon electrodes, and such localized heat is imparted to adjacent tiles 17 and intervening space, so as to produce substantially uniformly heated surfaces and zones.

Having described my invention, what I claim, and desire to secure by Letters Patent, is:—

1. An electric heater comprising a metal tube having an exterior catalytic agent coating, an interior tube of insulating material, granular resistance material within the same and electrodes in the ends of the tube and bearing against said resistance material.

2. An electric heater constructed with a metal tube, an inner tube of card-board having an exterior insulating coating of silicate paste, electrodes in the ends of said inner tube and a filling of granular resistance material in the tube between the electrodes.

3. The combination with the walls of a chamber, of an electric heater tube, having an exterior catalytic agent coating to prevent deposit of carbon, said tube extending through the walls and chamber, electrodes in the opposite ends of said tube and resistance material in the tube between the electrodes.

4. In a heating chamber, an electric heater tube having an exterior coating of metallic oxid as a catalytic agent, electrodes in the opposite ends of, and insulated from, said tube, and resistance material between the ends of the electrodes.

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

BURHANS VAN STEENBERGH.

Witnesses:

J. B. LYDECKER,

EDMUND C. LOCKWOOD.