No. 764,994. PATENTED JULY 12, 1904.

G. E. DUTERTRE.

ELECTRIC ROASTING OVEN.

APPLICATION FILED OCT. 7, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

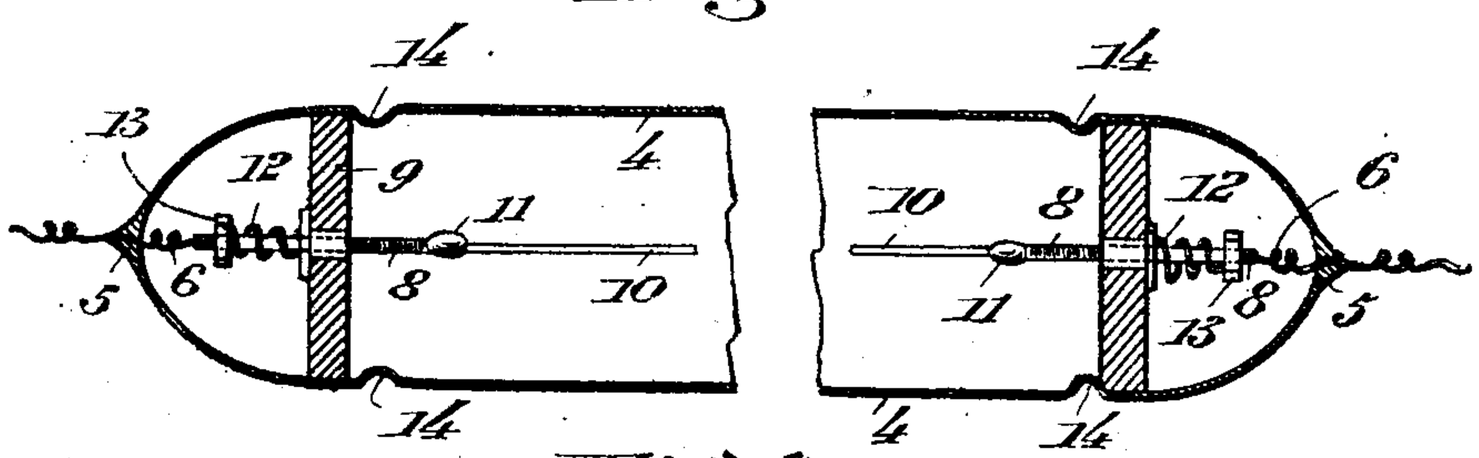


Fig. 2.

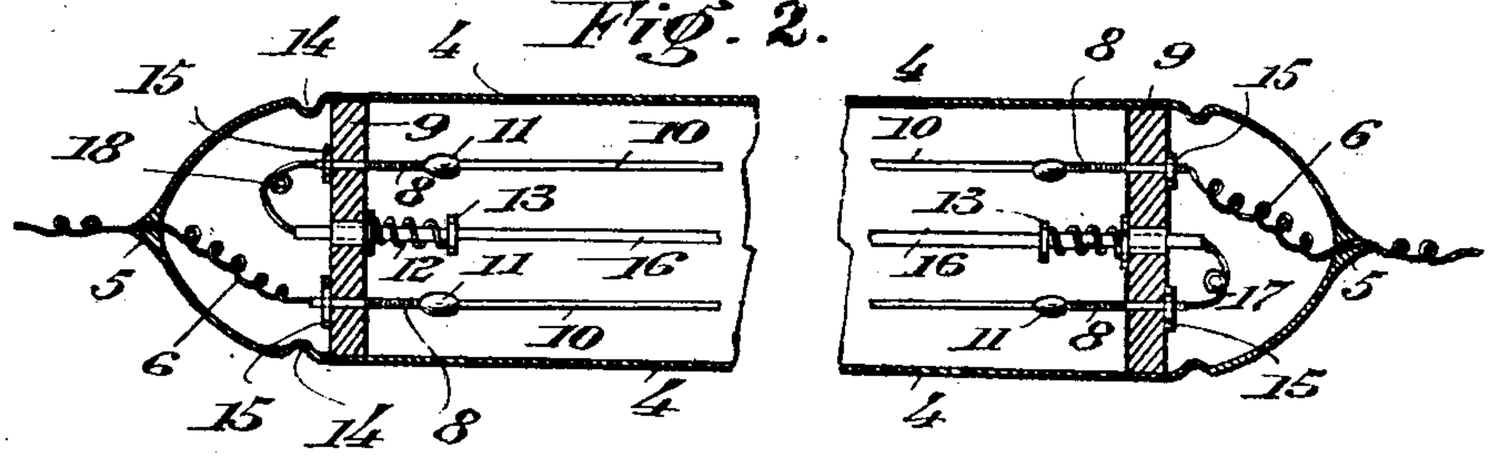
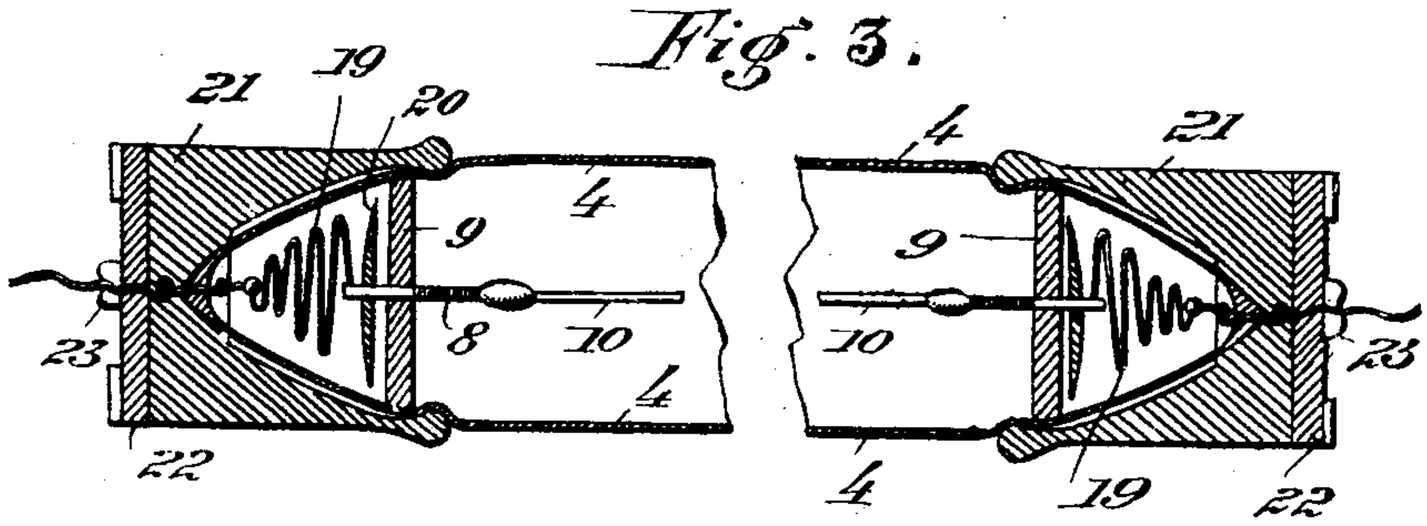


Fig. 3.



Witnesses:
L. Waldmann
C. Heymann

Inventor:
Georges Edmond Dutertre
per P. Singer
Attorney.

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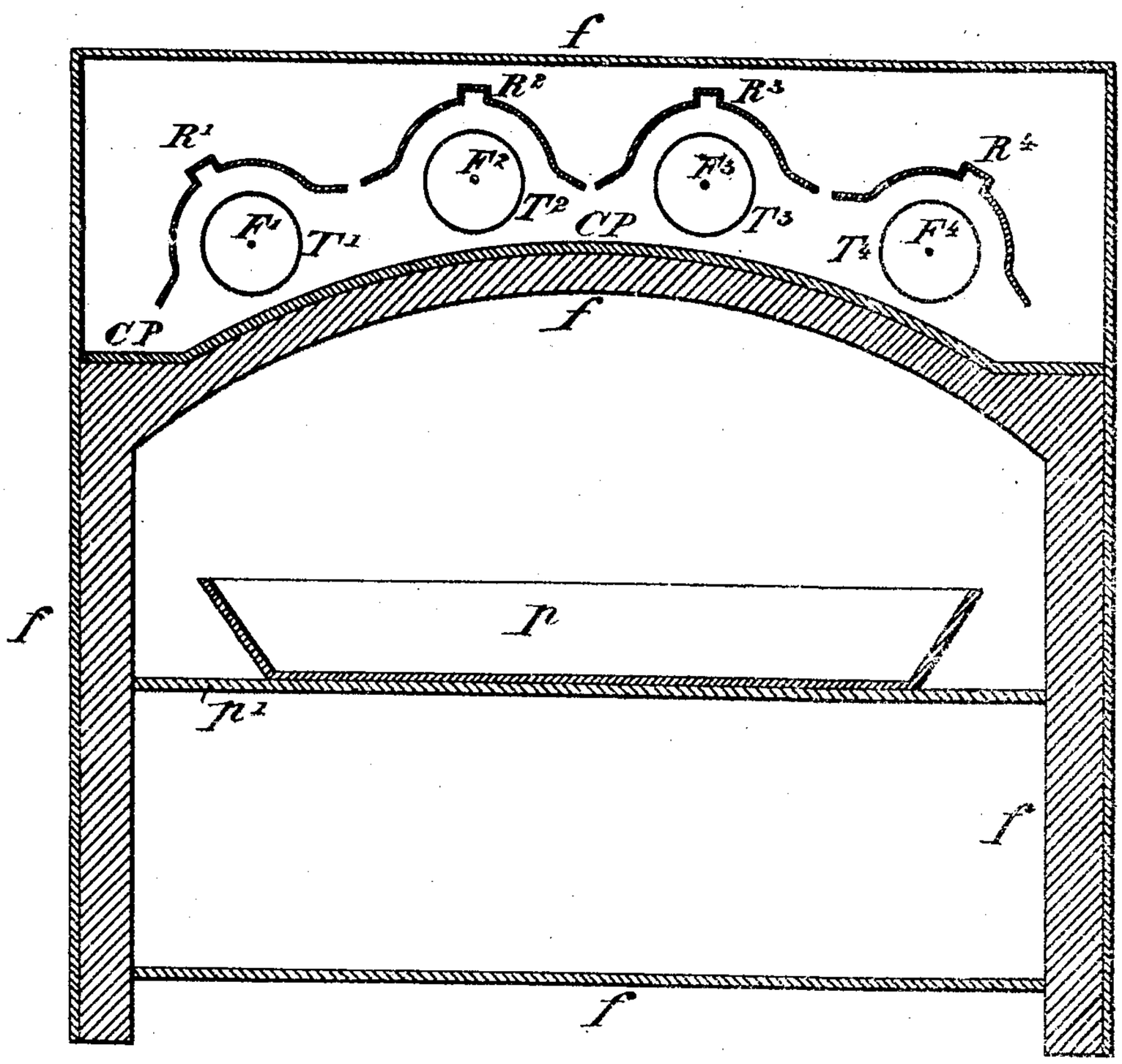
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.



Witnesses:
E. S. Noble
A. Hall.

Inventor:
Georges Edmond Dutertre
by P. B. Singer Attorney

No. 764,994. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

GEORGES EDMOND DUTERTRE, OF LEVALLOIS-PERRET, FRANCE.

ELECTRIC ROASTING-OVEN.

SPECIFICATION forming part of Letters Patent No. 764,994, dated July 12, 1904.

Application filed October 7, 1903. Serial No. 176,094. (No model.)

To all whom it may concern:

Be it known that I, GEORGES EDMOND DUTERTRE, a citizen of the French Republic, and a resident of Levallois-Perret, Seine, France, have invented a certain new and Improved Electric Lamp for Heating, of which the following is a specification.

This invention relates to apparatus for electric roasting by incandescence with the aid of luminous tubes.

The principle of the luminous tubes or electric furnaces, made especially to be fitted in apparatus requiring a sufficient evaporation and desiccation of the foodstuffs placed therein, bears upon the caloric radiation of carbon filaments, cylindrical or rectilinear, forced up to white heat inside glass or crystal bulbs. The roasting of meat obtained in this manner is perfect in all respects. With a consumption of three heat-watts a chicken of one and one-half kilos is roasted to perfection. To obtain this result, it is necessary that the smallest diameter of the filament be four-tenths of a millimeter, and the minimum consumption of electric energy is valued at about one and one-half watts per lineal millimeter. On the other hand, the total length of each filament, and consequently of the transparent tube, is established so as to spread in the special apparatus the caloric or luminous rays upon the corresponding surface valued in square centimeters at an appropriate distance from the piece to be roasted or cooked.

Several different forms of the luminous ovens will be explained during the course of the present description which have been made and which can by their grouping, either in quantity or tension satisfy, upon the other hand, the requirements of all electric stations, either at fifty-five volts (or even less in particular cases) or up to two hundred and twenty volts, and exceptionally to four hundred and forty volts.

This invention consists more particularly in fitting the filaments inside of the bulb or tube so that they will be constantly under tension and in introducing a particular combination of gases into the bulbs or tubes.

In the accompanying drawings, given by way of example, Figure 1 shows another species applicable to longer tubes for ordinary roasters. Fig. 2 is a third manner of carrying out the principles above set forth and permitting the invention to be used with varying voltage. Fig. 3 shows a species which is applicable to special apparatus requiring a long filament. Fig. 4 is a vertical sectional view of an oven employing the electric lamps of this invention, in which *f f* represent the walls of the oven; *p*, a roasting-dish; *p'*, the supporting-shelf; C P, the front part of the frame supporting the tubes; $T' T^2 T^3 T^4$, the glass tubes containing the filaments; $F' F^2 F^3 F^4$, the filaments, and $R' R^2 R^3 R^4$ metallic reflectors, which are preferably rotatable around the tubes and are made so as to permit the vapors to escape through holes in the side portions of their upper projections.

In the form of lamp shown in Fig. 1, 4 is the glass or crystal cylinder, the oblong ends whereof are closed at 5, where the conductors 6 6, of platinum or other metal, are soldered or fixed. 5 5 are small parts constituting the soldering or closing at each end of the tubular cylinder 4.

Each conductor-wire 6 is fixed by its end to a metal spindle 8, screw-threaded upon a portion of its length, which passes easily through an opening made in a disk 9, of an insulating and incombustible material. The spindles 8 are attached or soldered at 11 11 to the carbon filament 10, which must be brought to a luminous state for roasting purposes.

Each of the spindles 8 is provided with a coiled spring 12, bearing, upon the one hand, against the corresponding washer and, on the other, against a nut 13, screwed upon the said spindle and which at the same time serves to regulate the sphere of elasticity of the said spring.

Two grooves 14 14, projecting to the interior, prevent the disks 9 from approaching each other by the tension of the springs.

It is easily noted from an inspection of Fig. 1 that the filament 10 will be constantly adjusted. In the species shown in Fig. 1 filaments 10 of carbon are arranged inside the glass or crystal cylinder 4, the ends whereof

are closed at 5, at which point the conductors 6 6, connected to the outside contacts, are fixed or soldered.

Each of the filaments 10 is fixed to a metal spindle 8, which passes easily through a disk 9, made of an insulating and incombustible material, independent from the glass cylinder. These spindles are screw-threaded toward their end to receive a nut 15. These nuts 15 are intended to limit the motion of the disks 9. A spindle 16, of rigid metal, is arranged in such a manner that its ends pass through the two disks 9. Nuts 13 are arranged upon the spindle 16 in order to serve as a stop each one to a spiral spring 12, which bears, upon the other hand, against the front of the corresponding disk 9.

The object of the grooves 14 is in this case to stop the fall or shifting of the system constituted by the union of parts before described and introduced when fitted together inside the glass cylinder. The rectitude of the filaments is in this case again assured.

In the species shown in Fig. 2 the two filaments are fitted in tension. The current arrives by one end of a filament, passes through the same, and passes thence through a short conductor 17 into the spindle 16, through which it passes to be conducted, by means of a conductor 18, into the other filament and from thence to the exit of the cylinder.

The species shown in Fig. 3 comprises inside the glass cylinder 4 a filament 10, connected at each of its ends to a metal spindle 8, passing freely through a disk 9 and fixed by its end to a spring 19 having the form of a spiral cone. These springs 19 are intended to complete the rectitude of the filament. A lenticular disk 20, made of ferronickel or steel, is fixed upon both ends of the spindle 8. Each end of the glass cylinder is placed in a cylindrical cap 21, of ferronickel or steel, one portion whereof is bent inwardly in a truncated shape. Upon this cap is fitted a disk 22, of an insulating material, and in the middle whereof is fixed a contact 23 for passage of the current.

The various species above described have been made to be used according to necessity and the sizes of the apparatus intended for roasting, culinary, and heating purposes and according to the voltage obtained from the current.

The species shown in Fig. 1 allows longer filaments and tubes to be used in ordinary roasters, as well as in apparatus of large dimensions, in proportion to the importance of the joints to be roasted, the stroke of the spring being by the means set forth sufficient with regard to elasticity.

The luminous tube shown in Fig. 2 has the advantage, by using several separate filaments connected inside the tube itself electrically in tension, of working at voltages varying, according to their length, between fifty-five and four hundred and forty volts.

Finally, the tube shown in Fig. 3, which can be used in all cases, is particularly intended to be used in special apparatus wherein a long filament is necessary and the sizes whereof have to vary according to requirements. Then, as the effects of dilatation and retraction are very sensitive, the parts 21 and 21 of ferronickel or steel are magnetized during or even before the working of the apparatus, the magnetic influence being communicated to each part or socket 21 by a permanent magnet or preferably by an electromagnet.

In order to obtain a large consumption of amperes, according to the various cases, instead of using a single wire several are twisted together. These cabled wires assure advantages, such as resistance against traction and wear.

The artificial air introduced inside the tube in a proportion of twenty-five per cent. of its volume is composed of oxid of carbon and nitrogen. During the working there is a dilatation of gas, so as to compensate for three-fourths of the outside pressure upon the bulbs.

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

1. In a device of the character herein set forth, the combination of a tube, disks in said tube, a filament, threaded rods secured to the ends of said filament and passing through openings in said disks, nuts on said rods, and springs interposed between said nuts and said disks, and electrical connections from said rods through the walls of said tube.

2. In a device of the character set forth, the combination of a closed tube, a plurality of filaments in said tube, disks in said tube, rods connected with the ends of said filaments and passing through apertures in said disks, means for maintaining the tension in said rods, and electrical connections for connecting said filaments in series.

3. In a device of the character herein set forth, the combination of a closed tube, metallic sockets engaging grooves in each end of said tube, disks in said tube held by said grooves, a filament, metallic rods connected to each end of said filament and passing through openings in said disks, and springs connecting between said rods and the ends of said tube, and movable metallic disks on said rods adjacent to said first-named disks.

GEORGES EDMOND DUTERTRE.

Witnesses:
ADOLPHE STURM,
PAUL F. PÂQUET.