

APPARATUS FOR HEATING OR VAPORIZING FLUIDS.

1,403,594.

Fig. 1.

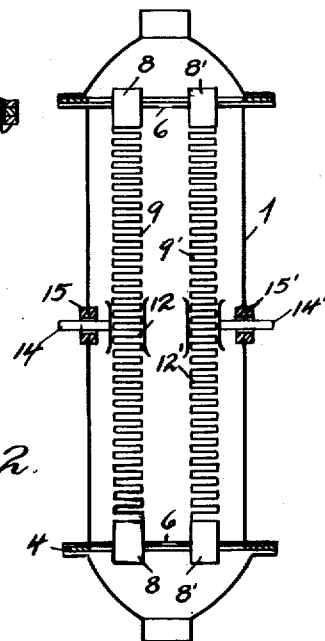


FIG. 2.

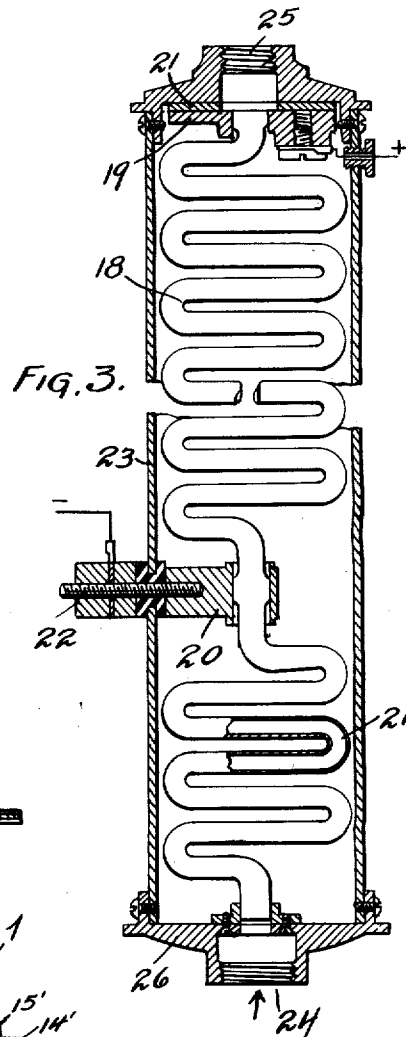


Fig. 3.

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APPARATUS FOR HEATING OR VAPORIZING FLUIDS.

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Specification of Letters Patent. Patented Jan. 17, 1922.

Application filed January 11, 1919. Serial No. 270,640.

To all whom it may concern:

Be it known that I, CELIO DUÓ, a subject of the King of Italy, residing at No. 347 Bolivar Street, Buenos Aires, Argentina, have invented certain new and useful Improvements in Apparatus for Heating or Vaporizing Fluids, of which the following is a specification.

This invention relates to certain new and useful improvements in apparatus for heating or vaporizing fluids by means of the heat produced by the passage of an electric current through a naked conductor in direct contact with the said fluid and its main object is to provide an apparatus for heating or vaporizing a liquid of a low conductive capacity on the passage through said naked conductor of an electric current of any kind without originating any of the usual electrolytic phenomena.

According to my present invention the apparatus mainly consists of one or more naked electric resistances which is or are wound in the form of a tube in such a way that the windings are sufficiently apart from each other so as not to form an electric contact between them, the separation, however being of such a nature that the liquid passing within said tubes may not escape between said windings. The apparatus according to my present invention may also consist of or comprise one or more continuous tubular elements acting as electric resistances through which the liquid to be heated or vaporized may pass, such resistances being in both cases, if desired, enclosed within any suitable casings or covers.

Heretofore apparatus of the above kind, that is, apparatus working with naked conductors in direct contact with the liquid to be heated, for instance, with water, have not given practical results when the ordinary city electric currents are employed inasmuch as they produce in a greater or lesser degree a decomposition of the liquid and also of the electric conductor due to electrolysis.

Water which is a poor conductor of electricity at normal or low temperatures, considerably increases its conductivity when heated and therefore when an electric cur-

rent is passed through a naked conductor in direct contact with such water, by-currents are produced which at the same time traverse the liquid increasing its electric intensity with the raising of the temperature, this tending to further electrolysis when the circulating voltage is higher than that of decomposition of the water, with subsequent formation of salts and destruction of the electric conductor.

In order to overcome the above drawback it is necessary that the liquid be totally non-conductive or that the electric tension used or derived from the conductor be lower than that required for decomposing the liquid in direct contact with such conductor.

When using the ordinary city electric currents, which generally pass through trifid conductors with the neutral grounded, it is necessary to avoid the formation of such derivations which run through the liquid parallel to the conductor and at the same time to avoid the closing of the electric circuit on the outside through the said liquid, by reducing the electric conductivity of such liquid in order that the electro-motive force resulting from the derivations of the conductor in direct contact with the liquid or forming the external circuit be not sufficient to provoke said decomposition.

This result is attained, according to my present invention, by forming the electric conductor as a tube by a series of windings or with a continuous surface and passing the liquid to be heated or vaporized within the said tube or tubes as the case may be. The length and cross section of the said tubes must be such that column of liquid circulating within the same may offer an electric resistance so that the tension derived at any point of the tube may not traverse such column forming a circuit between the liquid and the conductor or between the latter and the outer mass of liquid in a degree sufficient to allow the intervention of the electrolytical factors.

The column may be also interrupted by a series of air bubbles which provide for an electric insulation.

The invention may be carried into prac-

tice in different forms, two embodiments of the same being shown by way of example in the accompanying drawings, in which—

Figure 1 shows a vertical central section through an apparatus for heating water according to my present invention.

Figure 2 is a diagrammatic view of the same and finally, Figure 3 shows a modified form which is specially suitable for vaporizing water.

Referring now to Figures 1 and 2, 1 is an outer metallic case, 2 is a cover for the same having an opening at the center, such opening being suitably screwthreaded as at 3 so as to be suitably connected with the general water system. Said cover is electrically insulated as at 4, from the case 1 to which it is connected by means of insulated screws 11. 5, 5' are bushings fixed to the partition 6; 7, 7' are screws by means of which the short metallic tubes 8, 8' are held in position. To the said tubes 8 and 8' there are soldered or otherwise fixed the ends of each of the electric conductors 9 and 9' which are then wound in the form of coils the windings of which do not touch each other but are not so separated as to allow of the water falling between them. The opposite ends of the said conductors are also fixed to similar tubes 8 and 8' which are held in position within the bushings 5 by means of set screws as shown or in any other suitable manner. About midway of the said coils 9 and 9' they are surrounded by metallic tubes 12 and 12' held in position within the metal rings 10 and 10' respectively by means of set screws 14 and 14'. The whole appliance is conveniently insulated, as shown at 15, 15' where an electrical connection is established at the terminals 16, and 16'. The conductors 9 and 9' may be thus easily interchanged in order to alter at will the intensity of the electric current passing through them.

The casing 1 is closed at the bottom by means of a partition 6 which is traversed by the above tubes 8 and 8' there being an opening 17 at the lower end of the external case for permitting the heated liquid to flow out.

The electric connections may be established under different forms but it must be always borne in mind that in no case a voltage sufficient for the decomposition of the liquid shall pass between the conductor and the said liquid running parallel with or between the conductor through the liquid to the outside.

Figure 3 shows a modified embodiment of my present invention which is specially adapted to the vaporizing of water. 23 is an outer metallic case having a top conveniently insulated therefrom as at 21 and formed with a central opening 25 for the outlet of steam or heated water. The said case is closed at its lower end by a bottom 26

fixed by means of screws and having an opening 25 for the entrance of the liquid. 18 is a tube in the form of a coil which acts as an electric resistance and which is fixed at 19 by means of screws or the like. The lower end of the said tube is held in a metal ring 20. A second insulating coil 21 is connected to the lower end of the said coil 18 and also to the opening 24 of the bottom 26. The electric current passes to one of the ends of the said coil 18 by a plug 22 suitably insulated from the wall 23 of the outer case and from the other end through another contact which is also insulated from the said wall.

It is obvious that according to the principles of the invention many embodiments of the same may be used without departing from the scope of the same which is clearly set forth in the appended claims.

Having now fully described and ascertained the nature of my said invention and in what manner the same is to be carried into practice, I declare that what I claim is:—

1. An electric heating apparatus, comprising a casing adapted to contain a liquid, a pair of resistance elements mounted in said casing and insulated therefrom, said elements comprising a plurality of separated coils forming a tube adapted to permit direct contact of the liquid with the interior and exterior thereof.

2. An electric heating apparatus, comprising a casing adapted to contain a liquid, a pair of tubular resistance elements mounted in said casing and insulated therefrom, said tubes being formed of coils sufficiently spaced apart to insulate adjacent coils but preventing the escape of liquid therebetween.

3. An electric heating apparatus, comprising a casing adapted to contain a liquid, a pair of partitions within said casing, a pair of electric conductors each wound upon itself in a plurality of separated coils forming a tube adapted to contact at its interior and exterior with the liquid in the casing, said tubes being sufficiently spaced apart to insulate adjacent coils but preventing the escape of liquid therebetween and removably secured at each end thereof in one of said partitions, contact members passing through the wall of said casing and insulated therefrom and in contact with said tubes, and a pair of end members secured to said casing and insulated therefrom.

4. An electric heating apparatus, comprising a casing adapted to contain a liquid, a pair of partitions within said casing, a pair of bushings supported by each of said partitions, a pair of electric conductors each wound upon itself in a plurality of separated coils forming a tube adapted to contact at its interior and exterior with the liquid in the casing, said tubes being sufficiently spaced apart to insulate adjacent coils but prevent-

ing the escape of liquid therebetween and
removably secured at each end thereof in one
of said bushings, contact members passing
through the wall of said casing and insulated
therefrom and in electrical contact with said
5 tubes, and a pair of end members secured to
said casing but insulated therefrom.

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

CELIO DUÓ.

Witnesses:

C. C. O'CREERSOE,

JOHN W. CONNELLY, Jr.