Dec. 11, 1923. 1,476,699

F. J. FABRET

APPARATUS FOR PRODUCING LOCAL ANAESTHESIA

Filed Dec. 8, 1920 2 Sheets-Sheet 1

Fig. 1.

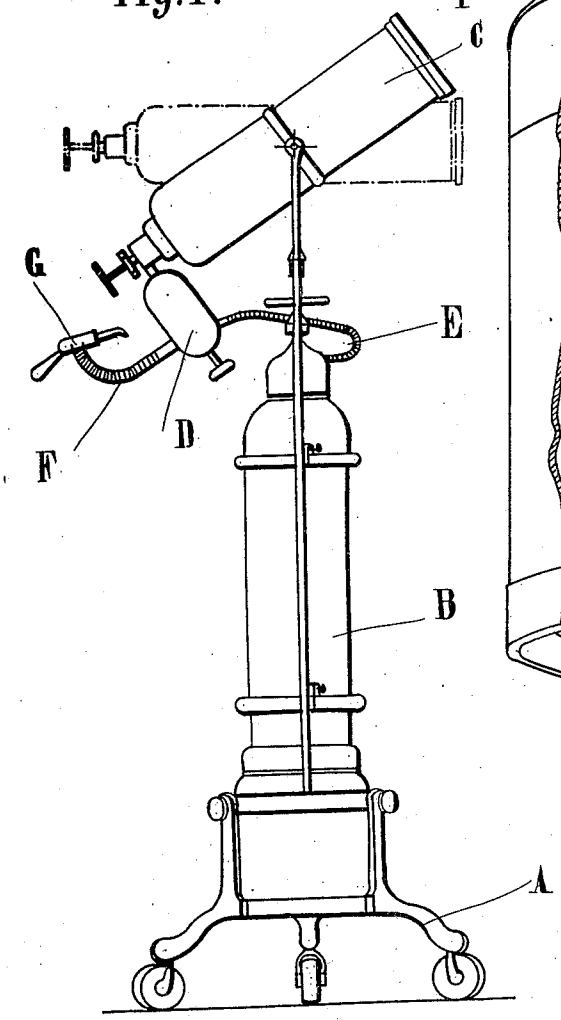
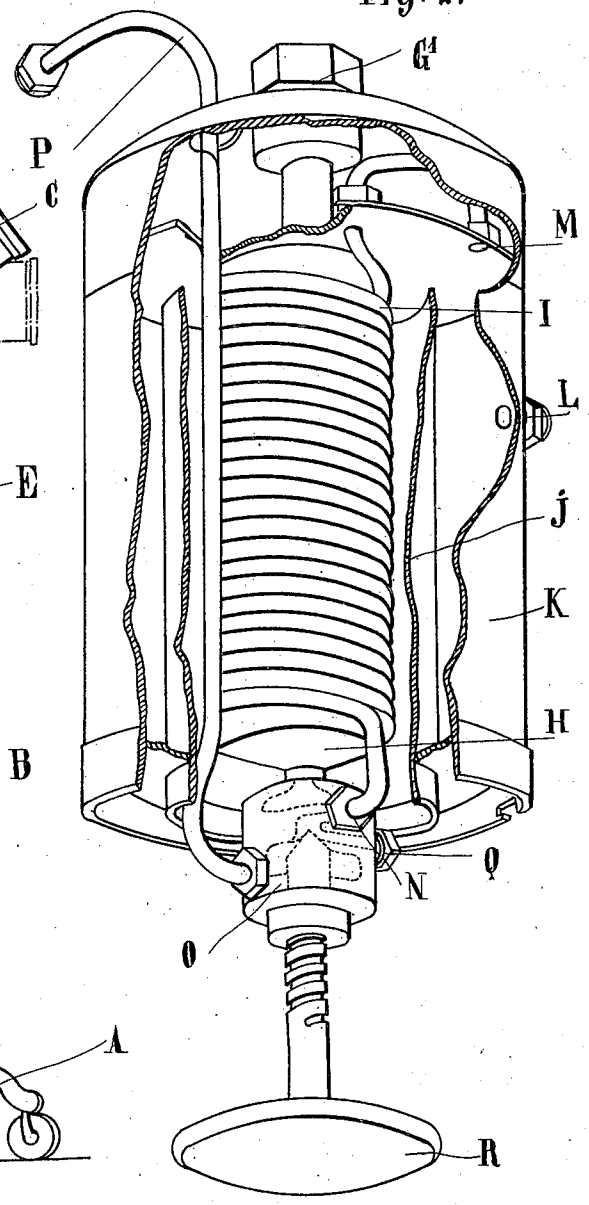



Fig. 2.




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Filed Dec. 8, 1920 2 Sheets-Sheet 2

Fig. 3.

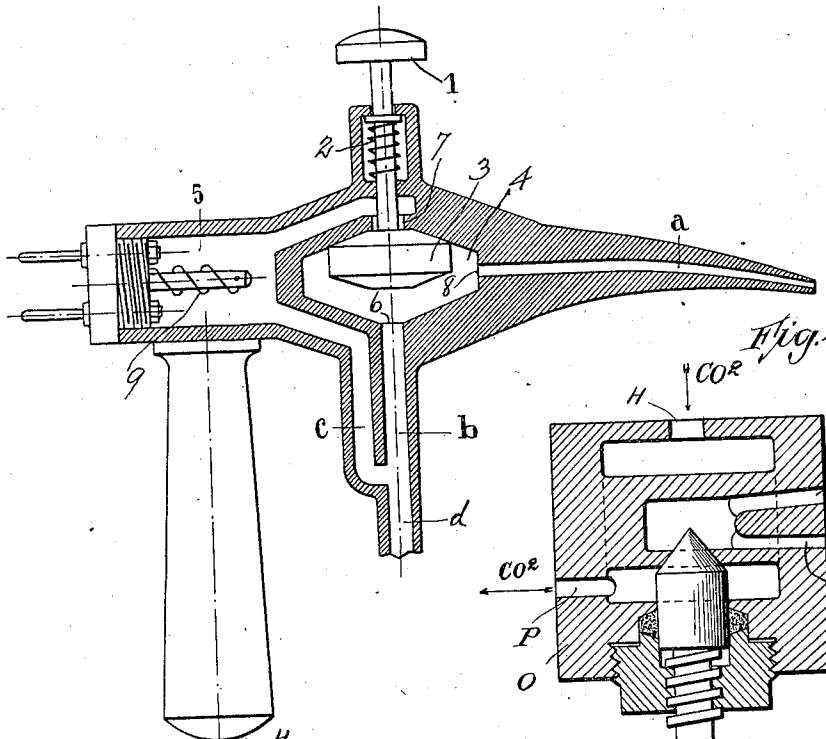
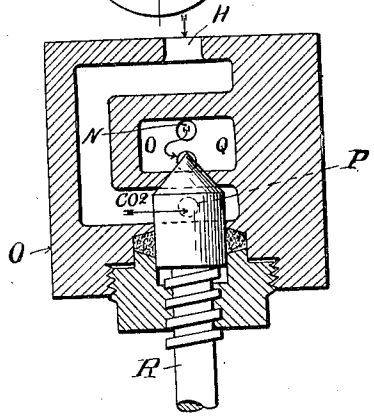



Fig. 4.




Fig. 5.




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# UNITED STATES PATENT OFFICE.

FRANÇOIS JOSEPH FABRET, OF NICE, FRANCE.

## APPARATUS FOR PRODUCING LOCAL ANÆSTHESIA.

Application filed December 8, 1920. Serial No. 429,194.

*To all whom it may concern:*

Be it known that I, FRANÇOIS JOSEPH FABRET, a citizen of the Republic of France, and resident of Nice, France (post-office address 6 Avenue de Verdun), have invented a new and useful Apparatus for Producing Local Anæsthesia, which improvements are fully set forth in the following specification.

This invention relates to an apparatus for producing local anæsthesia quickly and without pain to the patient by first slowly and gradually lowering the temperature of the tissues to be anæsthetized within a given region of the operating field, and then, after the operation has been finished, by re-establishing the reduced circulation by a slow and gradual raising of the temperature.

In carrying out the operation, a jet of oxygen heated to 37.5° C., which is the temperature of the human body, is first projected against the part to be anæsthetized. The heating of the jet can be effected in any desired manner, for instance by passing the oxygen through a flexible tube leading from a heat-exchanger to the handle of a blow pipe wherein there is arranged a small electric resistance through which a variable current is caused to flow; the heating operation being regulated by means of a spring-controlled button arranged at the back of the blow pipe above the handle. By manipulating this button in the proper manner, so as to gradually cut down the current, the temperature of the oxygen jet and, hence that of the part to be anæsthetized may be gradually lowered; and when the temperature of said part has dropped until it reaches 20° C., the current is shut off and the jet of oxygen is cooled by means of a cooling or freezing agent, such as carbonic acid, which can give a temperature of —90°, this cooling being continued to a greater or less extent according to the regions to be rendered insensitive. In the case of a tooth, it may be carried as low as —10°, but in practice operating can begin even at 0°, that temperature being maintained during the whole time of operating.

When the operation is finished and the part operated on is to be returned to its normal temperature, the procedure above described is reversed, and for a few minutes the jet of oxygen may even be maintained at +40° without the patient experiencing the least disagreeable sensation.

While carbonic acid has been referred to in the foregoing as the cooling or freezing agent, it is to be understood that the invention is not limited to that particular substance, as other substances of a similar character or having similar properties might obviously be equally well used.

The accompanying drawings illustrate, by way of example, one embodiment of an apparatus constructed in accordance with my invention for the production of anæsthesia in the manner previously stated; and in said drawings:

Figure 1 is an elevation of the complete apparatus;

Fig. 2 is an enlarged part-section detail view of the heat-exchanger;

Fig. 3 is an enlarged sectional view of the blow pipe and its adjuncts.

Figs. 4 and 5 are enlarged detail vertical sections of the drum O, taken at right angles to each other.

Referring more particularly to Fig. 1, the apparatus is shown therein as comprising a support or stand A of cast iron or the like mounted on three legs provided with rollers. This stand carries a metal tank B containing a tube or flask of oxygen of 3 cubic meters capacity; and above said tank, and also carried by the stand, there is arranged a second tank C containing a tube or flask of of carbonic acid of 8 liters capacity, which can be given any position so as to facilitate evaporation of the carbonic acid and render more convenient the handling of the blow pipe. The oxygen tank B is connected at its upper end to a heat-exchanging vessel D by means of a tube E; and the said vessel D is screwed directly on the carbonic acid tank C and is provided with a flexible tube F to which the blow pipe G is connected.

The heat-exchanger D, as shown on an enlarged scale in Fig. 2, comprises an inner copper tube H, the wall of which is constituted by a coiled pipe I with soldered or welded spires. This tube H provides an expansion chamber for the liquid carbonic acid which is admitted thereinto from the tank C through the inlet $G^1$ at the top of the tube.

Tube H is enclosed in a copper cylinder J from which it is insulated by agglomerated cork, and the cylinder J in turn is enclosed in a third cylinder K; the cylinders J and K being spaced from each other to form an annular tank or reservoir in which accumulates the oxygen admitted at L from tube E

and tank B. The coil I communicates at its upper or inlet end with the top of the annular tank or reservoir, as indicated at M; and its lower or outlet end opens at N into a drum O, the latter being provided with an orifice or nipple Q in which is fitted the inlet end of the flexible tube F leading to the blow pipe, and with a passage connecting the nipples N and Q, so that the oxygen admitted into the drum through the nipple or inlet N and the coil I will pass from said drum through the outlet nipple Q and tube F to the blow pipe.

The lower end of the expansion tube H also opens into drum O, and the latter is further provided with a second outlet nipple to receive the end of a pipe P for discharging into the atmosphere the expanded carbonic acid which passes from tube H into the drum. Under normal conditions, the oxygen and carbonic acid pass separately through the drum; but in order to enable a mixture of the two to be obtained, if desired for any reason, the oxygen passage may be tapped to provide communication with the carbonic acid space or chamber in the drum, the opening thus formed being controlled by a needle valve R.

So far as concerns this much of the invention, it will be apparent from the foregoing that the oxygen supplied from tank B passes through tube E and inlet L into the annular space or chamber in the heat-exchanger D between cylinders K and J, and thence through outlet M into and through coil I and nipple N into drum O, whence it flows through the drum and the outlet nipple Q into tube F which conducts it to the blow pipe. During the passage of the oxygen through coil I, liquid carbonic acid is admitted from tank C through inlet G′ into tube H, wherein it quickly evaporates, thereby cooling the current of oxygen to about −90°.

In order to enable the oxygen to be initially discharged in a heated state from the blow pipe, any suitable means or device may be utilized, that shown in Figure 3 being preferably employed. According to the construction illustrated in said figure, there is formed in the interior of the blow pipe a central chamber 4 having two oppositely-located inlets 6 and 7 and an outlet 8, the latter opening into the discharge passage *a*. The inlet 6 communicates directly with a conduit *b*; and at the side of this conduit *b* there is disposed a branch conduit *c*, both conduits leading from a common supply conduit *d* to which tube F is suitably connected. The branch conduit *c* opens into a chamber 5 containing a resistance 9 consisting of one or more wires of German silver or other material adapted to be connected to a source of current supply; the current being varied at will by means of a rheostat or the like, illustration of which has been omitted as unnecessary. The heating chamber 5 communicates with the inlet 7 leading into chamber 4, so that the latter is, therefore, in communication with both inlets 6 and 7; and to control such communication there is arranged within chamber 4 a suitable valve 3, the stem of which terminates in a push button 1 and is equipped with a spring 2 that normally holds the valve in position to close the inlet 7 from the heating chamber 5, leaving the inlet 6 normally open.

Assuming that the blow pipe has been connected up to the supply wires and that the current is "on", the resistance device 9 will be heated; and if, then, the button 1 is pushed in, the valve 3 will close inlet 6 and open inlet 7, so that the oxygen coming through conduit *d* from the heat-exchanger D will flow into and through the branch conduit *c*, and thence into and through the heating chamber 5, from which it passes through inlet 7 into the valve chamber 4 and is discharged through the passage *a* against the part to be anæsthetized. By providing the rheostat or other controller, the current can be gradually cut down, with the result that the temperature of the oxygen gradually drops; the current being shut off entirely when the temperature falls to 20° C., as previously explained, and the push button 1 then released, so that thereafter the oxygen enters the valve chamber directly through the conduit *b* and inlet 6, and does not flow through the heating chamber.

As a matter of fact, the oxygen which is discharged from the blow pipe after the button has been released and anæsthesia has commenced, is not only unheated, but is actually refrigerated; and for that purpose the carbonic acid or the like, which was shut off from the tank H during the treatment above described, is now admitted through the inlet G′ to said tank H and evaporates therein, thereby exerting the desired freezing action on the oxygen which is passing through the coil I, so that the oxygen is now supplied in a freezing state to the tissues to be anæsthetized. This is continued until total anæsthesia is produced, and thereafter until the operation has been completed; and during this stage some of the carbonic acid gas may be allowed to mix with the oxygen by manipulating the needle valve R, although this mixing of the two gases is seldom necessary excepting in rare instances when it is desired to economize in the quantities of the gases consumed. Under ordinary conditions, the needle valve remains closed, and all of the carbonic acid gas entering drum O from tank H is discharged from said drum through pipe P into the atmosphere.

When the operation has been completed, the procedure is reversed; that is to say, the freezing treatment is gradually reduced, and heating is effected gradually until the normal temperature of 37° C. is again reached.

I claim as my invention:—

1. Apparatus for producing local anæsthesia, comprising an oxygen tank; a blow pipe; a connection between the oxygen tank and the blow pipe for supplying oxygen from the former to the latter to be discharged against the tissues to be anæsthetized; means for heating the current of oxygen to be discharged; and a device arranged in the path of the oxygen for refrigerating the same by the evaporation of a liquid gas.

2. An apparatus, as claimed in claim 1, in which the heating means is located within the interior of the blow pipe.

3. An apparatus for producing local anæsthesia, comprising an oxygen tank; a blow pipe; a connection between the oxygen tank and the blow pipe for supplying oxygen from the former to the latter to be discharged against the tissues to be anæsthetized; an electric resistance disposed within the blow pipe in the path of the oxygen current and through which a variable current of electricity is adapted to be passed; and means for refrigerating the oxygen current.

4. Apparatus for producing local anæsthesia, comprising an oxygen tank; a receptacle connected to receive oxygen therefrom; means for supplying a vaporizable refrigerating medium to said receptacle to freeze the oxygen passing therethrough; a blow pipe; and a connection between said receptacle and the blow pipe to supply the refrigerated oxygen to the latter from the former to be discharged against the tissues to be anæsthetized.

5. Apparatus for producing local anæsthesia, comprising an oxygen tank; a tank for containing a liquid refrigerant; a receptacle connected with the refrigerant tank to receive the refrigerant therefrom, and in which said refrigerant evaporates; a receptacle surrounding the first-named receptacle and connected with the oxygen tank to be supplied therefrom, and wherein the oxygen supplied is refrigerated by the evaporation of the refrigerant; a blow pipe; and a connection between the second-named receptacle and the blow pipe to supply the refrigerated oxygen to the latter from the former to be discharged against the tissues to be anæsthetized.

6. An apparatus, as claimed in claim 5, in which the second-named receptacle consists of a tube coiled around the first-named receptacle.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FRANÇOIS JOSEPH FABRET.

Witnesses:
P. M. Roper,
Peter Petersen.