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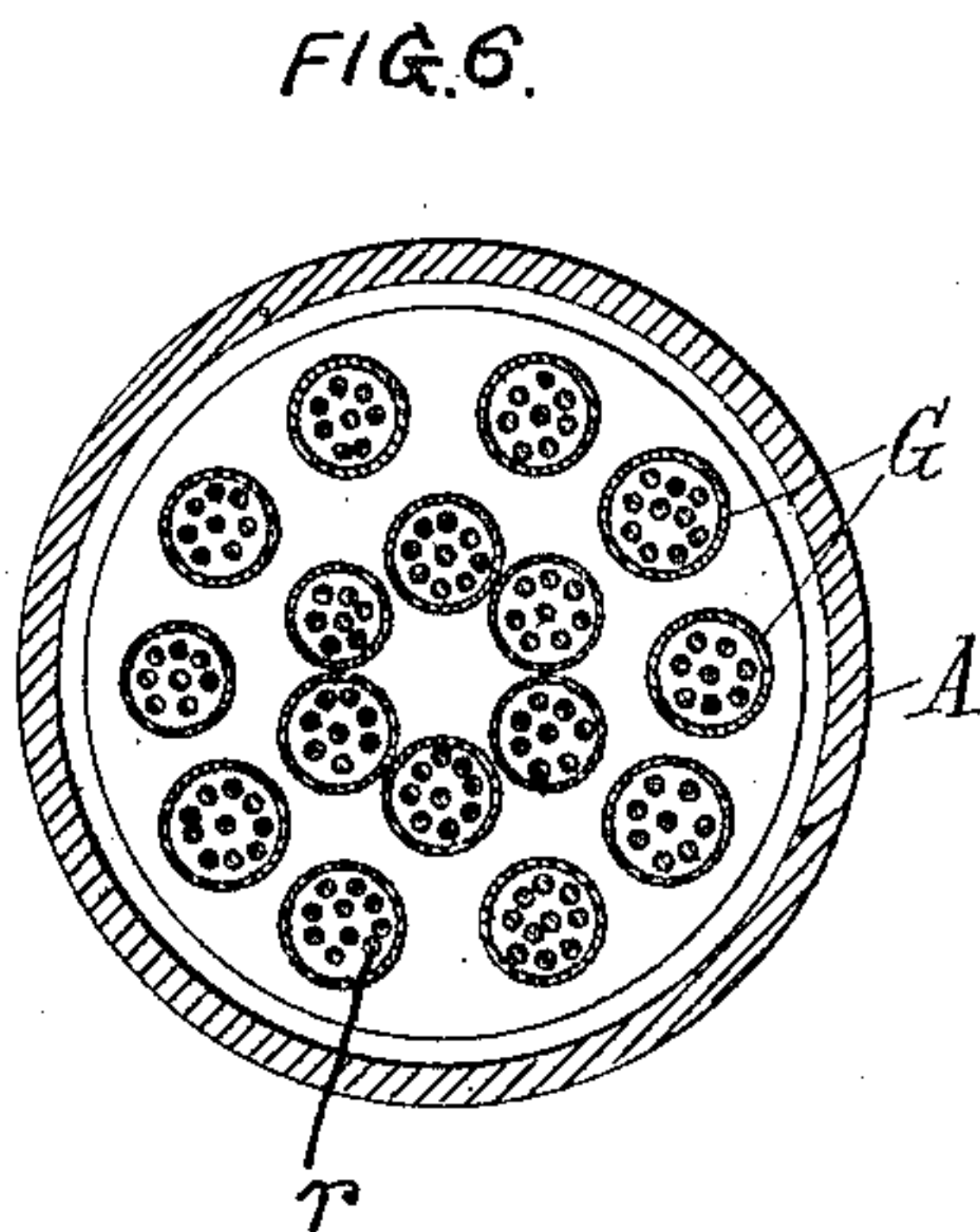
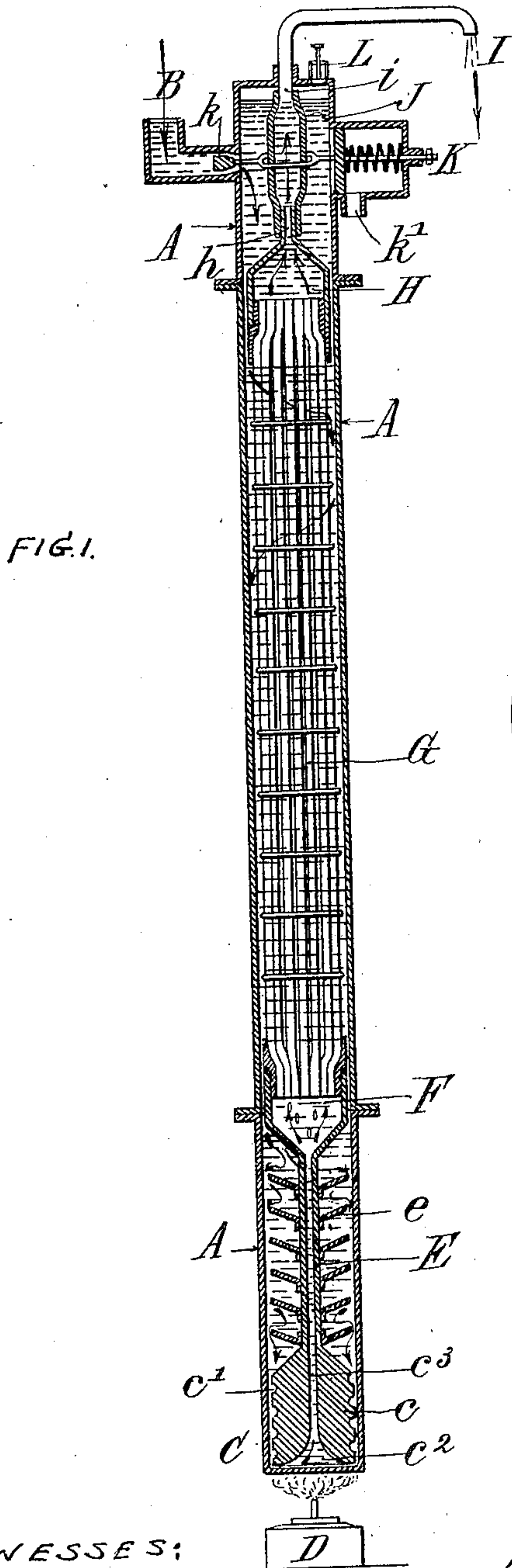
PATENTED FEB. 13, 1906.

C. F. V. MOREL.

APPARATUS FOR STERILIZING LIQUID BY HEAT UNDER PRESSURE.

APPLICATION FILED MAY 9, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

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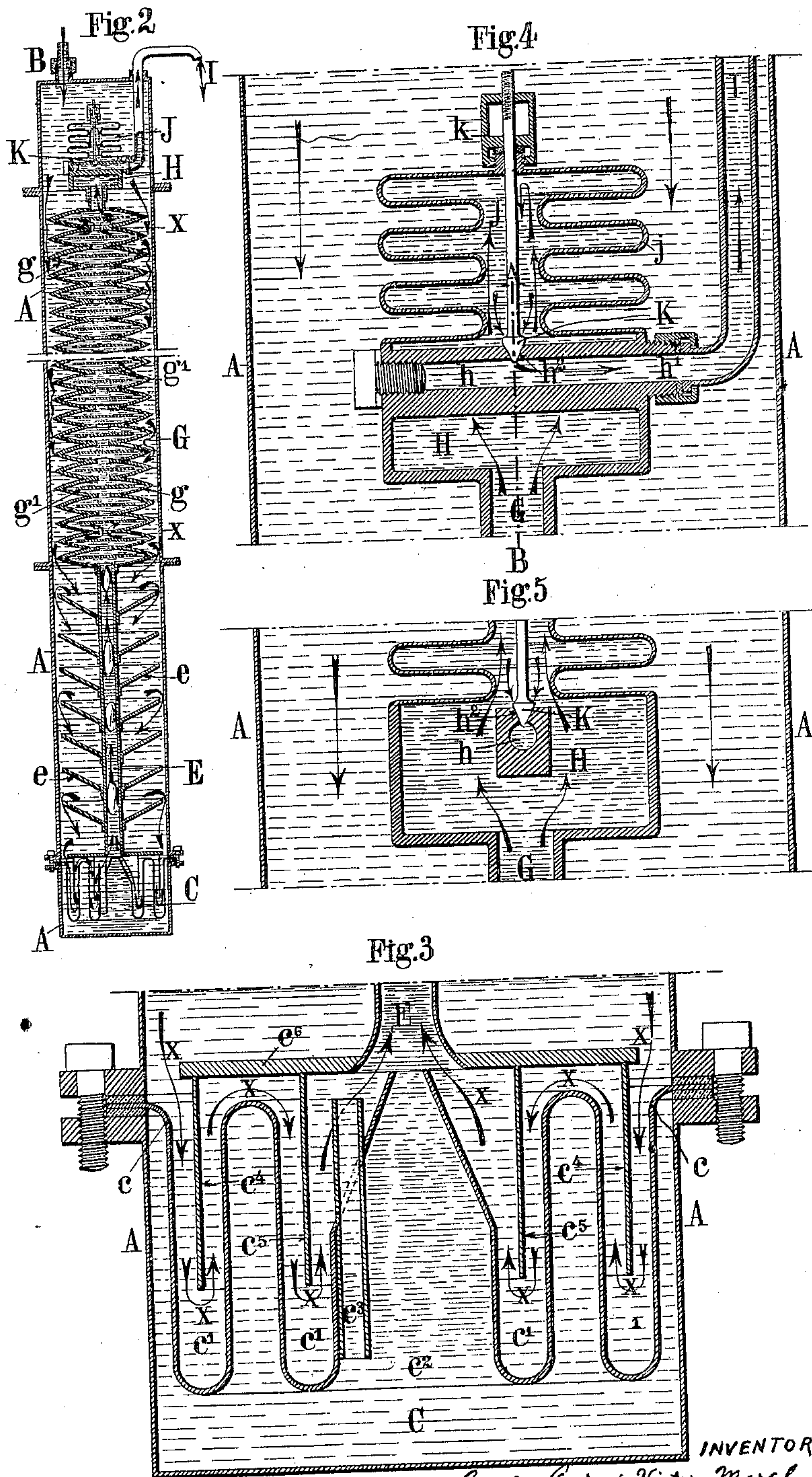
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U. S. PATENT OFFICE
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2 SHEETS—SHEET 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES FRÉDÉRIC VICTOR MOREL, OF PARIS, FRANCE.

APPARATUS FOR STERILIZING LIQUID BY HEAT UNDER PRESSURE.

No. 812,765.

Specification of Letters Patent.

Patented Feb. 13, 1906.

Application filed May 9, 1904. Serial No. 207,187.

To all whom it may concern:

Be it known that I, CHARLES FRÉDÉRIC VICTOR MOREL, a citizen of the Republic of France, and a resident of Paris, France, have invented an Apparatus for Sterilizing Liquids by Heat Under Pressure, of which the following is a specification.

This invention has for its object an apparatus for sterilizing liquids by heat under pressure by causing the liquid to circulate in two columns, one descending and the other ascending, in a cylindrical envelop heated at its base, so as to form bubbles of steam, which accumulate in the ascending column and automatically produce the discharge of the sterilized liquid when it attains the desired pressure. The apparatus so formed is automatic and furnishes a constant supply. It consists, broadly, of a cylindrical envelop in which are arranged a part forming a boiler, a suction-tube, a heat-recuperator, a pulsation device, and, finally, a pressure-regulator.

In the accompanying drawings, Figure 1 represents diagrammatically in vertical section an apparatus constructed in accordance with this principle and comprising a pressure-regulator. Fig. 2 represents diagrammatically, also in vertical section, a modified constructional form, the pressure-regulator being independent. Figs. 3 and 4 show separately and upon a larger scale, in vertical section, the boiler and pulsation device adapted to this constructional form. Fig. 5 is a transverse section on the line A B of Fig. 4. Fig. 6 is a transverse section, drawn to an enlarged scale, of the envelop of Fig. 1.

The cylindrical envelop A comprises at its upper part a tubular socket B, through which the liquid to be sterilized enters this envelop. At the lower portion of the envelop A, Fig. 1, is arranged a part C, constituting a boiler. This boiler is formed by a metal block c , around which is formed a helicoidal groove c' , the lower part of which opens into a chamber c^2 , formed by the base of the block c with the bottom of the envelop A. Beneath this chamber c^2 is arranged a furnace D or any other appropriate source of heat. The chamber c^2 is continued by a passage c^3 , which terminates in a suction-tube E, which is furnished externally with washers or wings e . This tube terminates in a chamber F, the diameter of which is slightly less than that of the envelop A. In this chamber F is engaged the lower extremity of an assemblage

G of recuperating-tubes, the interior of these tubes being provided with suitably-arranged metal rods r . The upper extremity of this tubular assemblage G is engaged in a chamber H identical with the chamber F. The upper part of this chamber terminates in a tubular socket h . A pipe i , fixed at the upper part of the envelop A in prolongation of the tubular socket h , conducts the sterilized liquid toward the outlet I. The socket h and the pipe i are connected by the intermediary of a pulsating device J, constituted by two sheets of india-rubber or rubbered fabric, connected at their edges.

A regulator K of any suitable kind regulates the pressure in the apparatus by acting upon the valve k for the admission of the liquid to be sterilized. The apparatus may be placed in communication with the exterior by means of an opening k' . At the upper part of the envelop A is arranged a valve L, adapted to be operated by hand for the discharge of the gases which may be formed at the upper part of the apparatus.

Operation: Assuming, Fig. 1, that the valve B is open and that the liquid to be sterilized fills the free space of the interior of the envelop A, which thus forms the descending column, also that the boiler C and the recuperator G are likewise filled with this same liquid and form the ascending column, under these conditions the two columns of liquid are in equilibrium and the walls of the pulsation device J are applied one against the other by the external pressure, and there will be no discharge at the outlet I—that is to say, the apparatus will occupy the inoperative position. The apparatus being in this condition, the furnace D is kindled. The liquid in the chamber c^2 becomes heated, liberating bubbles of vapor, which rise and accumulate in the suction device E, the helicoidal groove c' serving to prevent the bubbles from passing toward the descending column. When the liquid boils, the accumulation of the bubbles of steam in the suction device E forms a vacuum which destroys the equilibrium in the ascending column. The two columns tending to resume their stable condition, a circulation is produced which will be continuous so long as ebullition takes place in the chamber c^2 , the presence of the steam-bubbles in the suction device E forming the suction of the descending column. The liquid of the descending column circulates through

the tubular assemblage of the recuperator G, where it begins to become heated, then reaches the wings *e* of the suction device E, which retard its descent in such a manner that the hottest portion of the liquid is at the bottom of the apparatus, finally reaching the boiler C, around which it circulates, following the groove *c'* until it reaches the ebullition-chamber *c*². The sterilized liquid rises in the recuperator G enveloped by the liquid of the descending column, where it yields up a large portion of its heat, then passes through the pulsation device J, which it inflates, and reaches the outlet I. The ebullition temperature necessary for the sterilization of the liquid treated is determined by the pressure of the descending column. This pressure is itself determined by the aperture of the valve *k*, controlled by the pressure-regulator K, which is adjusted for this purpose. If for any reason the pressure should become greater than that determined upon, the pressure-regulator *k* would uncover the aperture *k'*, which would result in placing the apparatus in communication with the exterior.

In the modification of the apparatus represented in Figs. 2 to 5 the boiler C is constituted by a sheet of corrugated metal *c*, forming the annular compartments *c'* *c'*. This plate is fixed by its circular edge between two flanges of the envelop A and is thus supported somewhat above the bottom of the envelop, so as to form with it a chamber *c*², constituting the "boiler," properly so called. This chamber supplies itself automatically through the pipe *c*³ when the level of the liquid falls. In the annular compartments *c'* *c'* are arranged cylindrical vertical baffles *c*⁴ and *c*⁵, connected with a part *c*⁶, arranged at the base of the suction device E. This suction device is still constituted by a tube E, provided externally with washers or wings *e* and opening into the base of the recuperator G. This recuperator G is formed by a series of lenticular boxes *g*, united one above the other and comprising in the inner median portion a partition *g'*, forming a baffle. The upper part of the recuperator G opens into a chamber H, surmounted by a metallic pulsating device J. The chamber H comprises a transverse passage *h*, connected by a socket *h'* to a pipe I, conducting the liquid to be sterilized outside the apparatus. The passage *h* may communicate with the chamber H by the intermediary of an orifice *h*². The upper part of the chamber H is closed by the base of the metallic pulsating device J. This latter is formed by a manometric wall *j*. A pin-valve K, fixed at its upper extremity to the manometric walls, obturates with its base the orifice *h*² of the passage *h*. This pin-valve is adjusted, by means of a nut *k*, in such a manner that when the pressure is the same inside and outside the apparatus the pin-valve K obturates the orifice

*h*² and that when there is a slight excess pressure internally the valve more or less frees this orifice. It will be noticed that the pressure-regulator is a member which may be quite independent of the apparatus, and therefore it is not represented in the drawings. When the sterilization temperature which it is desired to attain is not very high and equals only a pressure of two to five meters of water, a reservoir may generally be readily installed at any desired height, with a float-cock regulating the supply in such a manner as to insure a practically constant level. The operation of this constructional form of apparatus is as follows: The liquid coming from the pressure-regulator or from a constant-level reservoir enters the apparatus through the socket B, fills the envelop A, and thus forms the descending column. Then the boiler C, the recuperator G, the chamber H, and the metallic pulsating device J are also filled with the same liquid and form the ascending column. Under these conditions the two columns of liquid are in equilibrium, the pin-valve K is applied to the discharge-aperture *h*² by the external pressure, and there is no discharge from the outlet I. This is the condition of repose of the apparatus. The apparatus being under these conditions, if a fire be kindled beneath the chamber *c*² of the boiler bubbles of steam are formed which accumulate in the suction device E and which will cause the suction of the descending column, thus producing excess pressure in the ascending column, this excess pressure acting upon the manometric wall, which will lift the pin-valve K to a greater or less extent, so that it permits of the discharge of the sterilized liquid through the outlet I. The liquid of the descending column circulates around the lenticular boxes *g* of the recuperator G, where it begins to become heated, then passes the wings *e*, which retard its descent, reaches the boiler C, first of all descending through the annular chamber *c'*, passing beneath the circular baffle *c*⁴, rising in this chamber, and then overflowing into the central chamber *c'*, where it is again caused to descend, passing under the baffle *c*⁵, and finally rising to the suction device E. Owing to this circulation, the liquid deposits at the bottom of the annular chambers *c'* *c'* the greater part of the incrustation in suspension before reaching the suction appliance E. The sterilized liquid rises in the recuperator G, following the path indicated by the arrows *x* and yielding up there the greater part of its heat. It then passes into the chamber H, then to the pulsation device, upon which it acts. The valve K rises and uncovers the orifice *h*², from which the sterilized liquid issues. The apparatus being thus regulated by the metallic pulsation device, it will be understood that if a leakage should occur without internal excess pressure this leakage would cause a loss of pres-

sure which would tend to close the outlet-aperture h^2 .

It will be noted that in the two constructional forms described above the principle of the operation is absolutely the same; that consequently the detail arrangements may vary while still remaining within the limits of the principle of operation.

I claim as my invention—

10 1. Apparatus for sterilizing liquids under heat, comprising an envelop, an ascending pipe therein, a boiler at the bottom of said envelop, and a pulsating device communicating with said ascending pipe for regulating the
15 discharge of the sterilized liquid.

2. Apparatus for sterilizing liquids under heat, comprising an envelop having a trough, an ascending pipe in said envelop, and a boiler at the bottom of said envelop, the ascending pipe having baffles descending into
20 the trough in the envelop to form a seal for the steam.

3. Apparatus for sterilizing liquids under pressure by heat, comprising an envelop,
25 means to introduce the liquid to be sterilized, a boiler at the bottom part of the envelop, a bell having several vertical concentric baffles, corresponding compartments on the bottom of said boiler to receive said baffles, an ascending tube communicating with the center
30 of said bell, and an outlet-valve for the sterilized liquid.

4. Apparatus for sterilizing liquids under heat, comprising an envelop, an ascending
35 pipe, a boiler with a passage connecting said envelop and the ascending pipe, in combina-

tion with wings on the outside of the ascending pipe for retarding the descending liquid.

5. Apparatus for sterilizing liquids under heat, comprising an envelop, an ascending
40 pipe, a boiler and a passage connecting said envelop and ascending pipe in said boiler, in combination with an outlet-chamber having a valve-seat and an elastic chamber carrying
45 a valve adapted to seat therein, said elastic chamber being in the upper part of the ascending pipe.

6. Apparatus for sterilizing liquids under pressure, comprising an envelop, a boiler therein, an ascending pipe therefrom, means
50 for directing steam from the boiler to the pipe, means for obstructing the circulation within the envelop, a passage of enlarged area above the ascending pipe and a valve to its outlet
55 adapted to be operated by pressure within the pipe.

7. Apparatus for sterilizing liquids under pressure, comprising an envelop, a boiler, and a trough above the bottom of the boiler, an ascending pipe having depending plates in
60 said trough, wings on the outside of the pipe, an enlarged passage for the liquid above the pipe, and a valve controlled by pressure within the boxes to the outlet therefrom.

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

CHARLES FRÉDÉRIC VICTOR MOREL.

Witnesses:

LÉON CRANEKIND,
HANSON C. COXE.