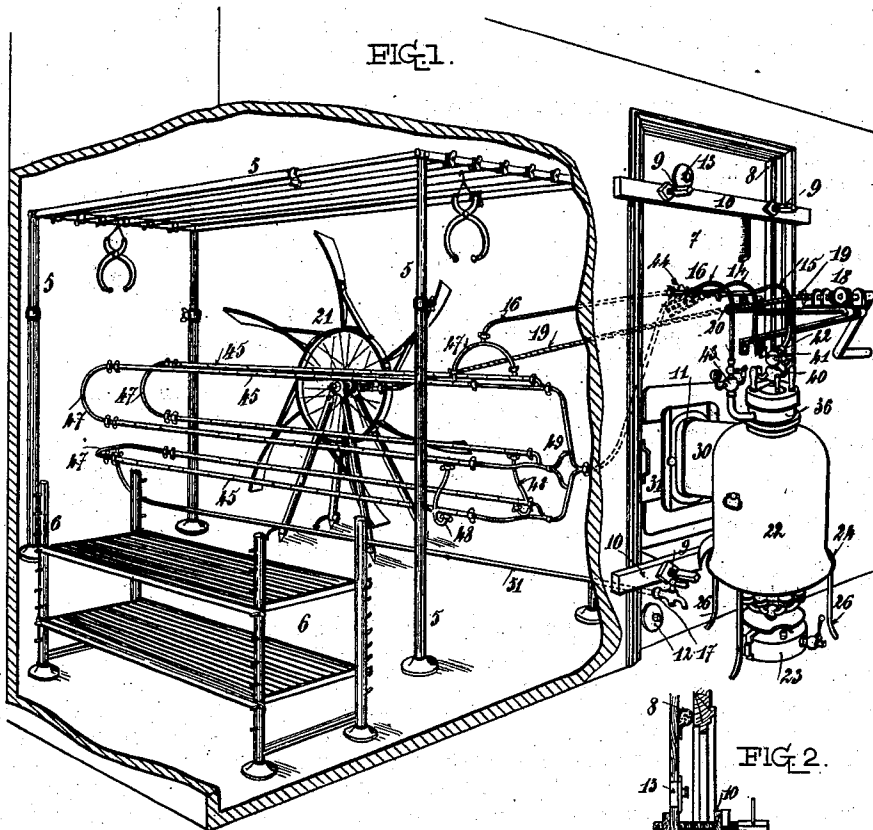
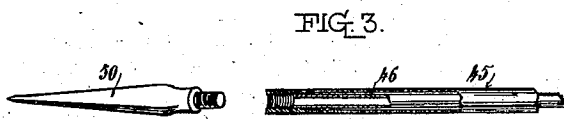
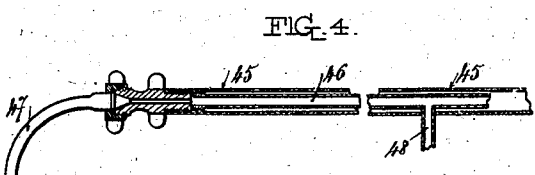
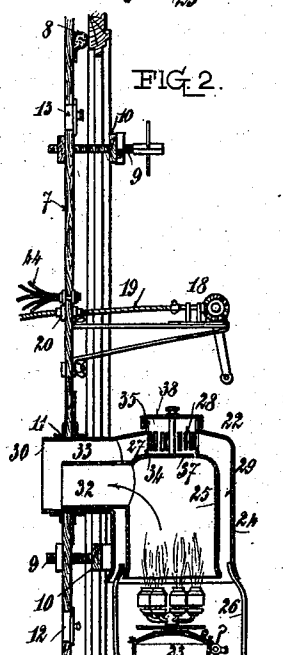


No. 728,221.

PATENTED MAY 19, 1903.

E. FOURNIER.
DISINFECTING APPARATUS.
APPLICATION FILED AUG. 9, 1900.

NO MODEL.



Witnesses
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UNITED STATES PATENT OFFICE.

EUGÈNE FOURNIER, OF PARIS, FRANCE.

DISINFECTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 728,221, dated May 19, 1903.

Application filed August 9, 1900. Serial No. 26,402. (No model.)

To all whom it may concern:

Be it known that I, EUGÈNE FOURNIER, a citizen of the French Republic, residing at Paris, France, have invented certain new and useful Improvements in Disinfecting Apparatus, (for which I have made application for Letters Patent in France, No. 297,574, dated February 24, 1900,) of which the following is a specification.

The present invention relates to an improved apparatus for practically and rapidly carrying out disinfection by the vapors of suitable disinfectants.

Up to the present time, and especially in the case of municipal service, for disinfecting purposes and disinfection at private residences a process is in use by which the operations can be carried out rapidly by contact with disinfecting-vapors in from four to six hours, but the demand has not gone so far as to require the disinfection of bedding in one and the same operation, the stoves constructed for this purpose not being suitable for carrying out this supplementary work except by way of a separate operation. Now the improved means forming the object of the present application are of such a nature that it is not only possible to disinfect any locality or chamber in six hours, or even in two to four hours, but also, and this is a very important point, to disinfect bedding, clothing, and other articles directly in the same place and during the same operation without having to employ special stoves constructed and employed for that special purpose. Numerous experiments undertaken in this direction have shown that the penetrating power of any vapor suitable for disinfecting purposes is in direct proportion to the temperature of the surroundings, and that therefore it is of the greatest importance that the temperature of the chamber to be disinfected should be raised to a minimum of from 30° to 40° centigrade. Now it has been observed, however, that as the heat rises it is absolutely necessary that the whole chamber should be evenly and regularly heated, to do which and to obtain an even distribution of this heat it is necessary that the air next to the floor should be also brought and maintained at the above-indicated temperature. These essential conditions of the process hav-

ing thus been stated it now remains to describe the means desired with a view of practically realizing the object of the invention. 55

The preferred means and arrangement of plant employed, as indicated by experience, will be described hereinunder, with reference to the accompanying drawings, in which—

Figure 1 is a perspective view, partly in section, of a complete installation as applied to the disinfection of a chamber, together with various articles—such as bedding, clothing, and the like—which such chamber may contain. Fig. 2 is a detail sectional elevation 65 of the heating apparatus, the removable door serving to close the chamber, and the various accessory devices for the injection of vapors and the agitation of the air; while Figs. 3 and 4 are detail views showing in longitudinal sections the injector-tubes serving for the disinfection of linen, clothing, bedding, and other articles which can be suspended in the chamber. 70

If such articles as bedding and the like and smaller objects are to be disinfected in the said chamber at the same time as the chamber itself, these articles are arranged so as to insure the best conditions under which the heated air surrounding them can efficiently act and the disinfectant vapors employed can penetrate them. Fig. 1 represents a suitable way of arranging such articles. A framework 5, which can be closed up, folded, or taken to pieces and capable of being extended in either height, length, or width, serves for the suspension of such articles as mattresses, linen, articles of clothing, and the like, while suitably arranged and adjustable shelves 6 are provided for objects of less size—such as boots, head-gear, books, and the like. The door of the room is either taken away bodily or completely swung back in the direction in which it opens, so as to allow, as represented in Fig. 1, the fixing of a removable door 7, fitting in the place of the ordinary door and provided with a strong frame or packing 8, which fits against the inner part of the ordinary door-frame, the tight fitting between the said door and the door-frame being secured by means of cross-bars 10 and clamping-screws 9, as represented in Figs. 1 and 2, so arranged as to effect a hermetic closing of the chamber in which the opera- 100

tion is to take place. Obviously, the manner of closing up the ordinary door-opening may vary according to circumstances and the shape and kind of doorway or opening to be closed.

The door 7 is provided with an opening 11, intended to receive the principal tube of a heating apparatus of special construction to be described hereinafter, two other openings, a lower one 12 and an upper one 13, serving for the rapid and complete expulsion of all vapors and humidity at the end of the disinfecting operation, so as to allow the room to be used immediately after such ventilation. A passage for a thermometer is also made in the door and two passages for pipes 14 and 15, through which the vapors of the disinfectants enter the chamber. Another passage for a pipe 16 is made, through which pass the vapors for heating the pipes which contain and inject the disinfecting-vapors into the articles of bedding or the like, so as to prevent any condensation of the said disinfecting-vapors. The door 7 may also be provided with a glazed inspection-window, which when combined with suitable means of lighting up the interior allows the interior of the room to be watched during the operation. Finally, the door 7 is provided with a connection and tap 17 for the purpose of removing any condensed vapors from the heated air which is admitted through pipe 16, together with mechanism 18 for transmitting a rotatory movement by means of a flexible cord 19, passing through the door 7 at a point 20 for the purpose of actuating a fan device 21 for agitating the air in the interior of the chamber.

The heating apparatus 22 consists, in proportion to the size of the chamber to be disinfected, of a petroleum-lamp 23, with four, eight, twelve, or other number of burners, with forced draft. The apparatus consists of a jacket 24, of sheet metal, supported, at a suitable height from the ground, on a tripod 26, permitting a free circulation of the air and the arrangement of the heating-lamp 23 under the devices below the center of the bell 24. This jacket 24 is combined with another casing or bell 25 inside it, the two bells thus forming a double casing connected by a central neck-piece 27 at the top, forming a crown with orifices 28, allowing the hot air freely to circulate in the manner to be described hereunder. An oblong sleeve 30, fitted to the outer casing or bell 24 of the heating apparatus 22, closely fits into the orifice 11 of the door 7, which orifice is combined with a closing register 31. The sleeve 30, which projects into the interior of the room by a connection about fifty centimeters long, forms a communication between the annular space 29 between the two bells 24 and 25 and the interior of the room to be disinfected, the latter also communicating with the interior of the bell 25, which is directly exposed to the heating effects, by another tube-pipe 32, fitted to said bell and resting upon the bottom por-

tion of tube 30, so as to leave between it and the said tube 32 a large upper space 33, through which freely passes the air heated by radiation in the annular space 29 between the two bells. The bells 24 and 25 are at their upper parts provided with central openings 34 and 35, in which is placed, with a view of injecting disinfecting-vapors into the chamber, an apparatus 36, as represented in Fig. 1, in which apparatus the said vapors are generated. During the operation of preliminarily heating the interior of the chamber the apparatus 36 is replaced by a double lid 37 38, closing the said openings 34 35, as represented in Fig. 2.

The apparatus 36 is provided with two tubular connections, one of which, 40, supplies the disinfecting-vapors to two branch pipes 41 and 42, respectively, connected with the pipes 14 and 15, forming injector devices, while the other, 43, for the heating-vapors is connected with the pipe 16. The devices for injecting the disinfecting-vapors consists of a spray device 44 of several branches, arranged with a view of agitating the atmosphere in the chamber, and of tubes 45 for the distribution and injection of the disinfecting-vapors in articles of bedding or other articles suspended on the framework 5. The said tubes 45 (represented in detail in Figs. 3 and 4) are perforated, so as to allow the disinfecting-vapors to pass out freely, and contain within them unperforated tubes 46 for receiving and circulating the heated air from the pipe 16, which circulation is effected through the whole system, as represented in Fig. 1, by means of branch connections 47 and branch pipes 48, establishing a communication between one tubular element and another. The disinfecting-vapors pass from the pipe 14 through the principal set of connections 49 at the corresponding end of the tubular element 45, the other ends of which are connected by curved connections so arranged that the heated vapors can circulate through the whole set of tubular elements 45. When such tubular elements 45 are intended to pass through such articles as mattresses and the like, the curved connections 47 are removed and replaced by pointed spikes 50, by means of which the elements can easily penetrate through the articles, and are removed after completely passing through the mattress or the like and projecting on the opposite side and replaced by the curved connections 47, by means of which the circulation of hot vapors is reestablished and made effective, as described in the above. A pipe 51, connected with the set of pipes through which the heating-vapors circulate, terminates in a tap 17 outside the apparatus, through which any condensed vapors may be drawn off.

The apparatus 21 for agitating the air in the chamber forms a kind of fan with large wings arranged on a drum mounted on a support or tripod and rotated by means of a

flexible cord 19, actuated by a transmission mechanism 18 outside the chamber.

The operation for disinfecting is carried out in the following manner: While carrying out the closing operations in a room, where-
 5 by any communication with the outside through windows, chimneys, or other openings is hermetically closed, the chamber is preliminarily heated by placing the lamp 23
 10 successively in different corners or parts of the room, the door of which has been previously removed or turned back and replaced by the door 7. The closing of the door is effectively secured by means of a packing-
 15 frame 8, cross-bars 10, and clamps 9 after having withdrawn the lamp 23 and after having well sprinkled the floor with a mixture of one part acetone and two parts water. The
 20 apparatus 22 is then connected, as shown in Fig. 2, for the purpose of heating the interior of the chamber, and the flexible cord 19 of the fan 21 is, by means of the mechanism 18, actuated, thus similarly turning the fan 21. All the openings of the chamber having been
 25 carefully closed and the various articles to be disinfected suitably arranged in the interior—*i. e.*, either placed on the shelves 6 or suspended from the bars of the frame 5, according to their nature—the whole system is
 30 combined with the injecting devices previously described. The heating of the chamber now takes place. The hot air, produced directly in the bell 25, passes into the chamber through tube 32, while the heat result-
 35 ing by radiation from the said bell serves to heat the air circulating in the annular space 29 between the two bells 24 and 25, which air also enters the chamber through tube 30, the greatest part of the radiated
 40 heat of the apparatus 22 being thus utilized. During this operation of heating the fan 21 is kept working, thereby securing a uniform heating and even distribution of heat in all parts of the chamber. The desired degree of
 45 temperature being obtained, the double cover 37 38 is replaced by the vaporizing apparatus 36 for generating the disinfecting-vapors, as represented in Fig. 1, its pipes 41, 42, and 43 being connected with the pipes 14, 15, and 16,
 50 respectively, and serving for the transmission of the disinfecting-vapors and the heating-vapors, respectively. The heating is continued until the manometer of the apparatus indicates the pressure required, while at the
 55 same time the fan 21 is kept rotating. The required pressure having been obtained, a first injection of moist vapor is made of a mixture of water and acetone either through the injector-sprayer 44 or through the tubular
 60 system 45 or simultaneously by the two, according to the nature of the operation to be carried out. While the injection is proceeding through the tubular system 45, the circulation of heated vapors in the inner tubes
 65 46 of the latter is effected through the pipe 43 of the apparatus 36, and afterward the draw-off tap 17, communicating with the pipe

51, is opened from time to time for the purpose of withdrawing any condensation products which may have been effected in the
 70 tubes 46 of the tubular system 45. The injection having been completed, the heating is continued, while at the same time the fan 21 is kept revolving until after about an hour the injection of the mixture of acetone and
 75 water before mentioned takes place. This injection having been finished, the fan 21 is kept revolving for some minutes, after which the heating is stopped, the apparatus 22 withdrawn, together with its accessory parts, and
 80 the register 31 closed, so as to completely close the opening 11 of the door 7. After the interval of time considered sufficient for the condensation and penetration of the disinfecting-vapors—say about four hours—the
 85 apparatus 22 is replaced and the heating continued, this time, however, without ejecting the vapors, and the fan 21 kept revolving for about half an hour or an hour. The heating is then suspended for about an hour and a half,
 90 after which it is started again, making simultaneously with it at the second hour or the sixth after the injection of the before-mentioned mixture of acetone and water an injection of ammonia-vapor, while the fan 21 is kept ro-
 95 tating all the time. This last injection having terminated, the apparatus 22 is withdrawn, the register 31 hermetically closed, and after two to six or eight hours, according to the surface dimensions and the thick-
 100 ness of the porous and absorbent article, the chamber may be opened. If the chamber is required for immediate use, it should be energetically ventilated, heating it for about
 105 ten minutes before opening it. Such heating is accompanied by opening the orifices 12 and 13, through which the expulsion of every trace of vapor or dampness can be effected. To facilitate this action, the upper orifice 13 may be connected with a tube terminating
 110 outside the chamber.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The herein-described disinfecting apparatus comprising a heating device for the pro-
 115 duction of intense heat arranged outside the chamber to be disinfected and serving to raise to a suitable degree the temperature of the chamber by passing into it air heated directly
 120 and air heated by radiation, and for the heating of an apparatus for generating disinfecting-vapors; a fan for agitating and mixing the air, inside the chamber so as to obtain an even temperature throughout; a door adapted
 125 to close the chamber to be disinfected, said door being hermetically closed by means of a packing-frame 8 applied to the door-frame of the chamber and fixed to it by cross-bars and clamps, said door being provided with the necessary openings, connections, and
 130 tubes for the apparatus for heating, injecting and agitating the air, as well as for the reception of a thermometer and with inspection-holes and ventilation-orifices; and two

injectors, one a spray device consisting of a number of branches for effecting the distribution of the disinfecting-vapors in the chamber, while the other consists of a system of
5 perforated tubes inclosing non-perforated tubes for the circulation of heated air and terminating in a tube extending through the lower part of the door and a tap for the purpose of removing the products of condensa-
10 tion, substantially as described.

2. The combination with a compartment or chamber, of a heating apparatus, a system of piping within said chamber for conducting disinfecting-vapors, a fan within the
15 chamber, means outside the chamber for actuating said fan, and an injector comprising a number of branches constituting a spray device, all as and for the purpose specified.

3. In a device for the purpose described,
20 the combination with a chamber, of a heating

apparatus comprising two concentric shells or casings, a sleeve fitted to the outer of said casings, and extending into the said chamber, and forming communication between the
annular space between the casings and the
25 interior of said chamber, a smaller tube within said sleeve and communicating with the inner casing, the said casings having openings at the top, and a removable closure therefor, and a heater disposed beneath the bot-
30 tom of the inner casing, all substantially as shown and described.

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

EUGÈNE FOURNIER.

Witnesses:

LOUIS SULLIGER,
EDWARD P. MACLEAN.