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E. F. MATTESON
LABORATORY AUTOCLAVES

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2 Sheets-Sheet 1

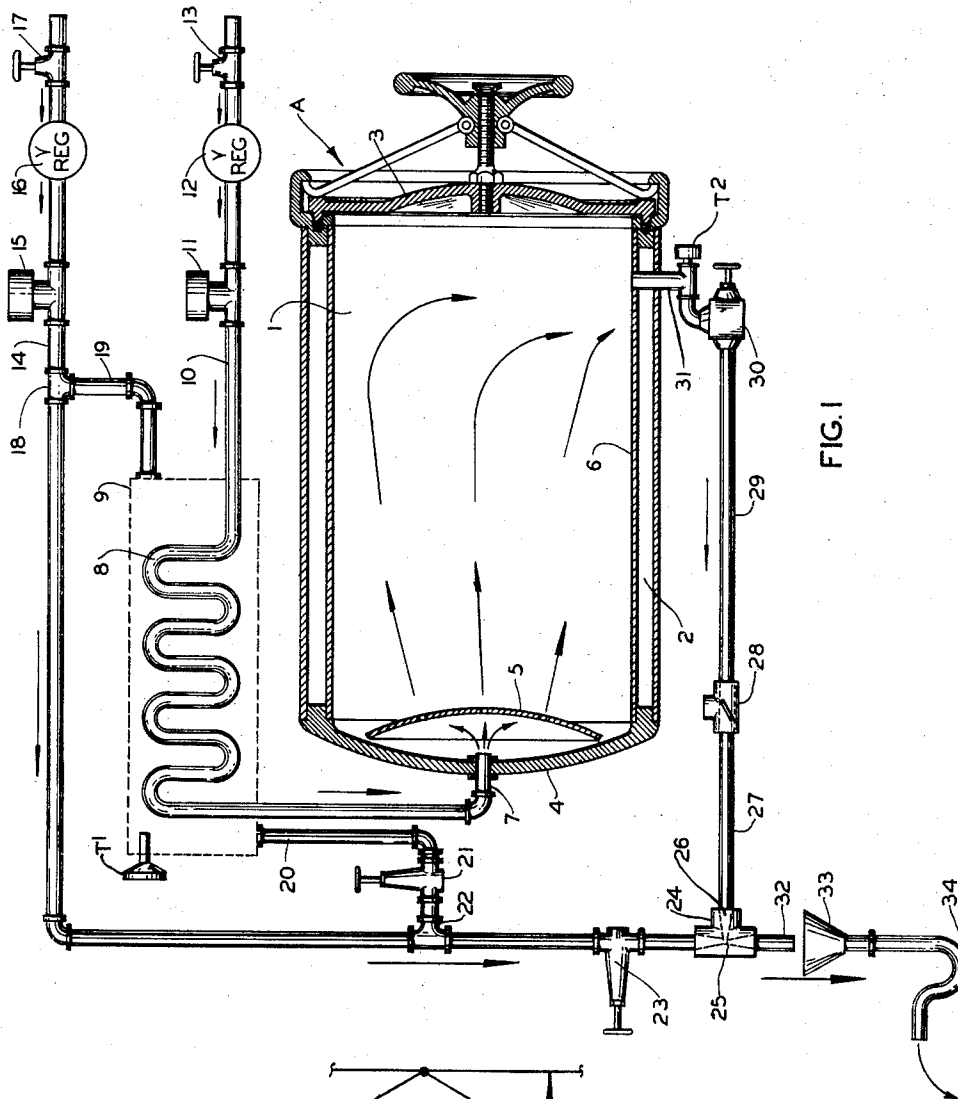


FIG. 1

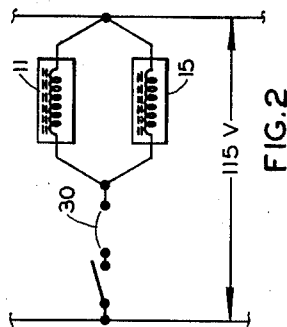


FIG. 2

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2 Sheets-Sheet 2

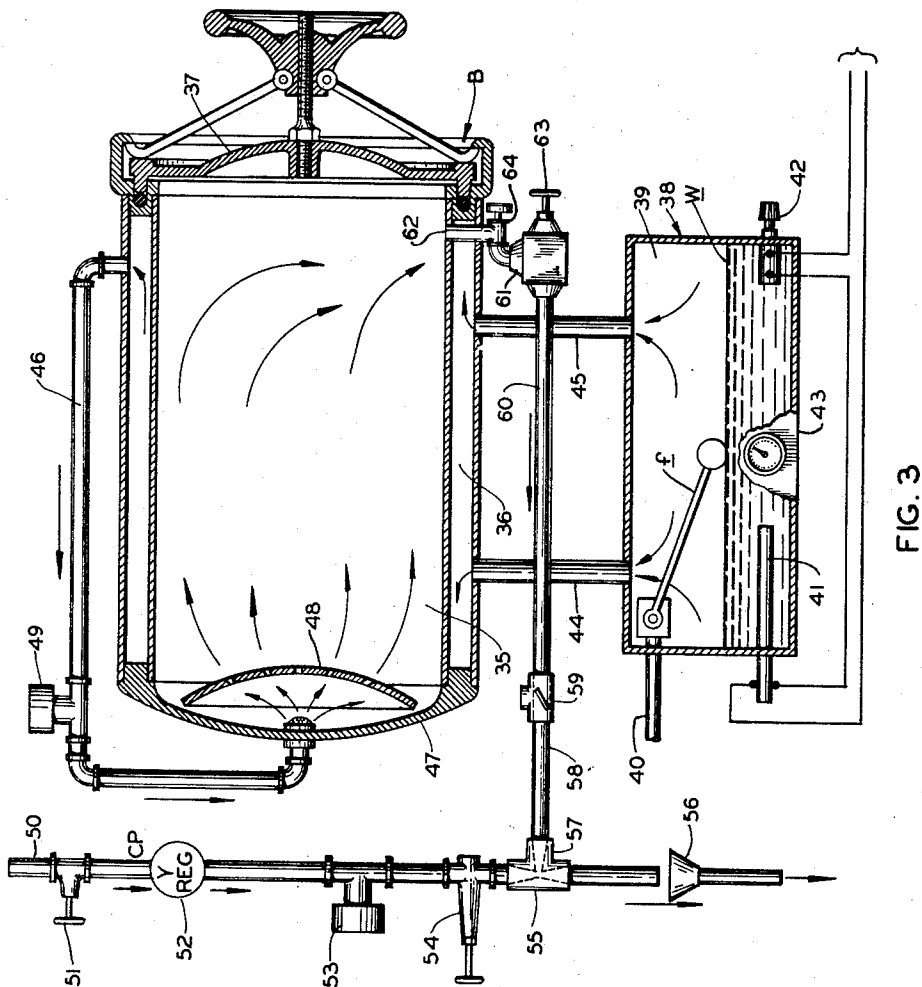


FIG. 3

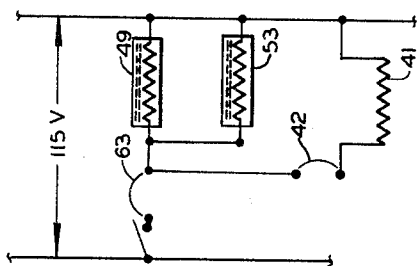


FIG. 4

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3 Claims. (Cl. 23—290)

This invention relates in general to laboratory auto-
claves and, more particularly, to devices which are capable
of carrying out inspissation.

In certain procedures in biological laboratories, hospi-
tals, and the like, it is necessary to pasteurize heat co-
agulable liquids, such as bacteriological slants, and heat-
sensitive alkaloids, proteins, vaccines and serums. These
operations are usually referred to as inspissation and
it is an essential requirement to maintain constant tem-
perature and humidity within a closed sterile chamber for
various periods of time and in temperature ranges which
are substantially below 212° F. Moreover, it is also es-
sential that a partial pressure system be maintained in
the chamber so that the steam, which is employed to main-
tain the desired temperature, will not condense and dilute
the liquid being processed nor create a condition within
the chamber such that the liquid being processed will
tend to evaporate and become concentrated. Finally, it
is necessary to create the desired temperature in the
chamber without stratification or striation of the atmos-
phere within the chamber.

It is, therefore, the primary object of the present in-
vention to provide an autoclave having a chamber in
which it is possible to maintain precisely controlled
humidity, temperature and pressure relationships at tem-
perature ranges substantially below 212° F.

It is another object of the present invention to provide
an autoclave or inspissatory sterilizer of the type above
defined which is highly efficient in the performance of
its stated functions and can be fabricated economically.

It is a further object of the present invention to pro-
vide an autoclave of the type stated which may optionally
be used as a conventional high-temperature sterilizer
whenever desired without any mechanical or electrical
modifications.

It is also an object of the present invention to provide
an autoclave of the type stated which makes very eco-
nomical use of water, steam and electrical power.

With the above and other objects in view, my inven-
tion resides in the novel features of form, construction,
arrangement and combination of parts presently described
and pointed out in the claims.

In the accompanying drawings (two sheets)—

FIG. 1 is a longitudinal sectional view of an autoclave
constructed in accordance with and embodying the pres-
ent invention, shown schematically the steam, water and
electrical connections employed;

FIG. 2 is a schematic wiring diagram of the control
circuit utilized in connection with the autoclave shown
in FIG. 1;

FIG. 3 is a longitudinal sectional view of a modified
form of autoclave constructed in accordance with and
embodying the present invention; and

FIG. 4 is a schematic wiring diagram of the control
circuit utilized in connection with the modified form of
autoclave shown in FIG. 3.

Referring now in more detail and by reference char-
acters to the drawings, which illustrate practical embodi-
ments of the present invention, A designates an autoclave
comprising a preferably cylindrical chamber 1 enclosed
within a jacket 2 and having its forward end closed by a
suitably hinged and gasketed door 3. Inasmuch as the
chamber 1, the jacket 2, and door 3 are conventional,
these elements are not described or shown in detail herein.

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Rigidly mounted in outwardly spaced relation to the
rear wall 4 of the chamber 1 is a baffle plate 5 which is
also marginally spaced around its periphery from the side
walls 6 of the chamber 1. Entering into the chamber 1,
preferably centrally of the back wall 4, is a steam-line 7,
which is connected to the outlet end of a condenser tube
8 disposed within a heat-exchange shell 9. The inlet end
of the condenser tube 8 is connected to a steam-line 10,
which is, in turn, connected through a solenoid valve 11,
a regulator valve 12, and a hand-operable shut-off valve
13 to a source of high temperature live steam (the latter
not being shown).

Also provided for use with the autoclave A is a water
line 14 connected through a solenoid valve 15, a regula-
tor valve 16, and a hand-operated shut-off valve 17 to a
source of water under pressure (the latter not being
shown). Conventionally set into the water line 14 is a
pipe T 18 which connects to a water-supply line 19,
running to the heat-exchange shell 9, the latter being con-
nected again to the remote side of the water line 14 by
a return line 20 which extends through a regulator valve
21 and pipe T 22. Beyond the T 22, the water line 14
runs through a regulator valve 23 and into a water-oper-
ated ejector or so-called aspirator 24 conventionally pro-
vided with an internal constriction 25 and side arm duct
26, which is, in turn, connected by means of a line 27
to a check valve 28, and thence through a line 29 to a
manually adjustable thermostat 30, the latter being con-
nected by a line 31 to the lower forward portion of the
chamber 1. The ejector or aspirator 24 discharges down-
wardly through a tube 32 into an "anti-siphoning" fitting
33 which is connected through a conventional trap 34 to
a sewer or waste-discharge line (the latter not being
shown). Conventionally mounted in the heat-exchange
shell 9 is a thermometer T¹ for the usual purpose of af-
fording temperature readings as the water in and flowing
through the heat-exchange shell 9. Similarly inserted in
the line 31 is a thermometer T² for affording a reading
of the temperature in the chamber 1. The manually ad-
justable thermostat 30 is electrically connected to the
solenoid valves 11, 15, and to a source of electrical power,
as shown in FIG. 3.

It will, of course, be understood that, although the
chamber 1 is shown and described herein as being cylin-
drical in shape, the present invention is not limited to any
particular shape so far as the chamber 1 is concerned.

In use, the steam and water are turned on by suitable
manipulation of the hand shut-off valves 13, 17, and the
autoclave allowed to come up to temperature. There-
upon, the door 3 is opened to permit placement of bac-
teriological material within the chamber 1. The door 3
is then closed and the valves 11 and 15 turned on. The
aspirator 24 produces a moderate amount of suction on
chamber 1. Meanwhile, the steam flows through the
condenser tube 8, warming the water to approximately
125° F. and, in turn, issuing forth from the condenser
tube 8 at a temperature of approximately 205° F. to
212° F., at which temperature it enters the chamber 1,
expands and is diffused by the baffle plate 5.

During operation, the thermostat 30 operates inter-
mittently, calling for water and steam simultaneously.
Depending upon the selected setting, it has been found
possible to maintain any desired temperature registered
on the thermometer T² in the range of 160° F. to 212° F.
within an accuracy of plus or minus 2° F. for whatever
length of time may be required. The constant flow of
water through the ejector 24 maintains the necessary de-
gree of suction upon the chamber 1 so as to create the
necessary partial-pressure condition therein. In order to
maintain any selected temperature and partial-pressure
relationship within the chamber 1 in the aforementioned
range of from 160° F. to 212° F., it is only necessary to

adjust the thermostat switch 30, which, in turn, energizes and de-energizes the steam and water supply valves and controls their cyclic operation as demanded by the sensing element of the thermostat. The constant suction from the ejector 24 also creates circulation within the chamber 1 and stratification of steam is prevented. It will be noted that the thermostat 30 is merely in heat-exchange relationship to the flow between lines 31 and 29 so as to sense the outflow temperature at the discharge line 31 and thereby relates temperature control to partial-pressure.

For installation where a source of live steam is not conveniently available, it is possible to provide a modified form of autoclave B, as shown in FIG. 3, comprising a chamber 35 having a jacket 36 and a door 37 similar in all respects to the comparable elements of the autoclave A. Structurally supported in any suitable manner beneath the chamber 35 and jacket 36 is a steam generator 38 including a chamber 39 having a water supply line 40 controlled by a conventional float valve *f* so as to provide a body of water *w* within the chamber 39. Also mounted in the chamber 39 so as to be immersed in the body of water *w* is an electric heating element 41 which is of conventional type and is connected by electric wires in series with a thermostat 42 to a suitable source of electrical power (not shown). The chamber 39 is also provided with a conventional thermometer 43 to afford a visual reading as to the water temperature within the chamber 39.

Extending vertically up from the top of the chamber 39 is a pair of steam ducts 44, 45, opening into the jacket 36, and the latter is, in turn, connected from a point forwardly near the door 37 and at its top by a steam transfer line 46 to the center of the rear wall 47 of the chamber 39 so that steam will enter the chamber 39 and be diffused by a baffle-plate 48, which is rigidly mounted across the back portion of the chamber 39 and functions in the same manner as the previously described baffle-plate 5. Interposed in the steam transfer line 46 is a solenoid valve 49 which serves the same function as the previously described solenoid valve 11.

Provided for co-operation with the autoclave B in a water line 50 which passes through a hand shut-off valve 51, a pressure regulator 52, a solenoid valve 53, a regulator valve 54, to an ejector or aspirator 55, and thence discharges into an "anti-siphoning" waste connection 56. The ejector has a side arm 57 which is connected by a suction line 58 to a check valve 59 and the latter is, in turn, connected by a suction line 60 to a fitting 61 having a side-tube connection 62 which communicates to the interior of the chamber 39 at the forward lower end thereof and is provided with a thermometer 64. Mounted in the fitting 61 is a manually adjustable thermostat 63, the latter being electrically connected to the solenoid valves 49, 53, as shown. The foregoing elements are substantially identical in structure and function to the comparable elements previously described in connection with the autoclave A.

When in use, steam is generated in chamber 39, and maintained at a temperature of approximately 205° F. by action of the thermostat 42 energizing or de-energizing heat supply to the generator, and passes up through, and around, the jacket 36. Thence it flows through the steam transfer line 46 under control of the solenoid valve 49 and thermostat 63 to the interior of the chamber 39. As was described in connection with the autoclave A, the thermostat 63 will simultaneously call for water and steam intermittently and thereby maintain the same closely con-

trolled conditions within the chamber 39 of the autoclave B as is true of the previously described autoclave A.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the laboratory autoclaves may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. An autoclave comprising a chamber charged with steam having a temperature below the temperature corresponding to atmospheric pressure on the steam-table, a steam condensate discharge line connected to said chamber, a jet aspirator connected to said steam condensate discharge line for imposing suction upon the chamber and to maintain the chamber at a pressure less than atmospheric pressure, a steam line discharging into the chamber, a baffle directing the steam so as to produce uniform circulation throughout the chamber, a water line connected to said jet aspirator, a condenser for conditioning the steam prior to entry into the chamber, said water line also being connected to said condenser, a thermostat responsive to the chamber temperature, solenoid valves interposed in said steam line and water line and being operatively connected to said thermostat for regulating the amount of flow in each of said steam and water lines, and an on-off valve in the steam line controlled by the thermostat.

2. An autoclave comprising a chamber, a steam line connecting said chamber with a source of steam, condenser means in heat exchange relationship with said steam line, a water line for delivering water to said condenser to reduce the temperature of said steam below 212° F., diffuser means in said chamber for spraying the steam mixture therein, a jet aspirator connected to said water line and to said chamber to reduce the pressure within said chamber below atmospheric pressure to prevent condensation of steam therein at a predetermined temperature below 212° F., a thermostat responsive to the chamber temperature, and valves in the steam line and the water line controlled by the thermostat.

3. An autoclave comprising a chamber adapted to be charged with steam having a temperature below the temperature corresponding to atmospheric pressure on the steam table, a steam line adapted to connect said chamber with a source of steam, a condenser located externally of said chamber and in heat exchange relationship with said steam line for reducing the temperature of steam below 212° F. prior to entry into the chamber, a baffle in said chamber for directing the steam therein, a water line connecting said condenser with a source of water, a jet aspirator connected to said water line and operated by the water flowing therethrough, means connecting said jet aspirator to said chamber at a position remote from said baffle, said jet aspirator imposing a suction on said chamber sufficient to create a vacuum within said chamber, a thermostat responsive to the chamber temperature solenoid valves interposed in said steam line and said water line and being operatively connected to said thermostat for regulating the amount of flow in each of said steam line and water line, and an off-on valve in the steam line controlled by the thermostat.

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