

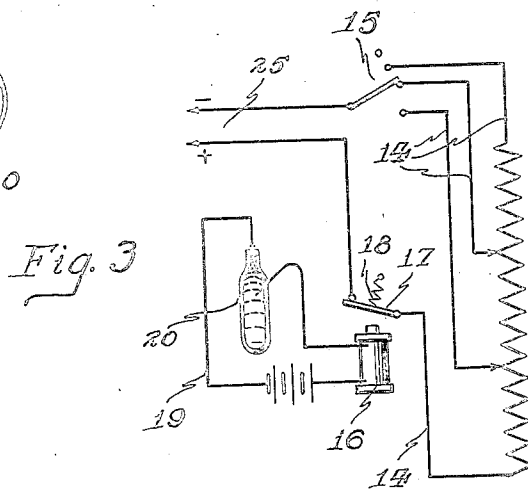
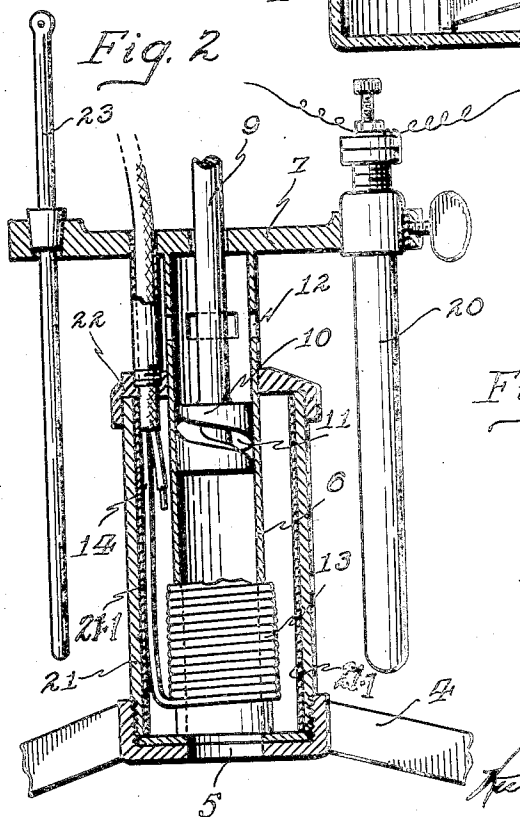
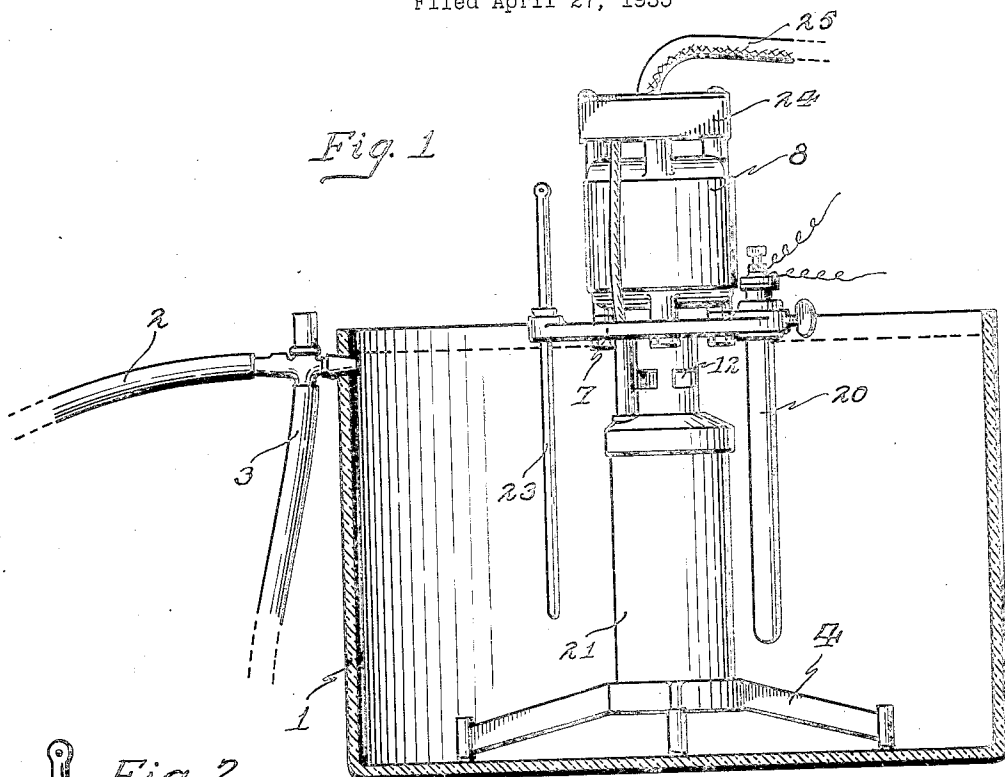
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HEATER AND CIRCULATOR FOR THERMOSTATIC BATHS

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HEATER AND CIRCULATOR FOR
THERMOSTATIC BATHS

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4 Claims. (Cl. 219—39)

This invention relates to thermal baths such as are used by biologists, chemists and physicists for maintaining objects immersed in the liquid at some definite temperature.

5 The objects of the invention are to provide a heater and circulator of unitary self-supporting form suitable for use in an open vessel without having brackets or the like extending to the walls of the vessel or to outside supports; and
10 to provide improvements in the construction and arrangement of a turbine circulator and heater for efficiently controlling the temperature of the bath.

15 A specific embodiment of the invention is illustrated in the drawing, wherein:

Figure 1 shows the operating unit in side elevation in combination with a thermal bath receptacle which is shown in section.

20 Fig. 2 is an enlarged vertical sectional detail of the heater and circulator.

Fig. 3 is a diagram showing electric circuit connections for the heating coil.

25 The heating and circulating unit is made so that it will stand in operating position on the floor of a receptacle and unattached to the side walls thereof, and comprises a supporting frame structure having mounted therein a central penstock tube through which the bath liquid circulates upwardly under the action of an impeller
30 fitted within the tube.

At the top of the tube is a head structure serving as a support for the motor, a thermometer, and a thermostat for regulating the delivery of heat to the bath liquid. The heat is applied from
35 a coil wound upon the tube and surrounded by a spaced and insulated cylindrical housing which separates it from the bath liquid and assures that the heating effect is concentrated upon the liquid within the tube. The function of the thermostat is to control heat delivery by the coil.

40 The drawing shows a bath receptacle 1 having inlet and overflow connections 2 and 3 for the circulating medium, usually water, and which serves to maintain at some fixed point the temperature of an object immersed in the bath.

45 The circulating and heating unit comprises a supporting base 4 having a central opening 5 in line with a tube 6 extending upwardly from the base and terminating at its upper end in a motor support or head 7. Motor 8 is bolted to the support 7 and the shaft 9 of the motor carries a rotor 10 fitting the bore of tube 6. The rotor 10 has a spiral channel 11 in its cylindrical surface and through which the bath liquid is driven up-
50 wardly when the motor is in operation. The

openings 12 at the upper end of the tube 6 provide uniformly spaced radial outlets for the bath liquid.

The liquid is heated as it passes upwardly through the tube by means of a heating coil 13
5 which consists of suitable resistance wire wound upon the tube and having a plurality of connections 14, Fig. 3, with a rheostat 15 whereby more or less of the coil is rendered effective for heating purposes when a thermostatically oper-
10 ated relay 16 permits the closing of contacts 17. Those contacts are normally held closed as by a spring 18 except when the relay is energized through the closing of a local circuit 19
15 by a mercury contactor represented by the bulb 20, and described in detail in our copending application for patent, Serial No. 13,698, filed April 27, 1935 on Thermo-regulators. This contactor is carried by a bracket on the head 7.

The coil 13 is housed within the cylindrical
20 casing 21 which separates it from the bath liquid and has a cap 22 at its upper end extending therefrom to the tube 6.

A thermometer for ascertaining the temperature of the bath liquid is indicated at 23 and is
25 supported by a bracket on the frame structure 7.

The electrical connections to the motor heater and regulator are housed in an outlet box 24 mounted on top of the motor and connected to
30 a source of current and other control devices not shown in Fig. 1 by the cable 25. For simplicity of illustration, the relay is shown as actuated by current from a battery although in actual practice we use a more complicated relay circuit for ob-
35 taining the desired minute relay current from the line circuit to the motor as described in our copending application Serial No. 20,058, filed May 6, 1935.

40 In operation of the heating and circulating unit the motor is in constant operation and the heat is supplied at a rate to exactly compensate for losses to the atmosphere and surrounding objects. The rate of the heat delivery by the coil is roughly regulated by the setting of multistage switch 15, and the temperature of the bath is
45 then automatically controlled by the intermittent operation of circuit opener 16 under control of the temperature responsive element 20.

The temperature responsive element may be set to close the local circuit 19 at some precise tem-
50 perature to a fraction of a degree. Thus heat is supplied as needed but the temperature of the bath water cannot exceed the temperature pre-determined by the setting of the thermostatic regulator 20. This closing of the regulator circuit
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actuates the relay to open the normally closed heater circuit and the constant circulation of the bath maintains a constant temperature over the period of operation.

- 5 Although but one specific embodiment of this invention is herein shown and described, it is to be understood that details as set forth may be altered or omitted without departing from the spirit of the invention as defined by the following claims.

10 We claim:

1. A thermal bath comprising a reservoir for a bath of liquid heating medium, a vertically disposed tube within said reservoir having inlet and outlet openings respectively located adjacent the bottom and top of said reservoir, an impeller within said tube for driving the heating medium through said tube, an electric heating coil surrounding said tube, and a heat insulating jacket housing said coil and positioned to prevent direct heating of the bath outside the penstock.

2. In a thermal bath, a heating and circulating unit comprising a vertical penstock tube having openings at the bottom and top thereof for circulating the contents of said bath, an impeller in said tube having an upwardly extending shaft, a motor carried on said tube for driving said shaft, an electric heating element surrounding said penstock tube, a jacket cooperating with said tube

to house said heating element, and a base frame carrying said unit.

3. A heating and circulating unit of the class described comprising a supporting base having concentric upwardly extending tubes the inner tube being longer than the outer tube, and having radial outlet perforations above the outer tube, a cap for the outer tube closing the space between both tubes, a heating coil between the tubes, a motor supported on the upper end of the inner tube and having a shaft extending therein and carrying an impeller for circulating a bath liquid through said inner tube.

4. A heating and circulating unit of the class described comprising a supporting base having concentric upwardly extending tubes the inner tube being longer than the outer tube, and having radial outlet perforations above the outer tube, a cap for the outer tube closing the space between both tubes, a heating coil between the tubes, a motor supported on the upper end of the inner tube and having a shaft extending therein and carrying an impeller for circulating a bath liquid through said inner tube, a bracket carried by said inner tube and having means for holding a thermo-regulator in said bath at one side of said unit.

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