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J. H. SWAN.

TEMPERATURE CONTROLLING APPARATUS.

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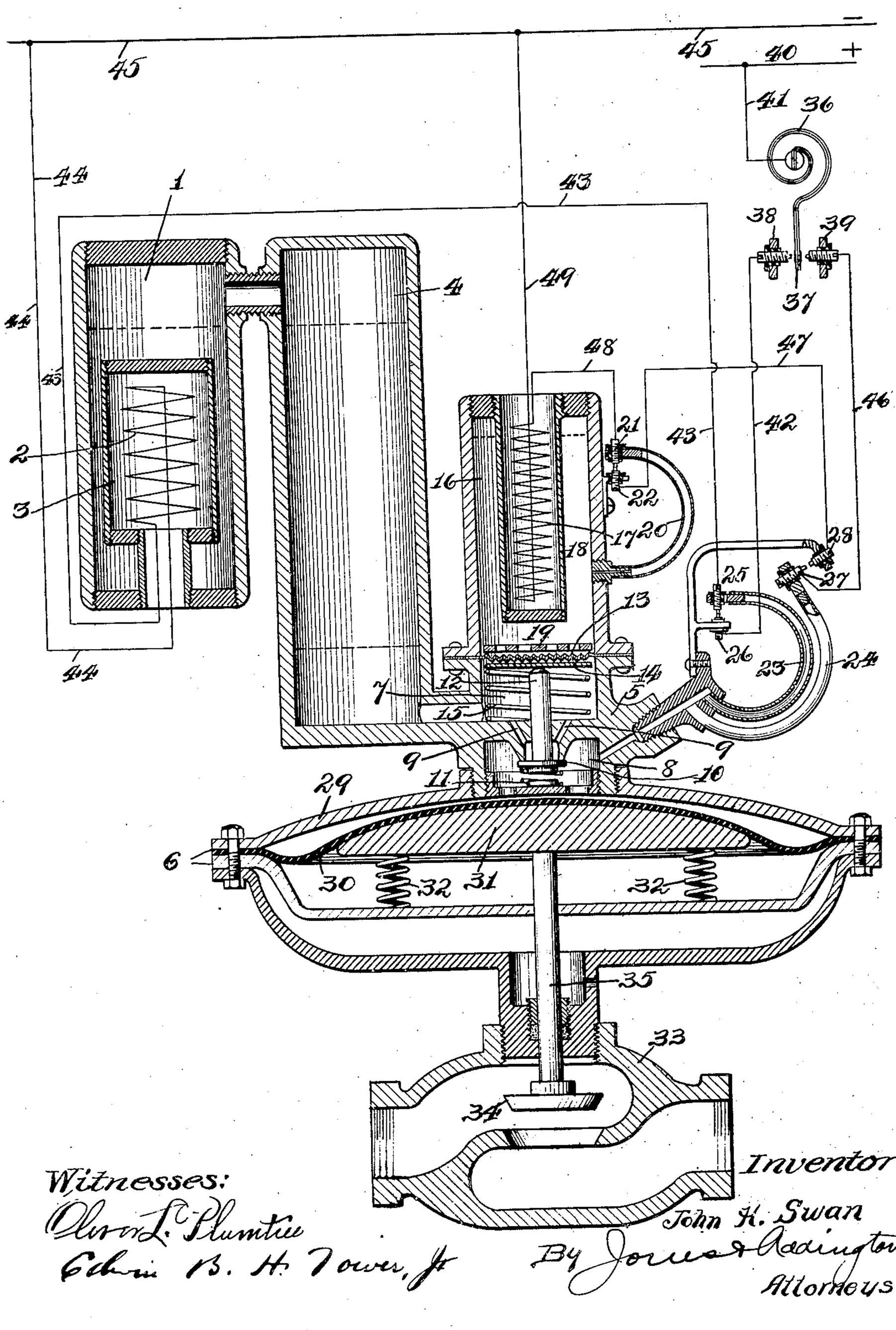

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UNITED STATES PATENT OFFICE.

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TEMPERATURE-CONTROLLING APPARATUS.

No. 829,810. Specification of Letters Patent. Patented Aug. 28, 1906.

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To all whom it may concern:

Be it known that I, JOHN H. SWAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Temperature-Controlling Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to improvements in apparatus for controlling temperature.

The apparatus of this character which is now in existence usually contains a fluid-pressure mechanism or motor which operates suitable means for regulating the heat admitted to the room where the temperature is to be controlled, the pressure for operating said motor being supplied from a storage tank or reservoir into which air or other fluid is compressed by a pump or compressor. Much attention must be given to such apparatus, so as to maintain sufficient pressure in the tank to operate the motor, and often there is great difficulty and expense in installing the pipes for conveying the pressure from the tank to the motor. Moreover, where the motor has the pressure which is admitted thereto regulated by a thermostatic valve the operation of the apparatus is frequently imperfect, due to dust and dirt which lodges in the valve and affects its sensitive action.

Among the objects of the present invention is to provide improved means for supplying pressure to the motor which will not require the labor and attention incident to employing a pump or compressor and tank for this purpose.

Another object of the invention is to provide an improved electrically-controlled apparatus for controlling temperature which may be easily installed at a comparatively small expense.

A still further object of the invention is to provide an apparatus of such size that it may be entirely arranged in the room where the temperature is to be controlled.

Although these objects of the invention have been mentioned, it is to be understood that many features of the invention may be employed in various ways.

There are various other objects of my invention which will be apparent from the accompanying drawing, in which is represented a sectional view of one form of my improved apparatus and a diagram of the circuits therefor.

The apparatus shown in the drawing contains a main generator or heating-chamber 1, which may be heated in any suitable way, an electric heating-coil 2, preferably arranged within a suitable sheath 3, being illustrated for this purpose. The upper part of the generator may be connected to the upper part of a reservoir 4, said reservoir preferably being connected through a check-valve 5 to a suitable fluid-pressure mechanism or motor 6. This valve preferably has an upper chamber 7 and a lower chamber 8, said upper chamber 7 being connected to the lower part of the reservoir 4 and the lower chamber 8 being connected to the motor. Between the two chambers of the valve extend ports 9, which are normally closed by a valve-gate 10, pressed upon its seat by a spring 11 and preferably having a stem 12, which extends upwardly into the upper chamber 7. At the top of the upper chamber of the valve is a diaphragm 13, which is preferably provided upon its lower face with a plate 14, adapted to bear against the stem of the valve-gate, said plate being preferably pressed upwardly by a spring 15 to permit the valve to normally remain closed. Above said diaphragm is provided an auxiliary or supplemental generator or heating-chamber 16, which, similar to the main generator 1, may be heated by a heating-coil 17, surrounded by a sheath 18. At the lower portion of said generator and just above the diaphragm is a foraminous plate 19 to hold said diaphragm against being raised.

To the generator 16 is preferably connected a Bourdon tube 20, which, it is understood, is a bent tube adapted to change its curvature on variation of the internal pressure. This tube carries a switch-contact 21, adapted to engage a stationary switch-contact 22. Similar tubes 23 and 24 are connected to the lower chamber 8 of the valve. The tube 23 has a contact 25, adapted to engage a stationary contact 26, and the tube 24 carries a contact 27, adapted to engage a stationary contact 28. The several Bourdon tubes are arranged so that on increase of the pressure therein to a predetermined amount the contacts controlled by tubes 20 and 23 will be opened, while those controlled by the tube 24 will be closed.

The motor or fluid-pressure mechanism 6

may be of any construction. The motor illustrated in the drawing has a suitable casing 29, within which is arranged a diaphragm 30. Against the diaphragm bears a plate 31, which is normally pressed upwardly by the springs 32. The motor may be employed for any purpose. It is here shown as arranged to operate a valve 33, which may control the passage for the heating fluid in a heating system, said valve being preferably provided with a gate 34, connected to the motor by a rod 35. This valve may of course be utilized for any purpose, and in some instances the motor may operate a damper to control the temperature instead of a valve, as is well understood.

For automatically controlling the operation of the apparatus which has been set forth a thermostat 36 of any type may be arranged in the room or apartment in which the temperature is to be controlled, said thermostat being provided with a contact 37, adapted to engage one or the other of the stationary contacts 38 or 39, according to the direction in which said thermostat moves when changes in the temperature occur.

The general construction of the apparatus having now been described, the operation thereof will be explained. Within the main generator and reservoir, as well as the auxiliary generator, is contained a suitable liquid or fluid—as, for example, water—the upper dotted lines indicating approximately the level thereof before the apparatus is set in operation. Assume that as the temperature in the room rises under the influence of the heating medium allowed to pass through the open valve or damper 33, as the case may be, the thermostat 36 moves until the contact 37 engages contact 38. A path for the current will then be established from supply-conductor 40, through wire 41, thermostat 36, terminals 37 and 38, conductor 42, terminals 26 and 25, conductor 43, heating-coil 2, and conductor 44, to the opposite supply-conductor 45. The generator 1 will now be set in operation, and as the fluid therein becomes heated a pressure will be created, which will force the liquid in the reservoir 4 through the check-valve 5 and into the motor 6. Under the pressure the diaphragm 30 will move downwardly and close the valve 33. When the pressure becomes sufficient, the Bourdon tube 23 will operate, thereby causing the circuit which has heretofore been traced to be opened at contacts 25 and 26. At the same time the contacts 27 and 28 will be closed. The heater 2 will now cease operation; but the valve 33 will still remain closed, as the pressure of the fluid upon the motor will be retained by the check-valve 5 regardless of the fall of the pressure in the main generator 1. When the temperature in the room falls to a predetermined amount, due to the closing of the valve 33, the thermostat will move until the contacts 37 and 39 engage each other. This will close a circuit from the supply-conductor 40, through conductor 41, thermostat 36, contacts 37 and 39, conductor 46, contacts 27 and 28, conductor 47, contacts 22 and 21, conductor 48, heating-coil 17, and conductor 49, to the other supply-conductor 45. The auxiliary generator is now set in operation and as the fluid therein expands the diaphragm is forced downwardly upon the stem 12 to open the check-valve, thereby permitting the compressed fluid in the motor to regurgitate to the reservoir. As the pressure in the motor falls, the operation of the auxiliary generator will be stopped by the breaking of the circuit for the heating-coil 17 at contacts 27 and 28. Also the contacts 25 and 26 will again close. The valve 33 now being opened again, the same action will be repeated as that heretofore described, when the temperature of the room rises.

If the check-valve be opened too soon after the main generator ceases operation, the pressure upon the liquid in the reservoir will not have fallen sufficiently to permit the motor to open the valve 33. Under such conditions the circuit of the heating-coil for the auxiliary generator could not be broken by the tube 24 at contacts 27 and 28, and therefore the tube 20 is provided to break said circuit when the pressure in the auxiliary generator becomes excessive.

If the diaphragm of the motor is made of rubber, it would be likely to rapidly disintegrate should it be subjected to the action of very hot water or steam, and therefore said diaphragm is protected in the present construction from the hot water and steam produced in the generator by providing the reservoir from which comparatively cool water is forced into the motor.

It is of course understood that any kind of fluid may be employed as the medium through which the pressure is exerted.

The apparatus which has been produced by this invention is particularly suited for use in buildings having a large number of rooms in which the temperature is to be controlled, as a complete apparatus may be installed in each room to regulate the operation of the radiator or other heating appliance therein, the electric current being supplied from suitable supply-mains running through the building.

There are various ways in which this invention may be applied to control the temperature in an apartment, and the motor may be arranged to serve any purpose for which it is suitable. Moreover, the apparatus is not confined in its use to regulating the operation of heating appliances or systems, but is capable of being employed to accomplish many different ends.

Where it is deemed advisable, the ther-

mostat may be adapted to successively close different circuits, as it moves in either direction, and thereby cause the motor to gradually move the means which is operated thereby.

It is manifest that the apparatus shown herein is susceptible of being changed in various ways and still be within the spirit and scope of my invention as set forth in the claims appended hereto.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a fluid-pressure motor, of a fluid-pressure generator supplying fluid under pressure thereto, an electric heater for said generator, a switch controlling the circuit of said heater, a valve for retaining the fluid under pressure in said motor, and electrically-controlled means for operating said valve.

2. In combination, a fluid-pressure motor, a fluid-pressure generator supplying fluid under pressure thereto, an electric heater for said generator, a thermostatic switch in the circuit of said heater, a valve for retaining the fluid under pressure in said motor, electrically-controlled means for operating said valve, and a temperature-controlling device operated by said motor.

3. The combination with a fluid-pressure generator having means for electrically heating the same arranged in a suitable electric circuit, of a fluid-pressure mechanism or motor supplied with fluid under pressure from said generator, means for setting the heating means in operation, and means operated by the pressure created in said generator, said means automatically opening the circuit of said heating means when the pressure in said generator reaches a predetermined amount.

4. The combination with a fluid-pressure generator, of means for heating the same, a fluid-pressure mechanism supplied with fluid under pressure by said generator, means controlling the operation of said generator, a valve for retaining the fluid under pressure in said motor, and means for operating said valve.

5. The combination with a fluid-pressure generator having means for electrically heating the same, of a fluid-pressure mechanism or motor supplied with fluid under pressure from said generator, means for controlling the operation of said generator, a valve for retaining the fluid under pressure in said motor, and means for operating said valve to release said fluid.

6. The combination with a fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, a fluid-pressure mechanism or motor supplied with fluid under pressure from said generator, a valve for retaining the fluid under pressure in said motor, a second fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, means operated by fluid under pressure from said second generator to operate said valve, and means for controlling the operation of the means for electrically heating said generators.

7. The combination with a fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, a fluid-pressure mechanism or motor supplied with fluid under pressure from said generator, a valve for retaining the fluid under pressure in said motor, a second fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, means operated by fluid under pressure from said second generator to operate said valve, and a switch for controlling the operation of the means for electrically heating said generators.

8. The combination with a fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, a fluid-pressure mechanism or motor supplied with fluid under pressure from said generator, a valve for retaining the fluid under pressure in said motor, a second fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, means operated by fluid under pressure from said second generator to operate said valve, means for controlling the operation of the means for electrically heating said generators, and a valve operated by said motor.

9. The combination with a fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, a fluid-pressure mechanism or motor supplied with fluid under pressure from said generator, a valve for retaining the fluid under pressure in said motor, a second fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, means operated by fluid under pressure from said second generator to operate said valve, a temperature-regulating device controlled by said motor, and a thermostat for controlling the operation of said means for electrically heating said generators.

10. The combination with a fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, a fluid-pressure mechanism or motor supplied with fluid under pressure from said generator, a valve for retaining the fluid under pressure in said motor, a second fluid-pressure generator having means for electrically heating the same arranged in a suitable circuit, means operated by fluid under pressure from said second generator to operate said valve, means for setting the first-mentioned means in operation, and means operated by fluid under pressure for automatically stopping the operation of said first-mentioned means.

11. The combination with a main fluid-pressure generator having means for electrically heating the same, a fluid-pressure mechanism or motor supplied with fluid under pressure therefrom, a valve for retaining the fluid under pressure in said motor, an auxiliary fluid-pressure generator having means for electrically heating the same, means operated by the pressure created in said auxiliary generator to control said valve, an electric circuit including the means for heating the main generator, a second circuit including the means for heating the auxiliary generator, a switch for opening or closing either of said circuits, and means operated by fluid under pressure for opening one of said circuits and closing the other when the pressure of the fluid supplied to said motor reaches a predetermined amount.

12. The combination with a main fluid-pressure generator having means for electrically heating the same, a fluid-pressure mechanism or motor supplied with fluid under pressure therefrom, a valve for retaining the fluid under pressure in said motor, an auxiliary fluid-pressure generator having means for electrically heating the same, means operated by the pressure created in said auxiliary generator to control said valve, an electric circuit including the means for heating the main generator, a second electric circuit including the means for heating the auxiliary generator, a switch for opening or closing either of said circuits, Bourdon tubes responsive to pressure from one of said generators, and controlling switch-contacts to open one of said circuits and close the other when the pressure of the fluid supplied to said motor reaches a predetermined amount.

13. The combination with a main fluid-pressure generator having means for electrically heating the same, of a fluid-pressure mechanism or motor supplied with fluid under pressure from said generator, a temperature-regulating device controlled by said motor, a valve for retaining the fluid under pressure in said motor, an auxiliary fluid-pressure generator having means for electrically heating the same, means operated by the fluid under pressure created in said auxiliary generator to control said valve, a circuit in which the means for heating said main generator is included, a second circuit in which the means for heating said auxiliary generator is connected, a thermostatic switch for controlling the continuity of said circuits, and means operated by fluid under pressure for opening one of said circuits and closing the other when the pressure of the fluid supplied to said motor reaches a predetermined amount.

14. In combination, a temperature-controlling device, a fluid-pressure mechanism for operating said device, a generator supplying fluid under pressure to said mechanism, means for electrically heating said generator, a circuit including said means, a thermostatic switch controlling said circuit, a valve for retaining the fluid under pressure in said mechanism, and electrically-controlled means for operating said valve.

15. In combination, a temperature-controlling device, a fluid-pressure mechanism for operating said device, a generator supplying fluid under pressure to said mechanism, means for electrically heating said generator, a circuit including said means, a thermostatic switch controlling said circuit, a valve for retaining the fluid under pressure in said mechanism, electrically-controlled means for operating said valve, and means operated by the pressure of the fluid in said motor and automatically controlling said circuit.

16. In combination, a temperature-controlling device, a fluid-pressure mechanism for operating said device, a generator supplying fluid under pressure to said mechanism, means for electrically heating said generator, a circuit including said means, a thermostatic switch controlling said circuit, a valve for retaining the fluid under pressure in said mechanism, a fluid-pressure mechanism for operating said valve, a supplemental fluid-pressure generator supplying fluid under pressure to the latter mechanism, and means for electrically heating said supplemental generator.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

JOHN H. SWAN.

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