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AUTOMATIC CONTROL DEVICE FOR REFRIGERATING APPARATUS.

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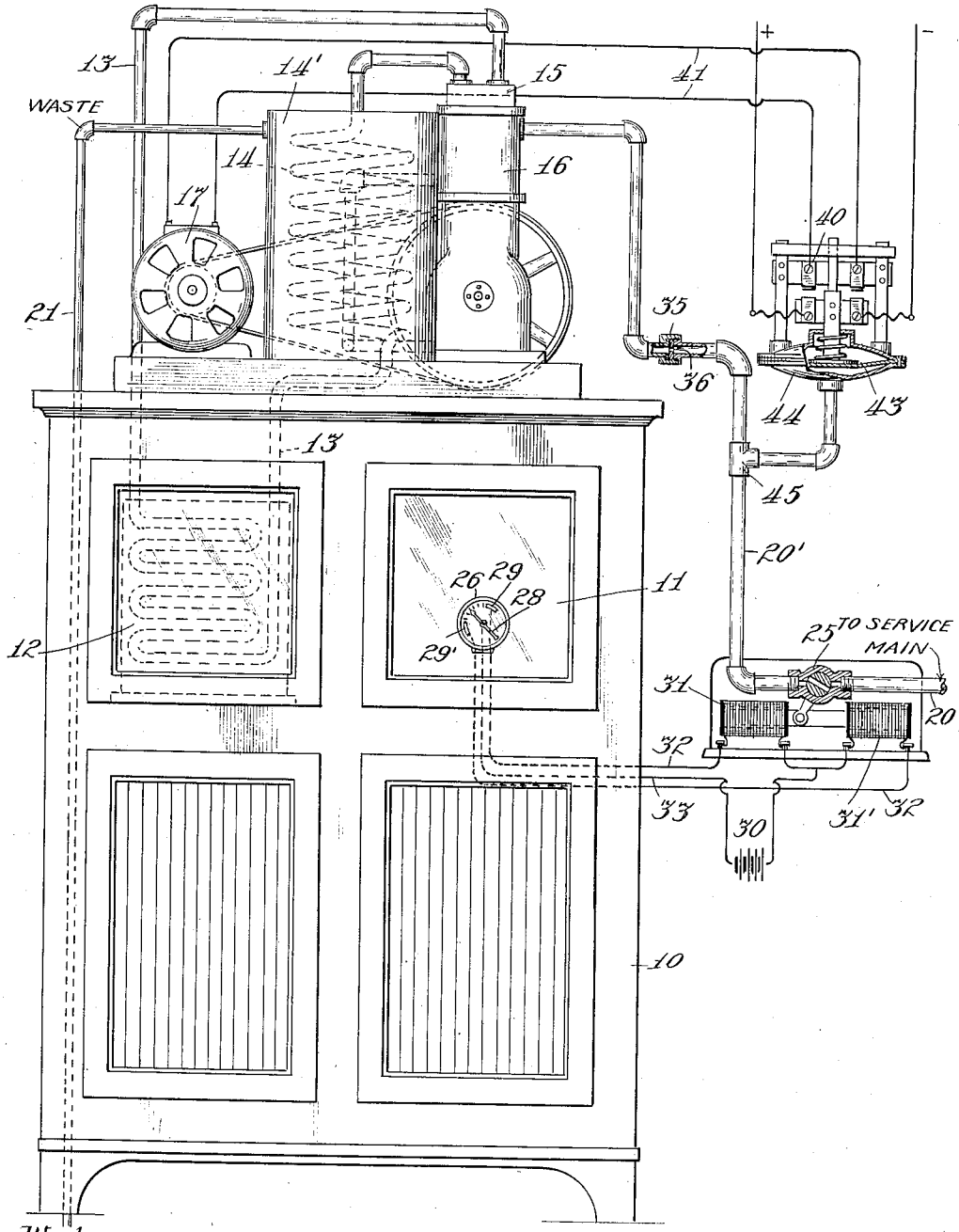

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UNITED STATES PATENT OFFICE.

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AUTOMATIC CONTROL DEVICE FOR REFRIGERATING APPARATUS.

1,050,910. Specification of Letters Patent. **Patented Jan. 21, 1913.**

Application filed January 22, 1912. Serial No. 672,551.

To all whom it may concern:

Be it known that I, FRANK BISHOP, a citizen of the United States, residing at South Bend, in the county of St. Joseph and State of Indiana, have invented certain new and useful Improvements in Automatic Control Devices for Refrigerating Apparatus, of which the following is a specification.

My invention relates to improvements in means for control of refrigerating plants, and has for its general object to provide means automatically to control the operation of the refrigerating apparatus so as to maintain the temperature of a refrigerated area between certain predetermined limits.

The specific embodiment of my system herein disclosed is particularly designed in simple, cheap, and convenient form suitable for employment in a small household refrigerating plant, such for example as that disclosed in a prior Patent No. 962,704, dated June 28, 1910, to Ralph W. Emerson and myself. It may, however, be otherwise embodied, as will be apparent from the following description. In such a household refrigerating system, taken as a basis of this disclosure, there is provided an electric-motor-driven ammonia compressor, connected through the usual condensing coils with the refrigerating coils, appropriately located with respect to the refrigerated area, which in this instance may be the food receptacle of a refrigerator. Water for the water jacket of the compressor and for the cooling tank is supplied under considerable head from a pressure-supply main, such for instance as an ordinary city water-supply system.

One of the objects of the present invention is to provide a control system for governing the compressor wherein a temperature-responsive device in the refrigerated chamber will control the pressure-supply means (such as the water-main connection) and the pressure thereby controlled in turn controls the operation of the compressor-driving means, and consequently the activity of the cooling system.

In the drawing, wherein I have illustrated in a single view, partly diagrammatic and partly in elevation, an embodiment of my invention, 10 indicates in general the refrigerated structure, such as a household refrigerator, having a refrigerated area 11 arranged to be cooled by the expansion of ammonia in the expansion coils 12, appropriately located relatively thereto, said coils being in a piping circuit 13 connected on the one hand through a condensing coil 14 in the water tank 14′ with the outlet of a compressor 15 and on the other hand through a return pipe to the inlet of the compressor 15. The compressor 15 is water-jacketed as at 16, and may advantageously be operated by an electric motor 17. For supplying water to the jacket 16 and tank 14′, a suitable service main 20 leading to any suitable supply of water pressure, such as a city water system, may be employed, said main having controllable communication through a piping section 20ˣ with the water jacket of the compressor 16, thence to tank 14′, and out through a waste connection 21 from the tank 14′. The particular arrangement and details of these portions of a refrigeration system form no part of my present invention broadly considered, save in so far as these or analogous parts form a foundation structure to which my invention is to be applied.

For controlling the supply of water from the service mains to the refrigerating system, and consequently the application or relief of pressure in the piping section 20′, I provide a cut-off valve 25, of any suitable construction in pipe 20, and arrange the same for thermostatic control by a temperature-responsive appliance located in the area 11 to be refrigerated. To this end, I have shown in the refrigerated area 11 a thermometer 26 having suitable connections to make electric contact at either end of a predetermined range of temperature variation. Thus, the thermometer needle 28, when it shows the lowest temperature desired, coacts with a contact 29, to close an electric circuit from the battery 30 through magnet 31, wire 32, the said thermometer

switch contacts, and a common return wire 33 to battery. When said needle reaches its limit of throw indicative of the desired maximum temperature, it coacts with a contact 29′ to close a similar circuit from said battery 30 through magnet 31′, wire 32, and return wire 33 to battery. "Low temperature magnet" 31 is arranged when energized to close the valve 25 and "high temperature magnet" 31′ is arranged when energized to open said valve. Thus, it will be apparent that the water pressure is turned on to the refrigerating system through the valve 25 as soon as the temperature in the refrigerating area reaches the predetermined maximum and remains on until the temperature has gone down to a predetermined minimum, and that then the pressure is automatically and positively turned off.

Between the pressure-control valve 25 and the compressor jacket, I provide a pressure-reducer 35 in the form of a box coupling with a restriction-washer 36 having a perforation of a suitable reduced size. Through such restriction sufficient water is admitted for properly supplying the refrigeration appliances, but owing to the restricted opening the piping section 20′ between valve 25 and the restrictor 36 is maintained, when the valve 25 is open, under nearly the full water pressure of the main 20. To this pressure area 20′ of the system, controlled by valve 25, I connect a pressure-responsive device which controls the operation of the compressor-driving appliances. In the specific illustration, where the compressor is electrically driven, the control is effected through an electric switch 40 in the supply circuit 41 for the motor 17. The movable element of the switch is actuated by a diaphragm 43 contained in a casing 44 which is in open communication through a T 45 with the pipe 20′ between valve 25 and restriction 36.

In the operation of the system, whenever the temperature in the refrigerator chamber goes up to a predetermined maximum, the closing of the circuit for high temperature magnet 31′, effected by the contact of hand 28 with contact 39, causes the energization of said magnet which acts to open valve 25, turning the full pressure from the service main 20 into the pipe 20′. Some water flows through the restriction 36 to the refrigerating appliances, but the water in pipe 20′ is maintained under relatively high pressure and therefore forces diaphragm 43 to raised position and there maintains it, so closing and maintaining closed the switch 40 for the circuit 41 of the compressor-driving motor 17. Until the temperature reaches a predetermined minimum, this condition is maintained. When minimum temperature is reached, the closure of the circuit for low temperature magnet 31 energizes the said magnet and causes it automatically and positively to close the valve 25. The pressure in pipe 20′ is immediately relieved (as pipe 20′ is, of course, vented through the restriction 36) and the diaphragm snaps back to normal position, opening the switch 40 and so stopping the operation of the compressor by disconnecting its motor from its power circuit.

While I have herein described in some detail a specific embodiment of my invention, it will be well understood by those skilled in the art that numerous changes in the structural features thereof, and the specific embodiment thereof, might be made without departure from the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. In a refrigerating plant, the combination with refrigerating devices including a compressor, of a thermostatic device in the refrigerated area, a source of fluid-pressure supply, means governing the pressure application controlled by the thermostatic device, and pressure-responsive means, controlled by the pressure-supply as governed by said thermostatic means, for controlling the operation of the compressor.

2. In a refrigerating plant, the combination with refrigerating means, a source of water-pressure supply, and an operating motor for the refrigerating means, of a thermostatically-controlled valve for the water-supply means, a pressure-responsive device associated with the water-supply system beyond said controlling valve, and a motor-controlling switch operated by said pressure-responsive means.

3. In a refrigerating plant, the combination with a refrigeration system having a compressor, of a source of supply of water under pressure, a thermostat located in the refrigerated area, a water-supply-controlling valve, means whereby said thermostat controls said water-supply-controlling valve, a pressure-responsive device associated with the water-supply system beyond the supply-controlling valve, and means operated by the pressure-responsive device for starting and stopping the compressor.

4. In a refrigerating plant, the combination of a source of pressure, a pressure-responsive device, controlling means to permit or prevent application of pressure from said source of said pressure-responsive device, a thermostatic device controlling said pressure-controlling device, in combination with a refrigerating system having its compressor controlled by the pressure-responsive device and its refrigerated area containing the thermostatic device.

5. In a refrigerating plant, the combina-

tion of a source of water supply having connection to a restricted outlet, a control valve for the water-supply source, a thermostat controlling said valve, a pressure-responsive device between the said valve and the restricted outlet, a switch governed by said pressure-responsive device, an electric motor controlled by said switch, and a refrigerating system having a compressor actuated by said motor and a refrigerated area including said thermostat.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

FRANK BISHOP.

In the presence of—
GEO. T. MAY, Jr.,
MARY F. ALLEN.