July 15, 1924. 1,501,660

L. HELMER

METHOD OF AND APPARATUS FOR CONDITIONING AIR

Filed March 28, 1921 2 Sheets-Sheet 1

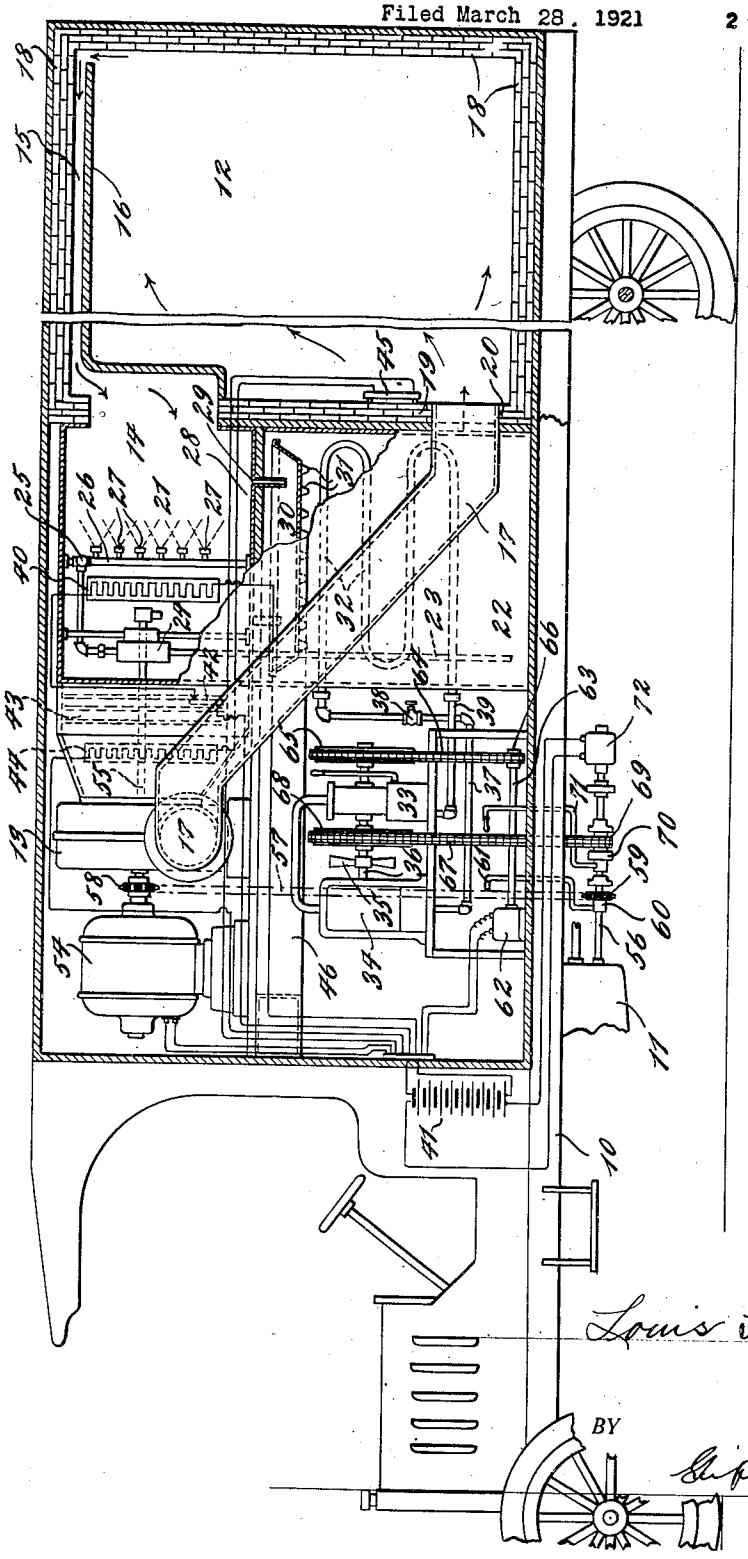


Fig. 1.

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BY

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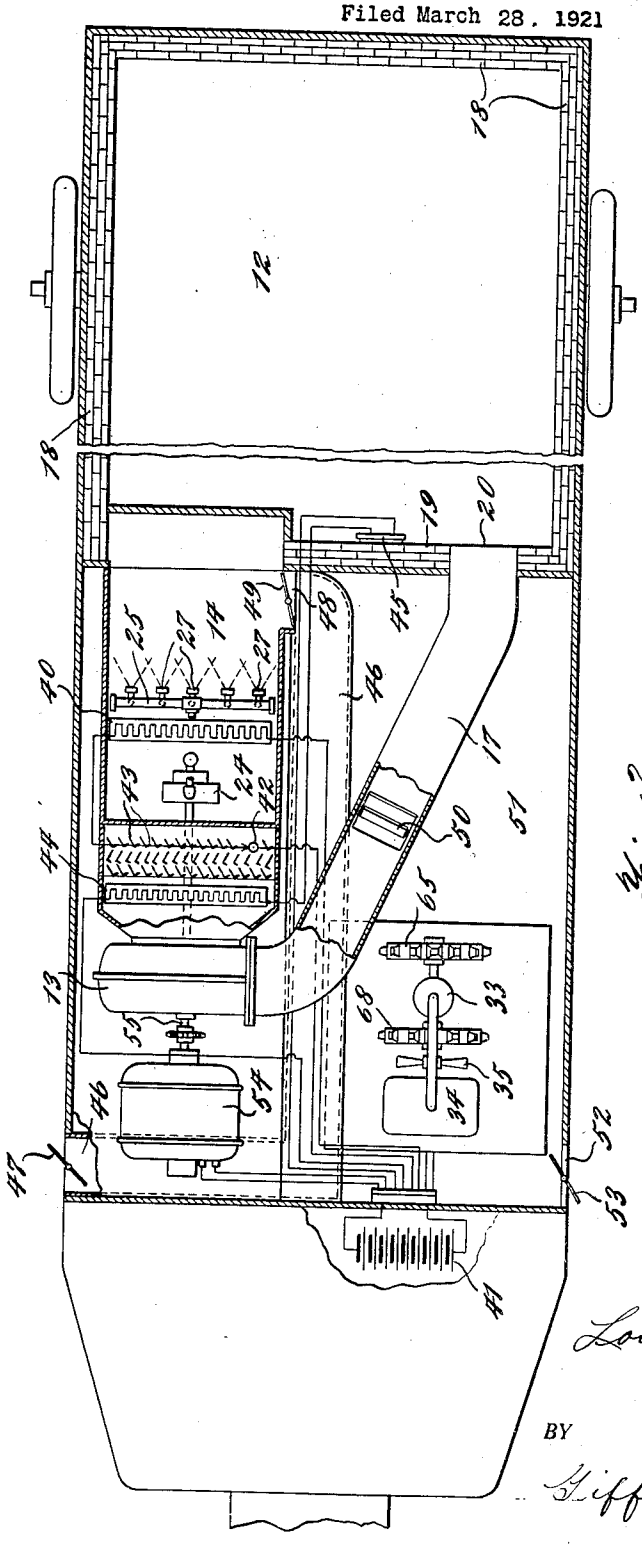


Fig. 2.

Louis Helmer
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Patented July 15, 1924. 1,501,660

UNITED STATES PATENT OFFICE.

LOUIS HELMER, OF NEW YORK, N. Y.

METHOD OF AND APPARATUS FOR CONDITIONING AIR.

Application filed March 28, 1921. Serial No. 456,183.

To all whom it may concern:

Be it known that I, LOUIS HELMER, a citizen of the United States, and a resident of the Borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in a Method of and Apparatus for Conditioning Air, of which the following is a specification.

One of the objects of my invention is the provision of a method of and apparatus for introducing vapors to the air to be conditioned, and for controlling both the percentage content of the vapor in the air and the temperature of the mixture, so that the mixture is suited to a desired purpose. For example, it is known that meat may be preserved for a considerable period if kept in air having the proper temperature and the proper vapor content. Likewise, such products as vegetables, fruit, flowers, etc. may be preserved for considerable periods by keeping the air and the vapor content thereof in the proper proportion, although the vapor content for this purpose will differ from that which is used, for example, for preserving meats. It is also important that the air in which such materials as powder, films and celluloid are kept should be maintained at the proper temperature and that the vapor content thereof should be maintained at the proper value.

In accordance with my invention, the temperature and the percentage of the vapor content of the conditioned air are automatically controlled without the use of materials such as hair, wood strips, catgut and other similar substances which are commonly employed for controlling the humidity of air, and which, in practice, deteriorate and become ineffective.

Another object of my invention is the provision of an air-conditioning apparatus mounted on a vehicle which is used for the transportation of perishable products of the character above indicated, and in which the conditioning apparatus may be driven by the same source of power that propels the vehicle.

Other objects of my invention will appear in the specification and will be particularly pointed out in the claims.

My invention will best be understood by reference to the accompanying drawings, in which I have illustrated the preferred form of my invention, and in which Figure 1 is a vertical sectional view showing certain parts in elevation through a vehicle carrying an air-conditioning apparatus embodying my invention, and Fig. 2 is a sectional plan view with parts broken away.

Like reference characters indicate like parts throughout the drawings.

Referring, now, to the drawings, 10 is the chassis of a motor vehicle in connection with which I have illustrated my invention, and on which is mounted the transmission gear box 11.

In accordance with my invention, a compartment 12 is provided, in which conditioned air is circulated and in which articles that are to be preserved, and, as here shown, transported, are contained. The air is circulated through the compartment 12 by any suitable means, such as a blower 13, which is located, in the form here shown, at one end of an air-conditioning chamber 14, to which the air is conducted from the compartment 12 by means of a conduit 15 located above a false top 16 for the compartment. The air is returned from the blower 13 to the compartment 12, and preferably near the bottom thereof, by means of a conduit 17. The compartment 12 is preferably surrounded by heat-insulating walls 18, and is separated from the air-conditioning apparatus and the parts associated therewith, preferably located at the front end of the vehicle, by a partition wall 19 provided with an opening 20 through which the conduit 17 communicates with the compartment 12.

In accordance with my invention, means are provided for introducing vapors of a desired character to the air, and it will be understood that any desired kind of vapor, such as water vapor, vapors from desired chemical substances, such as calcium chloride, and from other liquids, may be introduced for the preservation of the different kinds of goods that are placed in the air-conditioning compartment. I have indicated, in general, at 21 a means for introducing vapors to the air. The liquid from which the vapors are introduced to the air is preferably circulated, and may be pumped from a reservoir 22, which may conveniently be placed near the bottom of the vehicle, through a pipe 23 by means of a pump 24, to a header 25, to which is connected a plurality of pipes 26, which are preferably vertically arranged, as shown, and to which are connected a plurality of spraying nozzles 27, by means of which the air entering

the conditioning chamber 14 is subjected to the action of the spray and becomes saturated with the vapors. The unvaporized liquid falls into a receptacle 28 located immediately beneath the spraying nozzles and from which drain pipes 29 conduct the liquid to a pan 30, which is preferably provided with a plurality of nipples 31, through which the water drips over coils of a pipe 32, and which, when in operation, abstract heat from the liquid, thereby causing the same to return to the spraying nozzles at a temperature sufficiently low to make it possible to produce the desired temperature in the air and vapor mixture. The circulating fluid is forced through the pipe coils 32 by means of a compressor 33 connected to a condenser 34, which may be cooled by a fan 35 mounted on the same shaft 36 that actuates the compressor. The condenser 34 is connected to the pipe coils 32 by means of a pipe 37 provided with an expansion valve 38. The other end of the pipe coil 32 is connected to the compressor 33 by a pipe 39.

In accordance with my invention, means are provided for heating the mixture of air and vapor as the vapor is being introduced, and for controlling the temperature thereof, the arrangement being such that the air is saturated with vapors at the desired temperature. Preferably the mixture of air and vapor is heated by an electric heater 40 connected to a suitable source of electric energy, such as a storage battery 41, and in the circuit of which is included a thermostat 42, which is subjected to the temperature of the mixture of air and vapor which has been subjected to the action of the electric heater. It will be apparent that the action of the electric heater and the thermostat will result in maintaining the air saturated with vapor at a predetermined temperature, and in which therefore, a definite percentage of vapor will be present. The air so treated preferably passes through baffles 43, which act to remove solid particles of moisture contained in the air and which return the same to the receptacle 28. The construction of such baffles is well understood in the art and I have, therefore, indicated the same diagrammatically by dotted lines in Fig. 1. After the air has been saturated with vapor at a predetermined temperature, it is desirable to reduce the percentage of the vapor content, and this I accomplish by passing the same over a second heater, preferably an electric heating device 44, which may conveniently be connected to the storage battery 41, as shown, and in the circuit of which is included a thermostat 45, which is preferably disposed in the compartment 12, in which the materials to be preserved are stored. The second electric heating device raises the temperature of the mixture of air and vapor, and thereby superheats the contained vapor and reduces the percentage of the vapor content, which it will be understood is desirable for preserving products of a character heretofore indicated, and the thermostat 45 maintains the temperature of the air and vapor at a desired value.

Preferably a certain amount of fresh air is introduced to the air in circulation, which may conveniently be led in through a conduit 46 (see Fig. 2) controlled by a valve 47, which conduit leads to an opening 48 in the wall of the air-conditioning chamber 14, which may also be provided with a valve 49. A corresponding amount of air is preferably withdrawn from the air in circulation and may conveniently be taken from the conduit 17 through a valve 50 which communicates with the chamber 51 and from which the air passes to the outside air through an opening 52 controlled by a valve 53. For ordinary purposes, I prefer to introduce about five per cent of fresh air into the air in circulation and to withdraw a corresponding amount therefrom.

The blower 13 may be driven by an electric motor 54 connected to a suitable source of electric energy, such as the storage battery 41, as shown, and the armature of which drives a shaft 55, which actuates not only the blower but the pump 24, as indicated in Fig. 1. Normally, the shaft 55 is preferably actuated directly by the vehicle motor through a shaft 56 connected to the motor, and through a sprocket-chain 57 engaging sprocket-wheels 58 and 59 located on the shafts 55 and 56, respectively. The driving connection between the vehicle motor and the sprocket-wheel 59 may be controlled by a clutch 60, which is actuated by an operating handle 61.

The apparatus for extracting heat from the liquid which is used for spraying the air may be driven by an electric motor 62 connected to the storage battery 41, as shown through a shaft 63 and a sprocket-chain 64 engaging sprocket-wheels 65 and 66 on the shafts 36 and 63, respectively. The heat-abstracting apparatus may also be driven from the shaft 56 by means of a sprocket 67 engaging sprocket-wheels 68 and 69 secured to the shafts 36 and 56, respectively. The driving connection between the sprocket 69 and the shaft 56 may be controlled by a clutch 70, which is, in turn, actuated by an operating handle 71.

The storage battery may be charged by an electric generator 72, which may be driven by the shaft 56.

The operation of the device illustrated in the drawings and embodied in my invention will readily be understood from the foregoing description, and is as follows:

The larger portion, for example, ninety-five per cent, of the air is re-circulated

through the compartment 12 by the blower 13, thereby proportionally reducing the power required for conditioning the air. The air in the chamber 14 is subjected to the spray from the nozzles 27 and vapors thereby introduced to the air, the air and vapor mixture being maintained in a predetermined proportion as the vapor is being introduced, by means of an electric heater 40 controlled by the thermostat 42. By saturating the air with vapors at a predetermined temperature, a predetermined percentage of vapor is introduced to the air and this percentage may be controlled in accordance with the particular purpose for which the air is to be used. The provision of the apparatus for extracting heat from the circulating liquid which is vaporized insures the liquid being vaporized at a temperature below that of the desired temperature of the mixture of air and vapor, and it will be understood that under some conditions, as in the winter-time, when the temperature of the liquid may already be lower than that of the temperature of the mixture of air and vapor, the heat-abstracting apparatus will be unnecessary, and may be discontinued at such time. After the air has been saturated with vapors at a predetermined temperature, the mixture is heated by the second electric heater and the temperature thereby raised, thereby superheating the contained vapors and lowering the percentage of the vapor content, as it is desirable for the preservation of perishable products that the vapor content be below the saturation point of the air in the compartment. By the provision of the thermostat, which is also subjected to the influence of the air and vapor mixture leaving the second heater, the temperature of the mixture and the percentage of the vapor content may be controlled as desired.

What I claim and desire to secure by Letters Patent of the United States is:

1. In a device of the character described, a compartment, means for circulating air through said compartment, a liquid-circulating system and means for spraying the liquid into the entering air and at substantially the saturation point, means for lowering the temperature of the circulating liquid prior to the spraying operation, means comprising a heating device for controlling the temperature of the air and liquid spray mixture as the latter is being introduced to the air, and means for raising the temperature of said mixture and thereby lowering the percentage of liquid spray content therein.

2. In a device of the character described, a compartment, means for circulating air through said compartment, a liquid-circulating system and means for spraying the liquid into the entering air and at substantially the saturation point, means for lowering the temperature of the circulating liquid prior to the spraying operation, means comprising a heating device for controlling the temperature of the air and liquid spray mixture as the latter is being introduced to the air, means for raising the temperature of said mixture and thereby lowering the percentage of liquid spray content, and means for controlling the temperature of said mixture.

LOUIS HELMER.