

July 11, 1933.

L. W. MELCHER

1,917,537

AIR COOLER

Filed Aug. 1, 1930

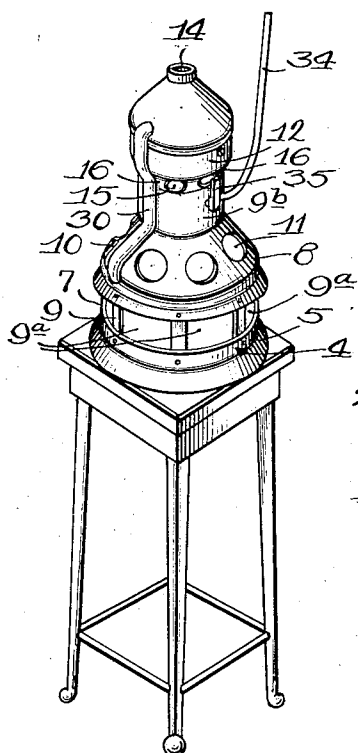


Fig. 1

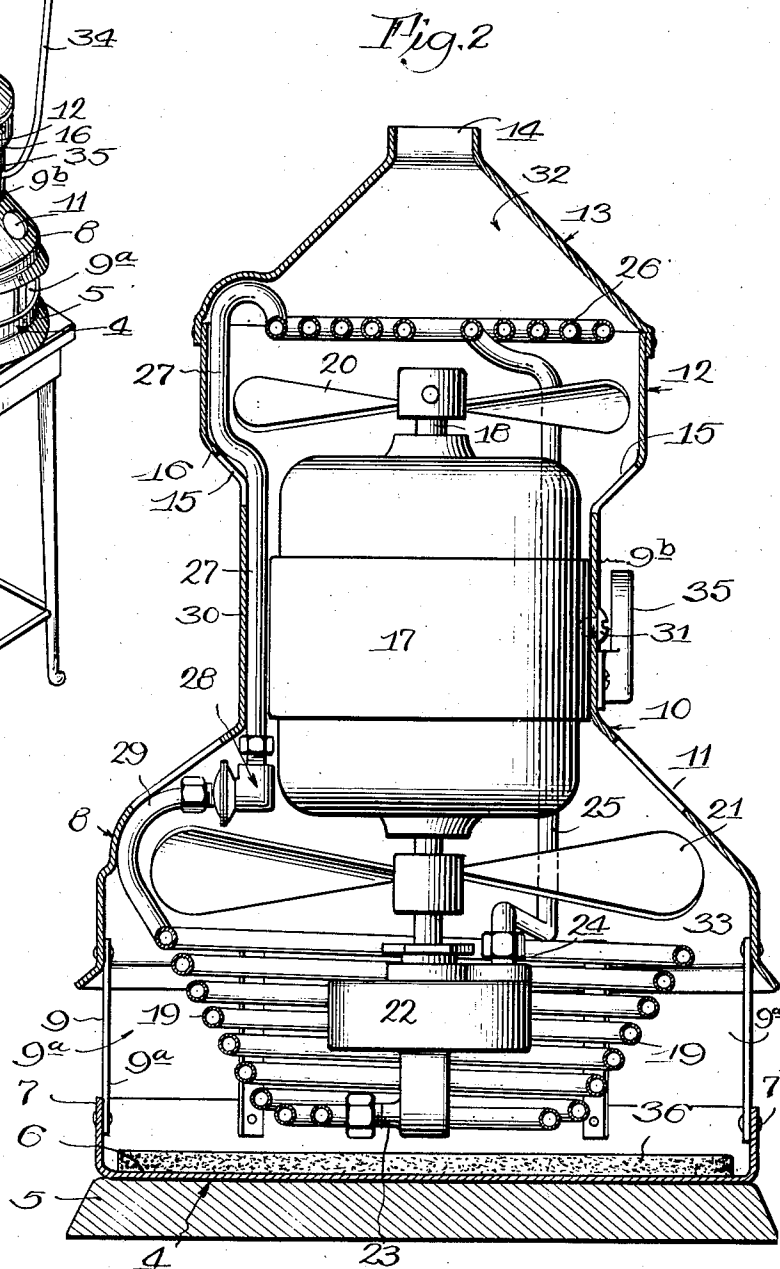


Fig. 2

Inventor,
Lee W. Melcher
By Fred Gerlach *Atty.*

UNITED STATES PATENT OFFICE

LEE W. MELCHER, OF WINNETKA, ILLINOIS

AIR COOLER

Application filed August 1, 1930. Serial No. 472,361.

The invention relates generally to air coolers. More particularly the invention relates to that type of air cooler which is portable and comprises a refrigerating unit and an enclosing casing for the unit.

One object of the invention is to provide an air cooler of this type in which the enclosing casing for the refrigerating unit is shaped to form an upper and a lower chamber and the refrigerating unit is arranged so that the motor for driving the compressor is located in the casing between the two chambers, and the condenser is mounted in the upper chamber and the expansion coil is mounted in the lower chamber.

Another object of the invention is to provide an air cooler of the last mentioned character which embodies a pair of fans which are mounted on opposite ends of the armature shaft of the motor and operate to cool the condenser and to force air around the expansion coil for cooling purposes.

A further object of the invention is to provide an air cooler which is generally of new and improved construction, consists of but a comparatively small number of parts and may be manufactured at a low cost.

Other objects of the invention and the various advantages and characteristics of the present cooler construction will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by the claims at the conclusion hereof.

In the drawing which accompanies and forms a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Fig. 1 is a perspective of an air cooler embodying the invention; and

Fig. 2 is a vertical section of the cooler.

The cooler which forms the subject matter of the invention is in the form of a portable unit and comprises a round casing 4. The latter is mounted on a base 5 and comprises a sheet metal bottom member 6 which is secured on the base 5 and is provided with an

upwardly extending annular flange 7. In addition to the bottom member, the casing 4 comprises an upper member 8. This member is formed of sheet metal, embodies a central constricted portion 9^b and is secured above the bottom member 6 by vertically extending bars 9 so as to form an air outlet 9^a for the casing. The bars 9 are secured to and extend between the annular flange 7 of the bottom member 6 and the lower portion of the upper member 8 of the casing. The lower portion of the upper casing-member is enlarged and is connected to the constricted central portion 9^b by a conical portion 10. The enlarged lower portion of the upper member of the casing forms a cooling chamber 33 in which are housed an expansion coil 19, a rotary compressor 22 and a fan 21 for forcing air through the cooling chamber 33. The upper portion of the upper casing-member is enlarged, as at 12, to form a chamber 32 through which air is forced to cool a condenser coil 26. The extreme upper portion of the upper member 8 of the casing terminates in a conical portion 13 which is provided with a central upwardly discharging outlet 14 for the discharge of air entering the chamber 32 through inlets 15 which are formed in an upwardly flared wall 16 between the upper portion of the upper casing-member 8 and the portion 9^b.

An electric motor fits in the constricted portion 9^b of the upper casing-member and substantially closes communication between the chamber 33 in the enlarged lower portion of the upper member of the casing and the chamber 32 in the upper portion of said member of the casing. This motor comprises a housing 17 and an armature shaft 18 and is arranged so that the shaft extends vertically. The shaft 18 extends above the motor housing 17 and has secured to its upper end a horizontally rotating fan 20 for drawing air through the inlets 15 and forcing it through the chamber 32 and then out of the casing by way of the outlet 14. The lower end of the shaft 18 projects downwardly from the motor housing 17 and has secured thereto a horizontally rotating fan 21. This fan is larger than the fan 20 and is adapted

to draw air through inlets 11 in the enlarged lower portion of the casing-member 8 and force it through the cooling chamber 33 and then out of the casing through the outlet 9^a.

5 The extreme lower end of the armature shaft 18 of the motor extends below the fan 21 and is connected to drive the rotor of the compressor 22. The expansion coil 19 consists of a spirally wound pipe and is disposed in

10 the lower portion of the casing-member 8 below the fan 21. It contains a suitable refrigerant, such as sulphur dioxide, and has its outlet terminal connected, at 23, to the inlet side of the compressor 22. The outlet

15 side of the compressor 22 is connected, at 24, to a vertical pipe 25 which is connected to the inlet end of the condenser coil 26. The latter is located above the fan 20 and is disposed in the chamber 32 in the upper portion

20 of the upper casing-member 8. A pipe 27 connects the outlet end of the condenser coil to the high pressure side of an expansion or pressure reducing valve 28 which is disposed in the upper portion of the cooling

25 chamber 33. The low pressure side of the valve 28 is connected by a pipe 29 to the inlet terminal of the expansion coil 19. The pipe 27 passes through an offset portion 30 in the upper casing-member 8. The pipe 25

30 extends through an offset portion in the upper member of the casing and is located diametrically opposite the pipe 27. The housing 17 of the electric motor is removably secured by screws 31 in the constricted portion

35 9^b of the casing 4.

The operation of the cooler is as follows:

When the electric motor is in operation, the compressor 22 is driven by the armature shaft 18 and operates to compress the refrigerant and force it upwardly through

40 the pipe 25 to the condenser coil 26. Fan 20 draws air through inlets 15 into the chamber 32 and forces it around the condenser coil 26 to cool the compressed refrigerant.

45 The heat absorbed by the air in passing around the condenser coil is discharged through the outlet 14 in the extreme upper portion of the casing-member 8 into the upper portion of the room in which the cooler is

50 located. At valve 28, the pressure of the refrigerant is reduced and the refrigerant expands and passes through the pipe 29 and the expansion coil 19 to the compressor. The fan 21 draws air through the inlets 11 and

55 forces it through the chamber 33 and around and between the loops of the expansion coil 19, and causes the air after it is cooled by the expansion coil to blow through the opening 9^a and thus out of the casing.

60 In practice it has been found that the normal room temperatures are relatively different in the upper and lower portions of the room and the present cooler functions to increase the differential by forcing warm

65 air from the condenser coil 26 to the upper

portion of the room and drawing air from the intermediate zone into the cooling chamber 33, cooling it, and then discharging it into the lower portion of the room. Thus, the cooler serves to extract the heat from

70 the air in the lower portion of the room and to force the air heated by the condenser to the upper portion of the room, thereby increasing the differential in temperatures between the upper and lower portions of the

75 room. In using the cooler, the upper half of a window in the room in which the cooler is placed is preferably opened so that the heated air in the upper portion of the room may escape. To provide for the inflow of

80 air, the lower part of the window is opened or a door in the room is left ajar. In a room which is provided with an exhaust fan in the upper portion thereof, the air heated by the cooler may be evacuated from the upper

85 portion of the room by the use of such a fan and the evacuated air may be replaced by way of a floor opening or like instrumentality.

The electric motor is connected by a flexible cord 34 to a suitable source of current

90 supply, so that it may be moved with comparative ease to any desired portion of a room. If desired, a thermostatic switch 35 may be included in the circuit to stop automatically the motor when the temperature

95 falls below a predetermined point.

A pad 36 of absorbent material, such as felt, is placed in the bottom member 6 of the casing to retain by way of absorption any moisture which drops from the expansion

100 coil 19 when the cooler is stopped. During use of the cooler, frost adheres to the expansion coil during the expansion period of the refrigerant, and when the device is stopped, the frost melts and the condensate falls onto

105 the pad and is absorbed and retained. When the fan is again started, the air passing over the top of the pad evaporates the moisture so it will be absorbed by the air discharged into the room.

The herein described air cooler consists of but a comparatively few parts and therefore may be manufactured at a low and reasonable cost. It is exceedingly efficient in operation and occupies but a small space in

115 that the various parts of the refrigerating unit are compactly arranged within the casing.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

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

1. In an air cooler, the combination of a refrigerating unit comprising a compressor, an expansion coil, a condenser, and an electric motor having a vertically extending shaft

connected to drive the compressor, a unitary casing for said unit provided with air inlets and outlets, and comprising a chamber above the motor and a chamber below the motor in which the condenser and expansion coil are disposed respectively; and a pair of fans for forcing air through said chambers connected to be driven by the motor.

drive the condenser, a casing enclosing said unit and comprising an enlarged lower portion provided with a chamber containing the expansion coil, and a reduced upper portion which surrounds the motor and forms a chamber above the motor for the condenser, a fan on the lower end of the shaft of the motor for forcing air through the lower chamber, and a fan on the upper end of the shaft of the motor for forcing air through the upper chamber, the casing being provided with air inlet and outlet openings for the lower chamber and air inlet and outlet openings for the upper chamber.

6. In an air cooler, the combination of a refrigerating unit comprising a compressor, an expansion coil, a condenser and an electric motor connected to drive the compressor, a unitary casing enclosing the unit and provided with a chamber in its lower portion in which the expansion coil is disposed, and air inlet and outlet openings for said chamber, means in the lower portion of the casing for catching and retaining condensate from the expansion coil, and a fan for forcing air through said chamber and over said means.

7. In an air cooler, the combination of a refrigerating unit comprising a compressor, an expansion coil, a condenser and an electric motor connected to drive the compressor, a unitary casing enclosing the unit and provided with a chamber in its lower portion in which the expansion coil is disposed, and air inlet and outlet openings for said chamber, an absorbent element in the lower portion of the casing for catching and retaining condensate from the expansion coil, and a fan driven by the motor for forcing air through said chamber and over said element.

8. In apparatus for cooling the air in a room, the combination of a refrigerating unit comprising a compressor, an expansion coil, a condenser, and a motor connected to drive the compressor, a unitary casing enclosing the refrigerating unit and embodying a part forming a chamber for the condenser and having an inlet opening and an upwardly facing outlet opening whereby air is permitted to flow to the chamber into contact with the condenser for condenser-cooling purposes and then to flow upwardly out of the chamber and towards the top of the room, and also embodying another part forming a separate chamber for the expansion coil and having for the last mentioned chamber an air inlet and a laterally extending air outlet beneath the outlet opening for the condenser chamber, and a fan in the chamber for the expansion coil connected to be driven by the motor and arranged to draw air into the last mentioned chamber for cooling by the expansion coil and to force the cool or refrigerated air out of the coil chamber through the laterally extending outlet in or-

2. In an air cooler, the combination of a refrigerating unit comprising a compressor, an expansion coil, a condenser, and an electric motor connected to drive the compressor, a unitary casing enclosing said unit and having a chamber in its lower portion in which the expansion coil is disposed, and a chamber in its upper portion in which the condenser is disposed, a fan driven by the motor for forcing air upwardly through the upper chamber, and a fan driven by the motor for forcing air through the lower chamber, the casing being provided with air inlet and outlet openings for the lower chamber and air inlet and outlet openings for the upper chamber.

3. In an air cooler, the combination of a refrigerating unit comprising a compressor, an expansion coil, a condenser, and an electric motor connected to drive the compressor, a unitary casing enclosing said unit and having a chamber in its lower portion in which the expansion coil and the compressor are disposed, and a chamber in its upper portion in which the condenser is disposed, a fan driven by the motor for forcing air upwardly through the upper chamber, and a fan driven by the motor for forcing air downwardly through the lower chamber, the casing being provided with air inlet and outlet openings for the lower chamber and air inlet and outlet openings for the upper chamber.

4. In an air cooler, the combination of a refrigerating unit comprising a compressor, an expansion coil, a condenser, and an electric motor having a vertical shaft connected to drive the compressor, a unitary casing enclosing said unit and having a chamber below the motor and in its lower portion in which the expansion coil is disposed, and a chamber in its upper portion above the motor in which the condenser is disposed, a fan connected to be driven by the upper end of the motor-shaft for forcing air upwardly through the upper chamber and a second fan connected to be driven by the lower end of the motor-shaft for forcing air downwardly and then outwardly through the lower chamber, the casing being provided with air inlet and outlet openings for the lower chamber and air inlet and outlet openings for the upper chamber.

5. In an air cooler, the combination of a refrigerating unit comprising a compressor, an expansion coil, a condenser and an electric motor having a vertical shaft connected to

der to form a cool layer of air beneath the air flowing upwardly towards the top of the room from the outlet opening for the condenser chamber.

- 5 9. In apparatus for cooling the air in a room, the combination of a refrigerating unit comprising a compressor, an expansion coil, a condenser, and a motor connected to drive the compressor, a unitary casing enclosing the refrigerating unit and embodying a part forming a chamber for the condenser and having an inlet opening and an upwardly facing outlet opening whereby air is permitted to flow into the chamber into contact with the condenser for condenser-cooling purposes and then to flow upwardly out of the chamber towards the top of the room, and also embodying another part forming a separate chamber for the expansion coil and having for the last mentioned chamber an air inlet and a laterally extending air outlet beneath said inlet and the outlet opening for the condenser chamber, and a horizontally extending fan in the chamber for the expansion coil connected to be driven by the motor and arranged to draw air downwardly into the last mentioned chamber for cooling by the expansion coil and to force the cool or refrigerated air downwardly and then outwardly through the laterally extending outlet in order to form a cool layer of air beneath the air flowing upwardly towards the top of the room from the outlet opening for the condenser chamber.
- 35 10. In apparatus for cooling the air in a room, the combination of a refrigerating unit

comprising a compressor, an expansion coil, a condenser, and a motor connected to drive the compressor, a unitary casing enclosing the refrigerating unit and embodying a part forming a chamber for the condenser and having for the chamber an inlet opening and an upwardly facing outlet opening above the inlet opening, and also embodying another part forming a separate chamber for the expansion coil and having for the last mentioned chamber an air inlet and a laterally extending air outlet beneath said inlet and the outlet opening for the condenser chamber, a horizontally extending fan in the chamber for the condenser connected to be driven by the motor and arranged to draw air into the condenser chamber through the inlet opening into contact with the expansion coil for coil-cooling purposes and then to force the air upwardly through the outlet opening towards the top of the room, and a second horizontally extending fan in the chamber for the expansion coil connected to be driven by the motor and arranged to draw air downwardly into the last mentioned chamber for cooling by the expansion coil and to force the cool or refrigerated air downwardly and then outwardly through the laterally extending outlet in order to form a cool layer of air beneath the air flowing upwardly towards the top of the room from the outlet opening for the condensed chamber.

Signed at Winnetka, Illinois, this 11th day of July, 1930.

LEE W. MELCHER.

40

45

50

55

60

70

75

80

85

90

95

100

105

110

115

120

125

130