

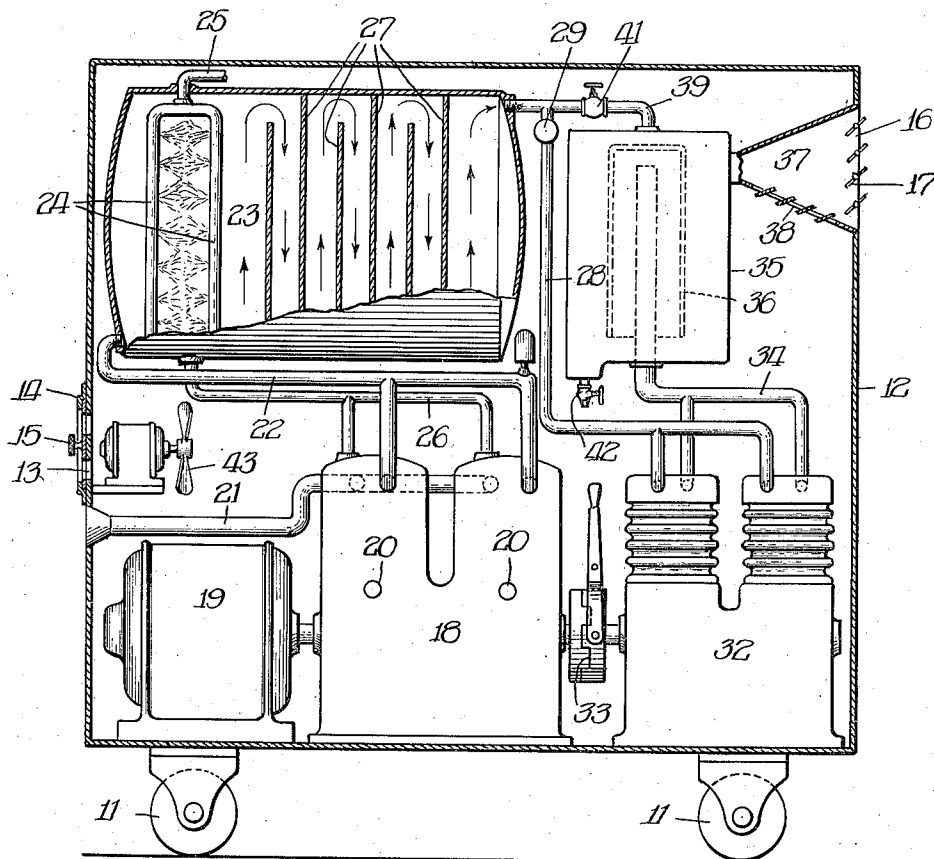
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AIR CONDITIONING

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AIR CONDITIONING

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1 Claim. (Cl. 62-136)

The present invention relates to an improved method and novel means for conditioning air by which the air may, in summer time, be cooled, dehumidified and washed, and, in winter time, may be washed and humidified.

For the specified cooling and dehumidifying of the air, the new procedure operates on the thermodynamic principle that air, after being compressed, if permitted to cool under pressure to room temperature, and subsequently made to do work, will be cooled substantially below room temperature, and will also lose considerable of its moisture, depending upon the original relative humidity.

In order to effect economy, another purpose of the invention is to cause the compressed air, during its expansion, to perform work in a suitable engine which supplies power to the air-compressor to assist in compressing additional air, and, by this means, the outside power, such as electricity, required to operate the compressor will be materially reduced.

The compressed air is washed and cooled by passing it through a water spray and subsequently freed from entrained moisture, and, in the winter time, the same apparatus by certain minor alterations or adjustments can be employed not only to wash the air, but to add the desired amount of moisture thereto in order to give it the required degree of humidity.

The preferred form of appliance employed for practicing this process has, besides several other advantages, those of compactness, practically-complete facilities for conditioning the air, and direct action, as the air itself is used in place of other fluids as in the case of a number of different mechanical devices for cooling and treating air. In such other machines, the fluid is first cooled, and, by means of suitable heat-exchangers, the heat is extracted from the air to the fluid which must be cooled further, direct-type heat-exchangers not being suitable for such use.

As distinguished from this, the simplicity and advantages of the new method and apparatus outlined above will be readily apparent.

Those acquainted with this art will understand the new invention and the benefits accruing from its employment from a consideration of a present preferred appliance designed to practice the process illustrated in vertical section and somewhat diagrammatically in the single view of the accompanying drawing forming a part of this specification and to which reference should be had in connection with the following detailed description.

Referring to this drawing, it will be noted that the appliance desirably, but not necessarily, is mounted on wheels or casters 11, 11 which give it portability, and comprises a casing or housing 12 having apertures or ports 13 therethrough at one end controlled, as to the extent of their opening, by an adjustable, correspondingly-apertured turning plate or damper 14 equipped with an operating knob or handle 15, the housing having at its opposite end a larger opening 16 controlled or regulated by manually-adjustable louvers 17.

Inside of the casing, an air-compressor 18 of any appropriate type is driven partly by an electric-motor 19, the air external to the casing 15 being drawn into the compressor through an admission-tube 21, the air under pressure being delivered from the compressor by conduit means 22 into one end of a tank 23 equipped near the same end with water-spray devices 24 supplied by water from any suitable source by an inlet-pipe 25, the excess water draining from the bottom of the tank through piping 26 into the water-cooling-jackets of the air-compressor, the water when leaving such jackets flowing out through discharge-pipes 20, 20 to any suitable drainage means.

Tank 23 is also equipped with a series of baffles extending alternately downwardly from the top of the tank and upwardly from the bottom thereof, thus providing a tortuous path for the air between and around them, all as is clearly depicted in the drawing, and, at the end of such tank opposite to that where the tubing or pipe 22 communicates therewith, a discharge-conduit 28 fitted with a control-valve 29 connects the interior of the tank with an air-engine 32, the rotary shaft of which is joined through a manually-operable clutch 33 with the shaft to the air-compressor 18, the air after performing its work in the engine flowing through conduit 34 which delivers it into a separator-tank 35 beneath a suitably-shaped baffle 36.

Tank or chamber 35 is connected to the delivery-opening 16 by a flaring conduit 37 having a louver-controlled opening 38 in its lower side, the upper part of the interior of tank 35 being joined by conduit 39 to the conduit 28 through a control-valve 41, the lower part of the separator-compartment 35 having a drain-valve 42 which may be opened from time to time to discharge the accumulated water.

An electrically-actuated fan 43 draws air into the casing 12 through the wholly or partially registering openings 13 and those of the damper

14 and delivers it through the passage 38 into the conduit 37 where it mixes with the treated air.

In general, the operation of this appliance is substantially as follows, assuming that valve 29 is open and that valve 41 is closed.

The electric-motor 19 and the air-engine 32 conjointly or unitedly drive the air-compressor 18 with the clutch 33 in operative condition.

Such air-compressor draws air from the outside of the casing into itself through the tube or conduit 21 and after its compression discharges it at a substantially higher temperature into the cooling and washing chamber 23, where it is washed and cooled by the water sprays and then freed from entrained water, including that precipitated out due to the lowering of the temperature of the compressed air in such chamber, by passing around the several baffles of the series.

The water used for this purpose drains from such tank or chamber through the piping 26 and through the encasing jackets of the air-compressor and maintains the latter at a suitable temperature for efficient and satisfactory operation, the water being delivered from the jackets through the discharge pipes 20.

Upon leaving the chamber or tank 23, the washed, dried air flows through the conduit 28 into the air-engine 32 where through its expansion it does work in operating the latter, the air thereby becoming further cooled with a resulting lowering of its percentage of absorbed moisture, the air-engine, of course, assisting in driving the compressor, as has been indicated.

The air discharged from the engine passes through the chamber or compartment 35 into the conduit 37 where it becomes intermingled with the untreated air flowing through the casing and such conduit by reason of the action of the electric-fan, the water condensed in the air during its expansion in the engine being segregated out in the separator 35 and ultimately drained off through the valve 42.

Obviously, by controlling or regulating the adjustment of the louvers of the opening 38 proper conditioning of the air as it passes into the room through the opening 16 is readily attained.

In winter, or at any other time if desired, by closing valve 29, opening valve 41, and throwing the clutch 33 out of action, the air leaving chamber 23 will pass through the separating-chamber 35 and conduit 37 into the room, diluted or mod-

fied more or less or not at all by the air capable of being fed through the housing by the electric-fan.

By thus not only washing the air, but by also humidifying it in chamber 23, by properly regulating the supply of water to the sprays, the conditioned air is properly modified to render it satisfactory for use in winter when humidity is desired or necessary to keep the room, steam or otherwise heated, in comfortable and healthy condition.

When thus employed, the compressed air may be cooled by the wash water and thus rendered properly modified to condition the air of the room into which it is delivered.

It is not essential that the compressed air do work in compressing air to be within the scope of this invention, the example given above being presented merely to illustrate how economy of operation may be effected.

Throughout this description of the invention the term "work" has been used in its broadest meaning as would be interpreted by those acquainted with the thermodynamics employed.

This invention is not limited to the precise and exact details of structure and procedure hereinbefore indicated, its scope being defined by the appended claim, and it is to be understood that various modifications and changes may be resorted to without departure from the principles of the invention and without the loss or sacrifice of any of its material benefits and advantages, for example, the treated air may be mixed with a suitable sterilizing agent, as, for instance, one incorporated in the water to which the air is subjected.

I claim:

A unitary, portable, room, air-conditioning system comprising a power-actuated, dense-air, compressor-cooler-expander type of air-cooling mechanism, means manually to couple and uncouple said compressor and expander, means arranged primarily to separate excess moisture from the expanded air, valve-controlled means to pass either cool, compressed air or expanded air, or both, to said separator means, and means for directing said moisture-free air to said room to be cooled comprising a mixing-chamber provided with an eduction inlet for air from said room.

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