

April 28, 1942.

J. R. ECK

2,281,002

AIR CONDITIONING DEVICE

Filed April 18, 1938

2 Sheets-Sheet 1



Inventor

John R. Eck

By Ernest N. Curtis

Attorney

April 28, 1942.

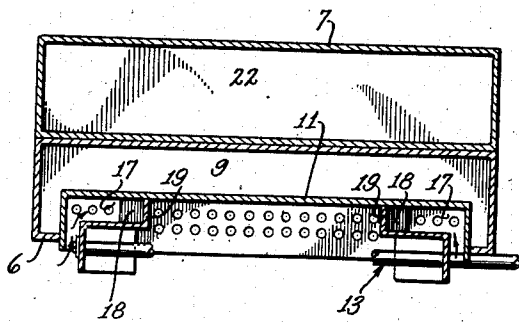
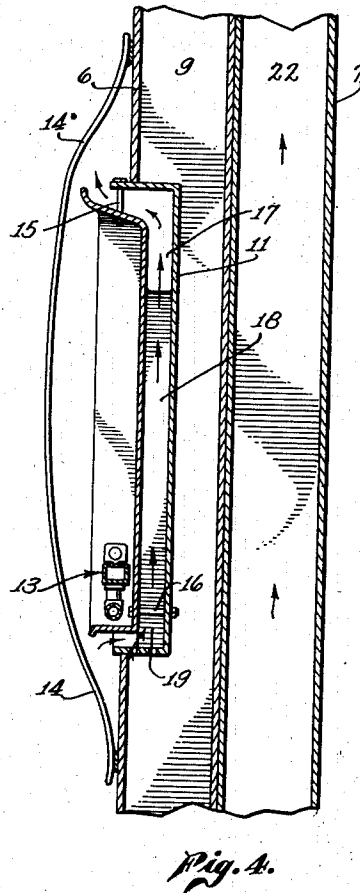
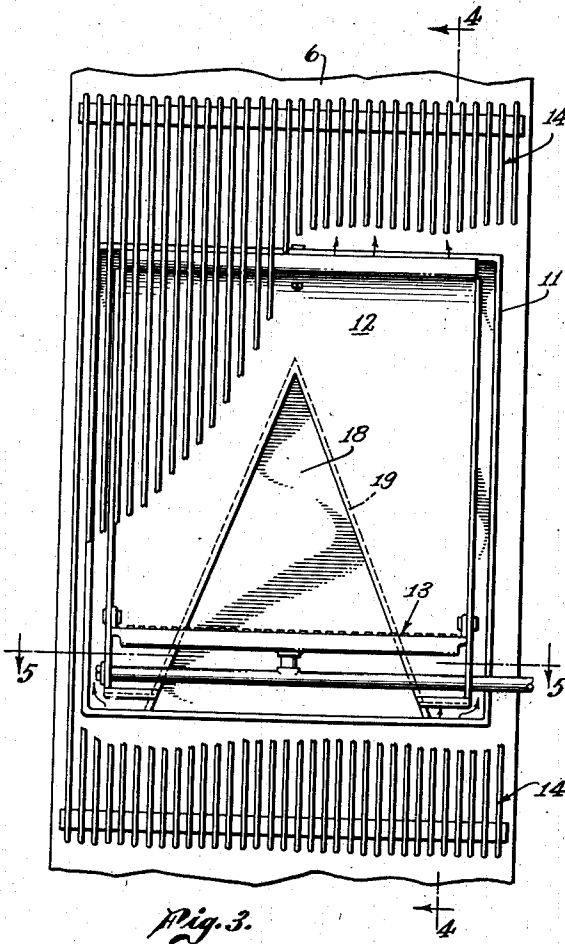
J. R. ECK

2,281,002

AIR CONDITIONING DEVICE

Filed April 18, 1938

2 Sheets-Sheet 2



Inventor

John R. Eck

Everett R. Curtis

Attorney

UNITED STATES PATENT OFFICE

2,281,002

AIR CONDITIONING DEVICE

John R. Eck, Solana Beach, Calif., assignor of
one-fourth to Omer Nelson and one-fourth to
Maurice M. Myers

Application April 18, 1938, Serial No. 292,595

3 Claims. (Cl. 98—33)

My invention relates to air conditioning devices, particularly with reference to dwelling houses, and its objects are to create a better circulation of air; to provide when needed a supply of fresh air to replace the foul air created by the breath of human beings or the burning of gas, firewood or other combustible materials; to maintain and control the air of a living room at a constant temperature and degree of oxygen content; to remove and expel rapidly foul and noxious gases from room occupied by living beings, and generally to bring about indoor atmospheric conditions conducive to human health and welfare.

My invention primarily consists in providing equipment for syphoning out of a living room the foul air containing carbon dioxide from its usual location near the floor thereof, and by reason of the suction thereby created, to permit fresh air heated at predetermined temperatures to be drawn in from outside sources through inlets located near the ceiling of said room.

My invention further consists in utilizing the heating equipment, which is used for raising the temperatures of a living room to the proper degrees for ordinary living temperatures, as a means for preheating the fresh air drawn into the room through the suction created by the removal of the dead or exhausted air near the floor thereof as aforesaid.

My invention further consists in the improvements and constructions illustrated in the drawings and hereinafter more specifically described and claimed.

Through the use of my invention, I preferably raise, through the employment of heat, the temperature of the fresh air drawn into the room to about sixty degrees Fahrenheit or to a degree not exceeding ten degrees below normal heated room temperatures. This cool air, entering the room from an air duct located in the wall near the ceiling, pours out into the top of the room to replace the air which is being rapidly drawn downward by reason of the suction through the syphoning duct, the entrance to the outlet of which is located at or near the floor of the room and tends to form a cool blanket extending over and immediately below said ceiling, thus forming a cushion against which the warmer air will arise so far as permitted by the suction below. As is well known, the dead air containing carbon dioxide is heavier than fresh air at or about the same temperatures and will normally tend to sink to the floor of the room. This fact coupled with the syphoning effect of my invention, and

entrance of fresh air at the top of the room, I have found results in the formation of air strata of substantially uniform thickness and location, the temperature of which maintains a variation in degree of not over one and a half degrees between the ceiling and the floor.

Preferably, in my invention, heat is supplied by a heating unit which is partially inserted in the fresh air duct and which acts as a preheater as well as being the main source of supply of heat for the room. No air is permitted to pass from the heater into the fresh air duct, such air being heated only by heat which passes through one thickness of metal. Heat may be supplied in any form. When the cool fresh air comes in contact with the heated air of the room, it causes an expansion of oxygen units which causes a downward pressure toward the exhaust pipe leading out of the room.

In constructing the fresh air duct, the incoming air opening should be at least four feet below the opening into the room. This causes a natural syphoning effect upward into the room instead of allowing the heated air to go to the ceiling and to pass out through the fresh air duct. Such construction forms an air trap preventing the air from flowing in the wrong direction.

By thus drawing the air from the floor level, a continuous downward air movement is caused. Foul air or air that contains a low volume of oxygen being heavier than air of high oxygen content or fresh air, has (as above stated) a natural sinking movement. Thus the foul air is drawn off from the floor, allowing the fresh conditioned air to displace it. Preferably such foul vapors are drawn off the floor through an exhaust air duct with a suction fan mounted at the exhaust end of the foul air duct, and permitting the exhausted air to be discharged into the outside atmosphere.

This syphoning of foul air from the floor level of the room causes a gradual undisturbed flow of fresh air into the room through the fresh air duct with no perceptible agitation or drafts, thus leaving the air to seek uniform stratas, the fresher air being located at the top.

The amount of air withdrawn and the amount of displacement of fresh air is controlled by the speed and size of the exhaust fan, and, as is obvious, the amount of air removed varies with the size of the room. Such removal takes place normally at the rate of 250 cubic feet per minute in a normal sized room containing 1750 cubic feet, and consequently the size of the room in cubic feet determines the amount of air change

necessary to be accomplished; such change to be most effective occurring every seven minutes. As a result my improved equipment gives absolute control over any air condition desired in one room or all rooms in a building.

This same air syphoning applies to cooling or refrigeration, in which case cooling is done by replacing the heating unit by a cooling element in the lower end of the fresh air intake, thus drawing the incoming air through the cooling element before entering the room. If desired a humidifier or filter may be used, with or without the cooling element.

Attention is hereby directed to the drawings in which similar numerals of designation refer to similar parts throughout the several views, and in which:

Figure 1 is a front elevation of my improved device showing the same attached to the floor and ceiling;

Figure 2 is a vertical section of the device and adjacent floor and ceiling shown in Figure 1, the fan being shown in elevation;

Figure 3 is an enlarged view of the preheating device shown in Figure 1;

Figure 4 is a vertical section on line 4-4 of Figure 3 looking in the direction of the arrows; and

Figure 5 is a horizontal section on line 5-5 of Figure 3 looking in the direction of the arrows.

Referring to the drawings, I construct my improved apparatus with the intake riser 6, which is of metal or other suitable material, and which is preferably rectangular in cross section. Such riser, as shown, preferably extends downwardly from the ceiling 31 of a room to and through an opening in the floor 30. At the bottom of said riser is the fresh air intake spout 8, through which fresh air is admitted to the fresh air duct 9, which is formed within said riser and leads upwardly to the fresh air outlet 10 located near the ceiling.

In order to bring about the stratification of air above referred to, I locate within an opening in the outer wall of said riser 6 (and preferably about four feet below said air outlet 10), the box 11 designed for receiving the pan 12, shaped to contain the heating unit 13, which may be constructed for the use of electricity, gas, or any heating means well known in the art. Through the use of said heating unit not only is supplied the heat necessary for heating the room, but the air passing through said intake riser is preheated and the syphoning effect of my apparatus thereby increased. If desired, a protective grill 14 may be provided to guard against any hazard from fire. To provide for proper air insulation and circulation, in compliance with the rules and regulations of the National Board of Fire Underwriters, I construct within the pan 12 the triangular recess 18, the walls of which 19 and air passages 17 permit the required insulation and circulation. As will be observed, the construction of this heating unit and adjacent parts is such that not only is the necessary heat provided for heating the room, but also the heat required for raising the temperature of the fresh air coming in from the intake spout 8.

After the said preheated air passes out of the fresh air outlet 10, it streams out into the room and tends to form a strata just below the ceiling to replace the foul air being drawn off below through the foul air outlet passage 22, preferably located immediately behind the fresh air intake spout 9. Such foul air is drawn into said

passage 22, through an opening in the floor 30, covered by the grill 21, below which is located the foul air receiving pan 21, connected with the duct 23 leading into the passage 22 of the outlet riser 7.

Such riser 7 is preferably rectangular in cross section and is of materials and construction similar to riser 6, and for convenience of construction is preferably located immediately back of said riser 6. It may, however, if desired, be otherwise located in any convenient position and may be of any desired construction. As here shown, it extends from below the floor 30, upwardly and through an opening in the ceiling 31, and communicates at its upper end with the spout 25 leading to the exhaust fan 29, suitable connections thereto being provided through the pipe 28 and fibre joint 27, the purpose of said joint being the elimination, so far as possible, of noise from said fan. As is obvious, upon the starting of the operation of said fan, the foul air coming out of the passage 22 will be expelled therefrom, thereby creating a syphoning effect for drawing into the room the fresh air admitted thereto through the fresh air duct 9. Even without the use of said fan, the natural tendency of the foul air containing carbon dioxide will be to sink and to pass out of the passage 22, and consequently to suck fresh air into the room through the duct 9, thereby producing the said syphoning effect though not to the same degree as with said fan.

By the term "living room" as used in the claims I desire to be understood as meaning any enclosed space within a structure designed for the use of living beings, including not only human beings, but also any form of life dependent upon the breathing of air for existence, and producing carbon dioxide from the taking of air into the lungs and expelling of waste products therefrom.

It is accordingly to be observed that my improved heating unit by reason of its location and construction as above set forth, serves a double purpose: first, of heating the air within the room itself to the proper temperature; and second, of preheating slightly the incoming fresh air to obtain the desired degree of cool air blanket over the ceiling to secure the best operating efficiency. It is evident there is no possible recirculation of air from the foul air outlet. In operation, my improved apparatus is essentially a non-recirculating type of heating and ventilating system, that is, fresh air is always brought in from the intake spout to take the place of the stale air passing off through the outlet riser. Among other differences, there are two radical departures from normal heating and ventilating practice. In my apparatus, the blower is installed in the foul air exhaust duct and causes the air to be drawn out through the single path of such duct, and as a result it necessarily follows that a slightly lower pressure prevails in the room than that of normal atmospheric pressure. Another departure is that of bringing in slightly preheated fresh air at ceiling height, allowing it to spread out over the room as a cold blanket to infiltrate down and to mix with warmer heated air below, and finally to be drawn out through the foul air outlet in the floor.

My invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment, as above set forth, is therefore to be considered in all respects as illustrative and not re-

strictive, the scope of my invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What I claim and desire to secure by Letters Patent is:

1. In an apparatus for conditioning air of a living room, the combination of two hollow risers uprightly disposed therein, one of said risers serving as a conduit for carrying off the foul air from said room and the other riser serving as a conduit for the admission of fresh to replace said foul air, a box shaped receptacle depressed within said fresh air conduit intermediate the ends thereof, a heating unit mounted within said receptacle and serving at the same time slightly to preheat said fresh air and also to supply sufficient heat to heat the air of said room at normal temperatures.

2. In an apparatus for conditioning air in a living room, the combination of two connected hollow risers vertically disposed therein, one of said risers extending above said room and serving as a conduit for carrying off the foul air from the floor of said room and the other riser serving as a conduit for the admission of a blanket of fresh air into the top of said room at ceiling height and to infiltrate said blanket downwardly into the air below, a heating unit mounted upon

and depressed within the wall of said fresh air conduit intermediate the ends thereof and serving at the same time slightly to heat, through said wall, said fresh air as it passes through its conduit and at the same time properly to heat the said room at living temperatures, and blower mechanism mounted upon the discharge end of the foul air riser above said room for causing the foul air to continuously be expelled from said room and to be replaced by fresh air.

3. In an apparatus for conditioning air in a living room, the combination of a foul air conduit leading from the floor therefrom first downwardly and then extending upwardly and discharging above the ceiling of said room, a fresh air conduit supplied with air taken from a source below said floor and extending upwardly through said floor and having its outlet into said room just below the ceiling thereof, a heating unit mounted in a depression of the wall of said fresh air conduit intermediate the ends thereof for preheating the air passing therethrough to about sixty degrees Fahrenheit, said unit being located approximately four feet below the outlet of said fresh air conduit and at the same time heating the air of said room at living room temperatures, and an exhaust fan mounted within said foul air conduit and acting to expel the foul air therefrom and to cause fresh air to be drawn into said room through said fresh air conduit.

JOHN R. ECK.