May 21, 1935. W. L. MORRISON 2,002,234

AIR COOLING AND CIRCULATING DEVICE AND PROCESS

Filed March 5, 1934 3 Sheets-Sheet 1

Fig. 1.

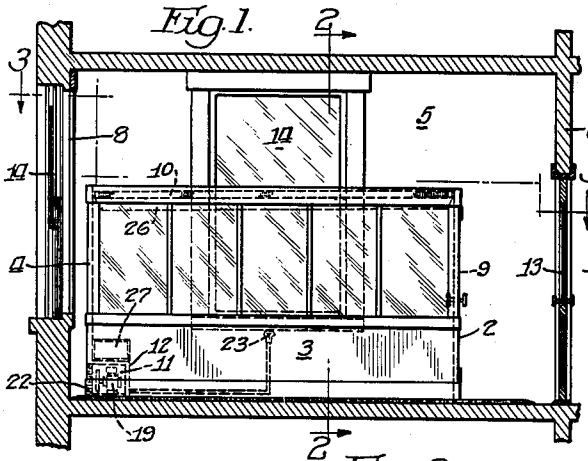


Fig. 2.

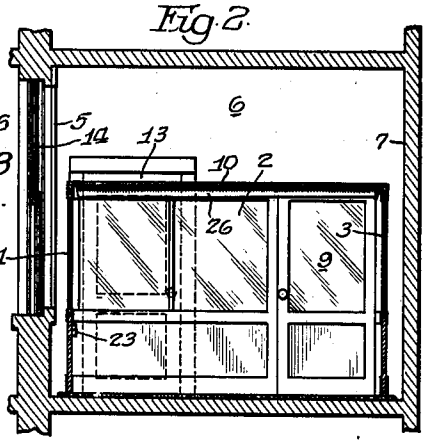


Fig. 3.

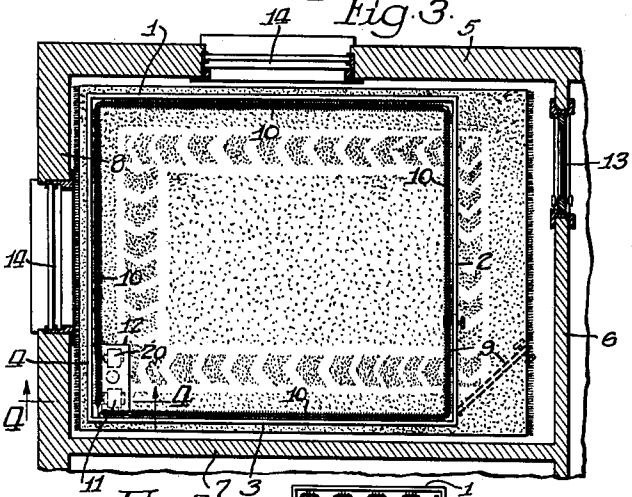


Fig. 5.

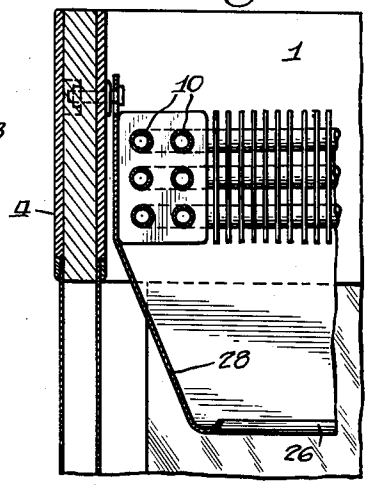


Fig. 4.

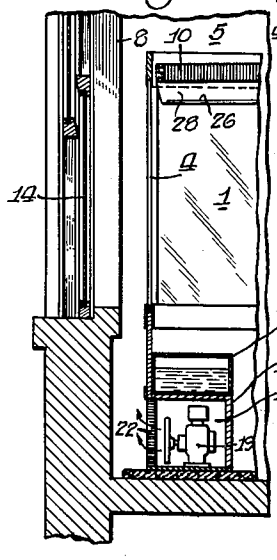


Fig. 15.

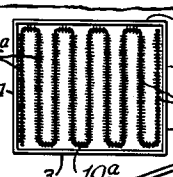
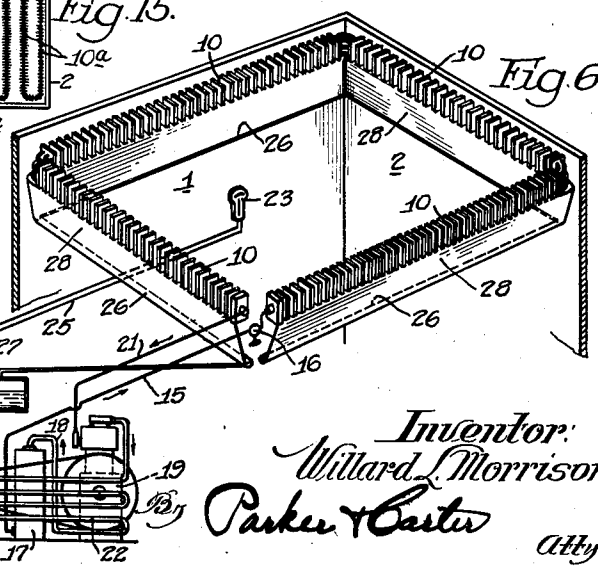


Fig. 6.



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Fig. 7

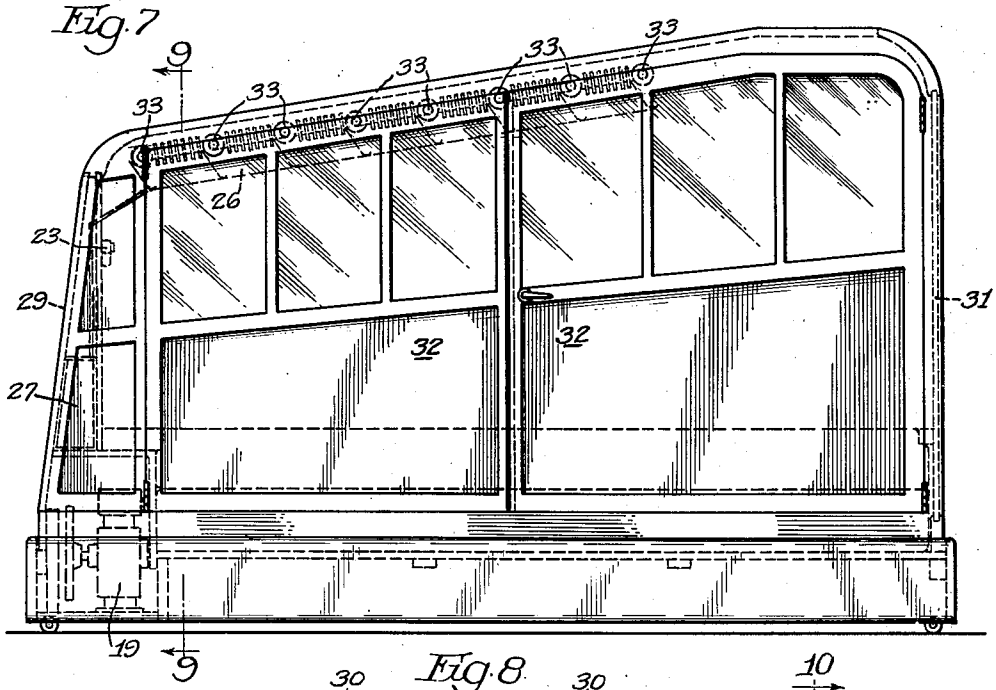
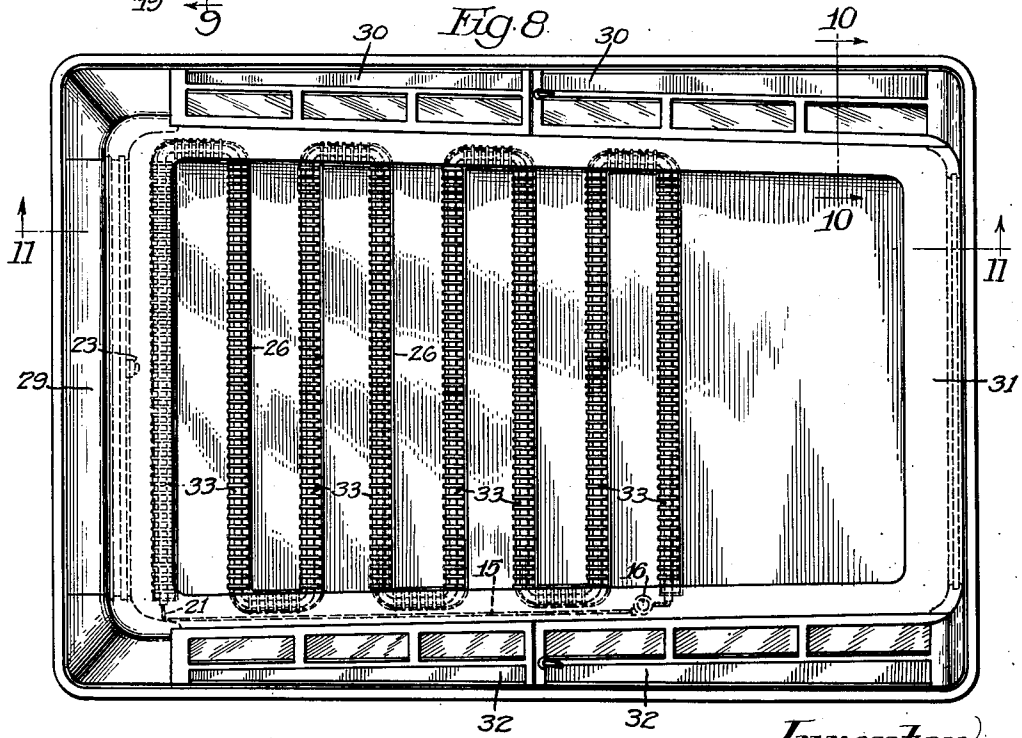


Fig. 8



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AIR COOLING AND CIRCULATING DEVICE AND PROCESS

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Fig. 9.

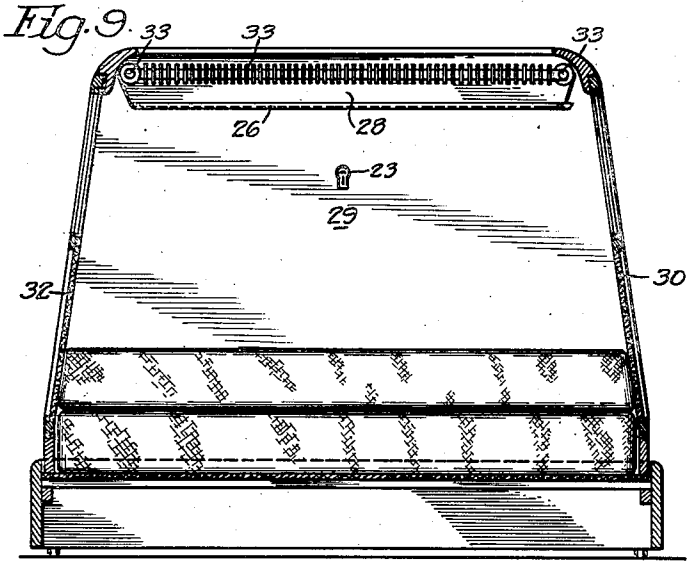


Fig. 10.

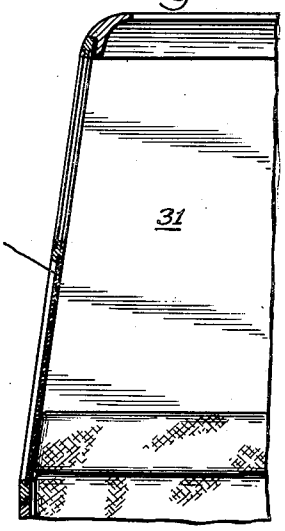


Fig. 11.

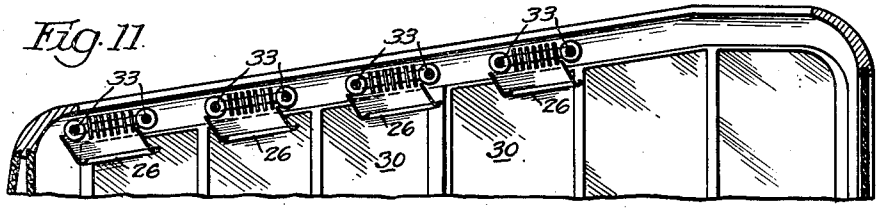


Fig. 12.

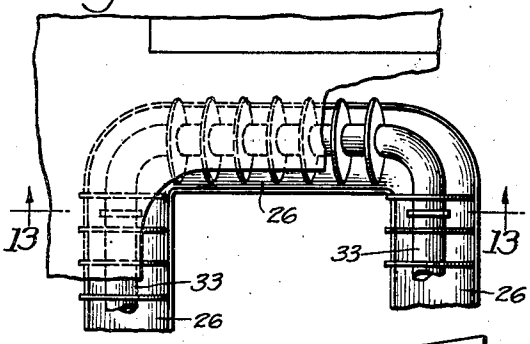


Fig. 13.

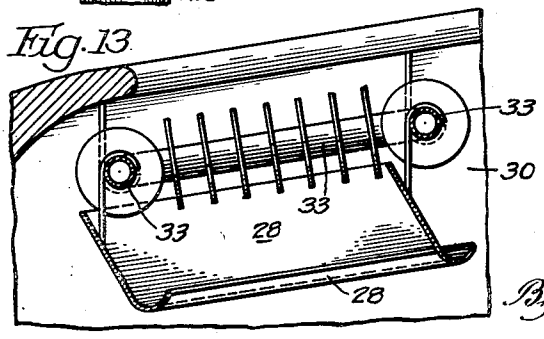
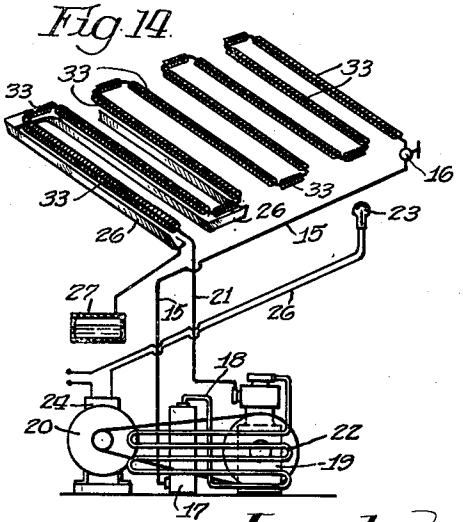


Fig. 14.



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Patented May 21, 1935 2,002,234

UNITED STATES PATENT OFFICE

2,002,234

AIR COOLING AND CIRCULATING DEVICE AND PROCESS

Willard L. Morrison, Lake Forest, Ill.

Application March 5, 1934, Serial No. 713,993

10 Claims. (Cl. 62—176)

This invention relates to an air cooling and circulating device and process and has for its object to provide a new and improved device of this description.

The invention is particularly adapted to be used in cooling and circulating air in a portion of any room or compartment in any building. In attempting to cool rooms of buildings great difficulties are presented, due, among other things to the fact that there is stored heat in the walls of the rooms which must be gotten rid of before any important cooling effect is produced in the room. In many instances these walls are capable of holding or storing a large amount of heat or heat units. One of the objects of the present invention is to provide a means for cooling a portion of the room without the necessity of removing the stored heat in these walls.

In a room of a building the warm air is at the top, and in attempting to cool the entire room it becomes necessary to cool this warm air at the top, which adds greatly to the difficulty and the expense of cooling the room. Another object of the present invention is to avoid this difficulty and expense.

In cooling rooms another difficulty is in securing a circulation of the air without great loss of the cooling effect. Another object of the present invention is to provide means whereby this difficulty is eliminated.

Another difficulty presented in cooling rooms is the noise due to the air moving devices which are used. Another object of the present invention is to do away with this noise and the other objectionable features of air moving devices apart from the cooling apparatus.

The invention has as a further object to distribute cooling air through the agency of the cooling coil. The invention has other objects which are more particularly pointed out in the accompanying description.

Referring now to the drawings, Fig. 1 is a view showing one form of the device embodying the invention with the walls of the room in section;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3;

Fig. 5 is an enlarged fragmentary view of the upper corner of the device illustrated in Fig. 4;

Fig. 6 is a diagrammatic view showing the circulatory system for the refrigerant used in connection with the device;

Fig. 7 is a side elevation of one form of device embodying the invention, particularly adapted to be used as a bed;

Fig. 8 is a plan view of the device shown in Fig. 7;

Fig. 9 is a sectional view taken on line 9—9 of Fig. 7;

Fig. 10 is a sectional view taken on line 10—10 of Fig. 8;

Fig. 11 is a sectional view taken on line 11—11 of Fig. 8 with parts omitted;

Fig. 12 is an enlarged fragmentary view showing one corner of the device illustrated in Fig. 8 with parts broken away;

Fig. 13 is a sectional view taken on line 13—13 of Fig. 12;

Fig. 14 is a diagrammatic view showing the circulating circuit of the refrigerant;

Fig. 15 shows a modified construction.

Like numerals refer to like parts throughout the several figures.

Referring now to the drawings, I have illustrated in Figs. 1 to 6 and 15 a construction particularly adapted for use in a room of any building. In this construction there is provided on the inside of the room a receptacle having four sides of walls 1, 2, 3 and 4 of heat insulating material, which are separated from the walls 5, 6, 7, 8 of the room by suitable air spaces, the size of the air spaces depending upon the size of the receptacle desired. These walls may be made of any suitable heat insulating material and may be made thin and are preferably transparent. They may be made of any suitable transparent material, preferably of some thin transparent material, and double walls are preferably used with air spaces between them. These walls, therefore, have substantially no stored heat to be gotten rid of. The bottom of the receptacle is preferably of heat insulating material and there may be a bottom made for the purpose, or the receptacle may be set upon a rug or carpet, particularly if the rug or carpet has a mat under it. The receptacle is open at the top and does not extend up to the top or ceiling of the room, there being a considerable space between the top of the receptacle and the top of the room.

The receptacle may be provided with some suitable means for entering and leaving it, such as the door 9. The receptacle is cooled by some cooling agency, which may be any of the cooling agencies now in use. This cooling agency or

refrigerant is passed through pipes 10 located preferably at the upper part of the receptacle.

I prefer to have each room a unit. I further prefer to have each receptacle provided with a refrigerating apparatus for cooling the cooling agency so that the rooms in a house will be independent of each other and only the rooms used require the apparatus to be in operation. This refrigerating apparatus may be of any of the usual types and may be located at any desired point, and I have indicated a chamber 11 into which it may be received, this chamber being separated from the compartment by the heat insulating walls 12.

The pipes 10 may be arranged in any desired manner, depending upon the conditions presented. In Figures 1 to 6 I have shown a construction where the cooling pipes are arranged around the compartment near the walls thereof, leaving the central space entirely open.

In Figure 15 I have shown a construction where the pipes 10a extend back and forth across the room at its upper part. When the cooling agent passes through these pipes it cools the air in the upper part of the receptacle, and this cooled air drops by gravity down into the bottom of the receptacle. The warm air passes up through the open top of the receptacle and out into the room. It will be seen that by means of this construction there is produced a circulation of air without fans or other air moving devices, the air being moved by the cooling apparatus itself, the cold air dropping by gravity down to the bottom of the receptacle, and the warm air rising and passing out of the top of the receptacle. It will thus be seen that a complete circulation of the air is secured without fans, without air moving devices and without the noise and expense associated therewith. I have therefore used the cooling coils and the force of gravity to cause the dropping of the air into the receptacle, and this displaces the warmer air so that it will move up and move out the open top of the receptacle.

The room into which the receptacle is received may be provided with one or more doors 13, and one or more windows 14, that is it may be a normal ordinary room of the kind now in use.

I have illustrated diagrammatically in Fig. 6 the circulatory system. In this system the pipes 10 and 10a constitute the cooling element, and this cooling element is connected by a pipe 15 which is provided with an expansion valve 16 and which connects with the tank 17. The tank 17 is connected by a pipe 18 with the compressor 19 which is operated by a suitable motor 20. The cooling element or pipe 10 or 10a is connected by a pipe 21 with the compressor 19, and the compressor 19 is connected with the condenser element 22, which in turn is connected to the tank 17.

I prefer to provide some automatic means of starting and stopping the motor responsive to the conditions in the receptacle. This may be accomplished by a thermostat 23 which controls a switch 24 in the electric circuit 25 of the motor, which turns the motor off and on as desired.

I prefer to provide some means for catching the moisture that may be produced by condensing the vapor in the air, and for this purpose I may provide under the pipes 10 and 10a the troughs or other water catching devices 26 which are arranged to carry the moisture down into a receptacle 27. I prefer to have these troughs at a distance below the pipes and connected to the pipes by means of an inclined wall 28 so as to provide a minimum interference with the dropping of the air when cooled, to the bottom of the receptacle. The pipes 10 and 10a are fastened to the receptacle by suitable fastening devices which support them in proper position.

It will be seen that by means of this construction it is unnecessary to remove the stored heat in the walls of the room and it is only necessary to cool a portion of the room and it is not necessary to cool the warm air at the top of the room, it only being necessary to cool air in the upper part of the receptacle as required to secure the proper cooling and circulating effect. This construction, therefore, can be made separately and may be set up in the room and will be made the size desired and can be taken down and removed when used in a climate having a winter season. It will further be seen that the cool air at the bottom of the receptacle cannot escape until it becomes warm, so as to rise or until the supply of cold air is sufficient to force it out, like the overflow of water in a receptacle.

This receptacle may be used in offices to enclose the desk and chairs of the individuals using the office, or in living rooms to enclose the seat-devices, or in dining rooms to enclose the chairs and table, or in other kinds of rooms, including assembly rooms, theatres and the like.

In Figures 7 to 14 there is illustrated a construction particularly adapted to be used as a bed. In this construction there are the four walls of insulating material 29, 30, 31 and 32. These walls fit down over the mattress so that the mattress acts as a seal. The walls 30 and 32 may be doors for easy access to the receptacle. The receptacle is open at the top and the cooling pipes 33 are arranged in the upper part thereof and as herein shown extend back and forth across the receptacle. The pipe 33 forms the cooling element through which the cooling material or refrigerant passes. In this construction I prefer to have the part of the receptacle at the head of the bed just over the head of the occupant, free from the pipe so that the cold air will not drop down upon the face and head of the occupant. This space also provides a space through which the warm air, produced by the breathing of the occupant, may easily pass up out of the open upper end of the receptacle. In this construction the air in the upper part of the receptacle is cooled by the pipe 33 and drops down into the receptacle, and the warmer air passes up out of the open top of the receptacle. In this construction I also provide the water trough or catching device 26 located below the pipe so that any moisture condensed by the pipe may be passed down into a receiving receptacle. Instead of having the pipe extending crosswise of the receptacle, it may be arranged around the edge, as shown in Fig. 1, or in any other desired manner, the condition necessary being that the cooling pipe shall be in the upper part of the receptacle so that the air cooled thereby will drop by gravity down to the bottom of the receptacle and the warm air will move up out of the open top of the receptacle.

I have illustrated diagrammatically in Fig. 14 the circulatory circuit of this device, which is similar to that shown in Fig. 6, and I have applied similar reference numerals thereto. The pipes which form the cooling elements may be formed and arranged in any desired manner and may be provided with fins or other means for increasing their cooling capacity. I may also provide a series of these pipes running parallel

to each other to increase the cooling capacity, as illustrated in Figs. 8 and 15. It will further be seen that I have here a process of cooling a room which consists in isolating a portion of the air in the lower part of the room, cooling the upper portion of the isolated air so that it will drop by gravity to the bottom of the isolated portion, the warmer portion of the isolated air being moved up out of the isolated area. The pipes also act as strengthening elements to strengthen the structure.

I claim:

1. An air cooling and circulating device comprising a receptacle having a plurality of sides and a closed bottom and open at the top, means in the upper part of the receptacle for cooling the air so as to cause it to drop by gravity into the bottom of the receptacle, the warmer air passing up out of the open top of the receptacle.

2. An air cooling and circulating device for rooms, which consists in a receptacle smaller than the interior of the room and having a plurality of insulating walls and a bottom and open at the top, the walls and the top being separated from the walls and ceiling of the room by air spaces, means for cooling and circulating air in said receptacle, comprising a pipe in the upper part of the receptacle through which cooling material passes and which cools the air in the upper part of the receptacle and causes it to drop by gravity to the bottom of the receptacle, the warmer air passing up and escaping through the open top of the receptacle.

3. An air cooling and circulating device for rooms, which consists in a receptacle smaller than the interior of the room and having four insulating walls and a bottom and open at the top, the walls and the top being separated from the walls and ceiling of the room by air spaces, means for cooling and circulating air in said receptacle, comprising a pipe in the upper part of the receptacle through which cooling material passes and which cools the air in the upper part of the receptacle and causes it to drop by gravity to the bottom of the receptacle, the warmer air passing up and escaping through the open top of the receptacle, a refrigerating apparatus with which said pipe is connected, the receptacle and the refrigerating apparatus forming an independent unit.

4. An air cooling and circulating device for rooms, comprising a receptacle smaller than the interior of the room and provided with a plurality of walls of insulating material, and open at the top and closed at the bottom, the open top being separated from the ceiling of the room by a space, means for circulating a cooling agent in the upper part of said receptacle so as to cool the air and cause it to drop by gravity into the bottom thereof and cause the warm air to move up out of the open top of the receptacle.

5. An air cooling and circulating device for rooms of buildings, comprising an air isolating compartment of insulating material open at the top for isolating a portion of the air of the room, and means for cooling the upper portion of said isolated air to cause it to drop to the bottom, the warmer air passing up and escaping at the top.

6. The process of cooling and circulating air, which consists in isolating a portion of air in a defined area open at the top and confining the bottom portion of said air against downward and sidewise movement out of said defined area, cooling air and causing it to drop by gravity into the bottom of said defined area and to displace warmer air, and causing said warmer air to rise and pass out at the open top of said defined area.

7. A device for cooling and circulating air in a segregated portion of a room, comprising a cooling receptacle for cooling human beings, said receptacle being open at the top, means for filling said receptacle with artificially cooled air so that the cooled air displaces warmer air and causes said warmer air to pass up out of the open top of said receptacle whereby the air warmed by the human being in said receptacle is displaced by the cooler air and passes out of the open top of said receptacle and the interior of said receptacle around said human being is maintained in a cooled condition.

8. An air cooling and circulating device comprising a compartment for receiving human beings, open at the top and, located in a room and having walls spaced away from the walls of the room so as to be substantially independent of the stored heat in the walls of the room, a refrigerating apparatus for cooling said compartment, and means for utilizing said refrigerating apparatus to produce circulation of air through said compartment and the portion thereof where the human beings are received.

9. An air cooling and circulating device comprising a compartment for receiving human beings, said compartment being closed at the bottom and open at the top, a refrigerating apparatus, having a cooling element in the upper part of said compartment, which cools air and discharges it by gravity into the bottom portion of said compartment where the human beings are to be received, the warmer air being free to rise to the upper part of the compartment separate from the cool air and pass out of the compartment, the cooling element being located at substantially the same height as the edge of the compartment at the open top.

10. An air cooling and circulating device comprising a room for receiving human beings, said room open at the top, a cooling element which takes air from outside said room and cools such air and discharges it by gravity into the bottom portion of said room, where the human beings are to be received, the warm air and impurities exhaled in the breath of the human beings being free to rise to the upper part of said room, separate from the cool air, and pass out at the open top, due to the difference in weight between them and the cool air, the movement of the cool air and warm air and impurities and the escape of said warm air and impurities from the room being produced solely by differences in weight between the warm air and impurities, and the cool air, the lower portion of said room being closed at the sides and bottom to prevent the escape of cool air therethrough.

WILLARD L. MORRISON.

DISCLAIMER

2,002,234.—*Willard L. Morrison*, Lake Forest, Ill. AIR COOLING AND CIRCULATING DEVICE AND PROCESS. Patent dated May 21, 1935. Disclaimer filed January 8, 1938, by the patentee.

Hereby disclaims from claim 6 of the said Letters Patent all processes except such where the cooling of the air which is dropped by gravity into the bottom of the defined area in which the portion of the air is isolated is "cooled at the top of said defined area, so that the movement of the air into the defined area is produced entirely by the cooling thereof at the top of the defined area," as is illustrated in all the figures of the drawings; and also disclaims from claim 7 of the said Letters Patent all devices for cooling and circulating air in a segregated portion of a room, except such devices where the means for filling the receptacle with artificially cooled air, so that the cooled air displaces warmer air and causes the warmer air to pass out of the open top of the receptacle, "consists of a means located at the top of receptacle" of the type illustrated in all the figures of the drawings, "which cools the air at the top of the receptacle and which forms the only means of circulating the air in the receptacle."

[*Official Gazette February 8, 1938.*]