C. E. BEERY.

METHOD OF HEATING AND VENTILATING BUILDINGS.

APPLICATION FILED MAY 7, 1912.

1,069,103. Patented Aug. 5, 1913.

Fig. 1.

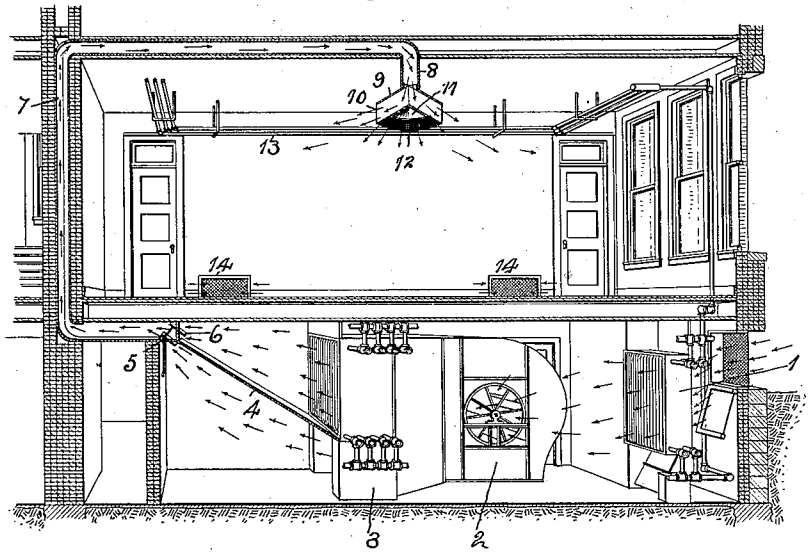


Fig. 3.

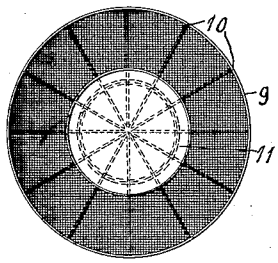


Fig. 4.

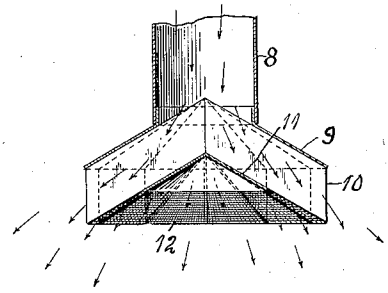
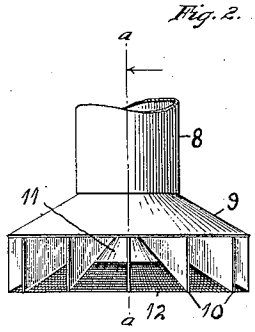


Fig. 2.



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UNITED STATES PATENT OFFICE.

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METHOD OF HEATING AND VENTILATING BUILDINGS.

1,069,103. Specification of Letters Patent. Patented Aug. 5, 1913.

Application filed May 7, 1912. Serial No. 695,745.

To all whom it may concern:

Be it known that I, CLINTON E. BEERY, a citizen of the United States, residing at Rockford, in the county of Winnebago and the State of Illinois, have invented certain new and useful Improvements in Methods of Heating and Ventilating Buildings, of which the following is a specification.

The object of this invention is to provide a method of heating and ventilating a room or building so that a uniform distribution and supply of air is imparted to a room, and more particularly to that portion of the room known as the breathing level or zone, in which zone the circulation of air shall be downward in a substantially vertical direction, at all points in the room, and shall be free from lateral air currents; the heating of the room being effected by indirectly heating the supply of incoming breathing air and by directly heating the stratum of air at the upper portion of the room.

The further object of this invention is to maintain a uniform temperature in the upper stratum of air in the room by means of direct radiation, and to supply to the room at a central point or at central points and immediately below this upper stratum and above the breathing zone, pure heated air of a slightly lower temperature than that of the upper stratum, and which is increasing in density at the moment of discharge, thereby presenting a breathing zone of pure and uniformly heated air without perceptible currents of air, by creating an imperceptible movement of the air in only one direction and that downward to exits at the base of the room.

The further object of this invention is to maintain, without creating perceptible drafts of air currents and with a minimum of difference in temperature between the air in the upper stratum of the room and the portions of the room below such stratum, a uniform temperature in pure air at a given distance (breathing zone) from the floor, in all portions of the room, where mechanical ventilation to supply large quantities of air is desirable, such as assembly halls, school rooms, etc.

The further object is to minimize both the supply of incoming breathing air and the temperature at which said air shall be heated, by the maintaining of a stratum of air at the upper portion or ceiling of the room at a higher degree of uniform temperature than that of the incoming breathing air.

These objects are attained with the cooperation of mechanical means for heating the air by both direct and indirect radiation and maintaining a forced supply of breathing air and a forced exhaust thereof. In the upper portion of the room and at a distance from the ceiling is located a direct heating device which maintains the upper stratum of air in the room heated at a uniform temperature. Fresh air taken from the outside atmosphere is heated by indirect means and forced by mechanical means through ducts to a distributing dome or plurality of domes located at points below the upper stratum of heated air, the dome being adapted to distribute this heated breathing air of a lower temperature than that of the upper stratum, to all points of the room and above the breathing level of the room. The breathing air thus evenly distributed over the breathing zone will pass downward through said zone and pass out of the room at exits located at or adjacent the floor level and below the breathing zone; this downward discharge of air being the result of the forced supply of air, the change of density of the incoming air partly affected by the heated stratum of upper air, and the particular location of the exits themselves.

In the accompanying drawings: Figure 1 is a vertical section in perspective showing the arrangement of apparatus of my improved method of heating and ventilating rooms or apartments. Fig. 2 is an elevation of the air admitting dome. Fig. 3 is an underface representation of the dome. Fig. 4 is a vertical section through the dome.

At Fig. 1 is shown the basement of a compartment and a room located over the basement. Within the basement are located the indirect means for heating the air in its passage from the outside to the room and comprises the tempering stack 1, a fan or blower 2, and a reheater 3. The fan or blower passes a portion of the air through the re-heater and a portion below the reheater. The partition 4 separates the air delivered by the fan or blower, and the dampers 5 and 6 are operated automatically

by a thermostat not shown placed in the room to be heated. The mixed air is conducted by a conduit 7 to the center of the ceiling of the room to be heated, and to its depending portion 8 is connected an air distributing dome which may be of a suitable construction, here shown as a dome comprising an inverted cone 9 to the inside of which are secured radial partitions 10. A small inverted cone 11 is located at the apex of the partitions, and a screen 12 extends from this cone to the end of the partitions.

The air distributing dome above described is located either in the center of the room or in the center of a predetermined zone, through which the air is to be passed.

Radiators furnishing direct heating means are suspended from the ceiling of the room to be heated and are located some distance from the walls of the room. Heat is supplied to the radiators in any suitable manner, and in this instance connections are made with the piping of the tempering stack 1 supplying steam. The room is provided with air outlets 14 located at or adjacent the floor level of the room.

The operation of the apparatus and method of heating and ventilating is as follows: The temperature at which the breathing air is to be admitted and at which the upper stratum of air is to be maintained, varies proportionally of course, according to the outside temperature and must be regulated thermostatically. Also it must be understood that the doors and windows are not to be left open while the heating and ventilating process is in operation, as this would interfere with the functions of the several devices. To get an understanding of the relative temperatures at the various points in the system, it will be presumed that the outside temperature is 2 degrees below zero. The direct heating means furnished by the radiators suspended from the ceiling may be supplied with heat by either steam, hot-water or electricity, and in this instance will maintain the upper stratum of air at a temperature of about 78°. Fresh air is drawn from the outside atmosphere through the tempering stack 1, a portion thereof forced through the reheater 3 and through duct 7 to be discharged from the dome which is located just below the upper stratum of air, this air being discharged at about 73°. The radial partitions in the dome divide the air so that it will be distributed evenly over the floor area of the room and above the breathing zone. Since the velocity of the incoming heated air is downward, this downward movement will be further maintained because of the upper bank of warmer air and also because of the changing density of the air as it encounters the colder lower portions of the room, thus maintaining the temperature at the breathing zone at about 68° or 70°. Furthermore, the passage of the breathing air through the breathing zone is downward at all points in the room and free from any perceptible lateral currents, thus giving an absolute sense of proportion in the temperature and supply of the air. The air is then discharged below the breathing zone through exits at or adjacent the floor level of the room.

It will be seen that with the passage of the air always downward at the breathing zone, fresh breathing air is insured to every individual and there is no passage of vitiated air from one person to another as in the commonly used system where the plan is mostly lateral distribution.

It is evident that the nearer the temperature of the admitted air is to the temperature of the air required for use at the breathing zone, the better will be the quality of the breathing air. Without the upper stratum of heated air, the breathing air would have to be heated to a much higher temperature in order to heat the room and a much greater volume of air admitted, furthermore, a very unsatisfactory system of heating and ventilation would result. In my improved method the upper bank of heated air, through radiation, co-acts in heating the room, minimizes the temperature to which the breathing air must be heated, and diminishes the amount of space in the room to be heated and ventilated to a minimum. To further perfect the method of downward uniform distribution of air through the breathing zone it is necessary that the exits shall be spaced proportionally about the room at the floor level, and shall have equal resistances to the inside pressure of air. It is evident that with unequal resistances there will be a slight lateral shift in the downward movement of air and toward the exit of the least resistance.

I claim as my invention:

1. The method of heating and ventilating a room or building, which consists in maintaining the uppermost stratum of air therein in a heated condition, introducing a warm air supply at a temperature lower than that of the stratum, into the upper portion of the room adjacent to said stratum, causing said air supply to pass downward from the heated stratum to the lower portion of the room, and removing said air from said lower portion.

2. The method of heating and ventilating a room or building, which consists in maintaining the uppermost stratum of air therein in a heated condition, introducing a warm air supply at a temperature lower than that of the stratum, into the upper portion of the room adjacent to said stratum, diffusing said air supply along the under side of the said stratum, causing said dif-

fused air supply to pass downward from the heated stratum to the lower portion of the room in substantially vertical lines, and removing said air from said lower portion.

3. The method of heating and ventilating a room or building, which consists in maintaining the uppermost stratum of air therein in a heated condition, introducing a warm air supply at a temperature lower than that of the stratum, into the upper portion of the room adjacent to the said stratum and centrally of a predetermined zone thereof, diffusing said air supply along the under side of the said stratum, causing said diffused air supply to pass downward from the heated stratum to the lower portion of the room, and removing said air from said lower portion.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CLINTON E. BEERY.

Witnesses:
A. O. BEHEL,
E. D. E. N. BEHEL.