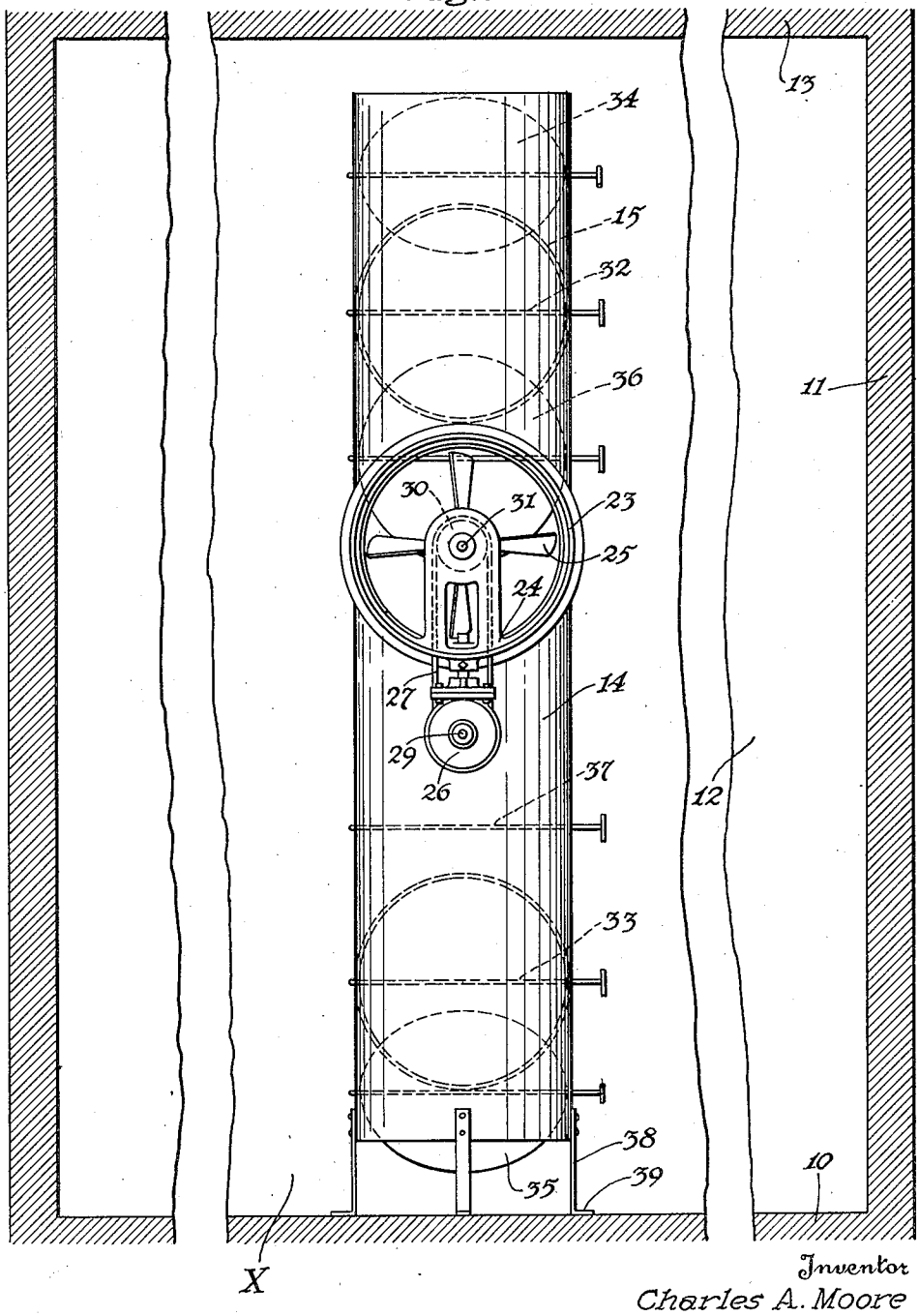
May 10, 1932. C. A. MOORE 1,858,024

VENTILATING AND AIR CIRCULATING DEVICE

Filed Sept. 17, 1930 3 Sheets-Sheet 1

Fig. 1



Inventor
Charles A. Moore

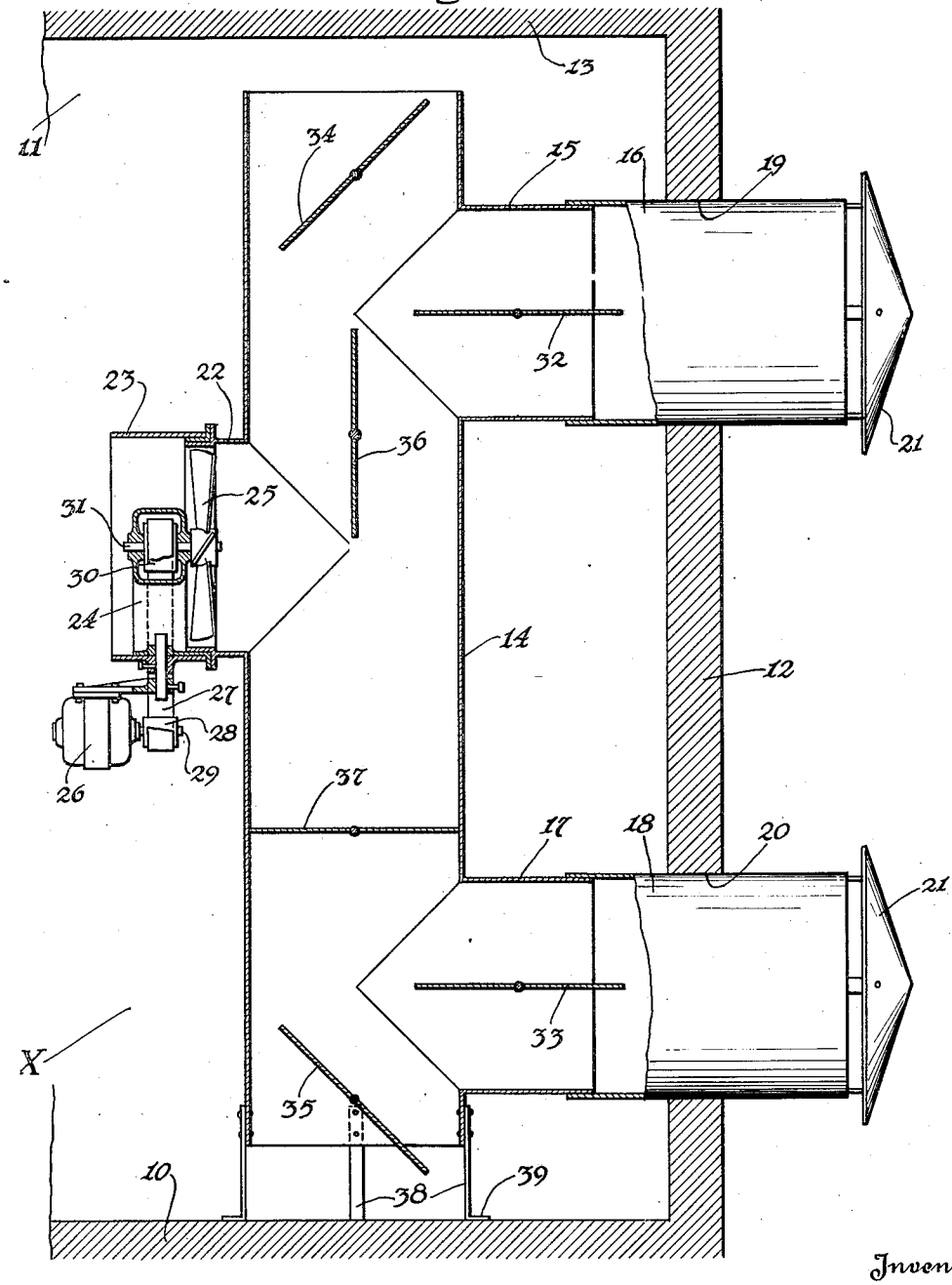
By Cancel & Pagaard
Attorneys

May 10, 1932. C. A. MOORE 1,858,024

VENTILATING AND AIR CIRCULATING DEVICE

Filed Sept. 17, 1930 3 Sheets-Sheet 2

Fig. 2



Inventor

Charles A. Moore

By Cowell & Kagaard

Attorneys

May 10, 1932. C. A. MOORE 1,858,024

VENTILATING AND AIR CIRCULATING DEVICE

Filed Sept. 17, 1930 3 Sheets-Sheet 3

Fig. 3

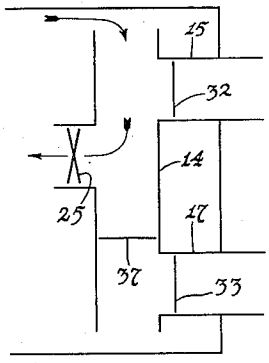


Fig. 4

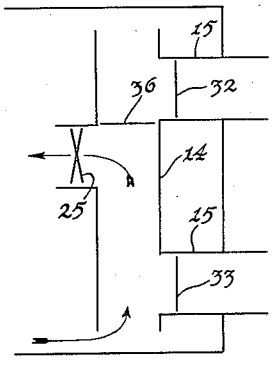


Fig. 5

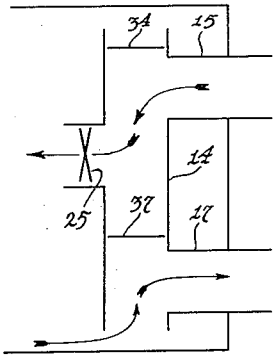


Fig. 6

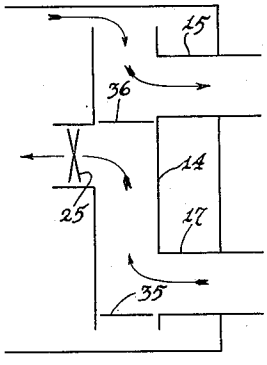


Fig. 7

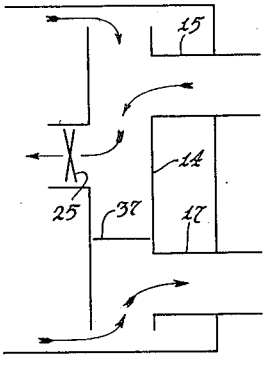


Fig. 8

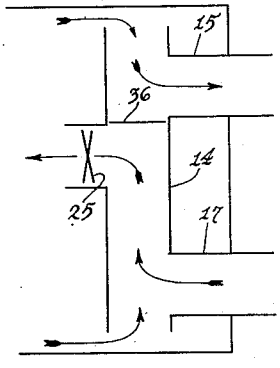


Fig. 9

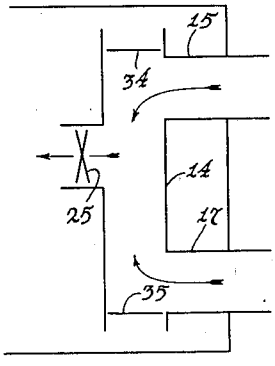
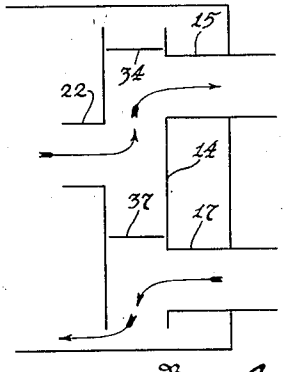


Fig. 10



Inventor

Charles A. Moore

By Cancell & Lagaard

Attorneys

Patented May 10, 1932

1,858,024

UNITED STATES PATENT OFFICE

CHARLES A. MOORE, OF EDINA, MINNESOTA

VENTILATING AND AIR CIRCULATING DEVICE

Application filed September 17, 1930. Serial No. 482,632.

My invention relates to ventilating and air circulating devices, an object thereof being to provide an improvement in such devices for storage rooms, workshops or chambers of any kind, wherein ventilation is desired in conjunction with an established circulation of air and the conditioning thereof, as by varying the relative percentage of humidity.

Another object is to provide an exceedingly simple and inexpensive device of the present nature capable of ready adjustment to produce a wide range of results meeting any of the various demands which may be placed upon a device of this character in any of the many places in which it may be installed.

A further object is to provide a device, as above, for effecting, in a simple manner, the forced circulation of air within a chamber, and for ventilating the chamber through a forced ingress and egress of air, a still further object being to supply such a device, wherein various movements of air may be effected by gravity alone, or by force in conjunction and in harmony with gravity.

With the foregoing and other objects in view, which will appear in the following description, the invention resides in the novel combination and arrangement of parts and in the details of construction hereinafter described and claimed.

In the drawings, Fig. 1 is an elevational view of a device embodying my invention, the same being illustrated as installed in a chamber of a building structure; Fig. 2 is a longitudinal central sectional view of said device and Figs. 3 to 10 inclusive are diagrammatical views thereof.

In the drawings, I have shown a building structure comprising a floor 10, side walls 11, end walls 12 and a ceiling 13, which provide a chamber X. The ventilating and air circulating device illustrated as installed in said chamber includes an upright main pipe 14, the upper end of which falls short of the ceiling 13 of the chamber X, the lower end thereof being disposed slightly above the floor 10 of said chamber. Issuing horizontally from the upper portion of said main pipe 14 is an upper branch pipe 15, a thimble 16 being fitted thereto and forming an extension thereof. Issuing horizontally from the lower portion of the main pipe 14 is a lower branch pipe 17 fitted with a thimble 18 forming an extension therefor. Said thimbles 16 and 18 extend through openings 19 and 20 in an end wall 12 of the building structure, each of said thimbles being provided at its outer end with a jack 21 of conventional design. Issuing horizontally from the main pipe 14, substantially medially thereof, and in relation diametrically opposed to that of the upper and lower branch pipes 15 and 17 is an intermediate branch pipe 22 over the end of which is fitted an extension sleeve 23. Mounted within said intermediate branch pipe 22 is a fan support 24 in which a fan 25 is revolubly mounted. A motor 26, suspended beneath the sleeve 23, drives said fan 25 through a belt 27 reaching from a pulley 28 on the motor shaft 29 to a pulley 30 on the fan shaft 31. The motor 26 is of the reversible type, but ordinarily in the use of my invention, rotates to revolve the fan 25 in a direction to draw air from the main pipe 14 and force it outwardly into the interior of the chamber X.

The upper and lower branch pipes 15 and 17 are respectively fitted with dampers 32 and 33. Within the main pipe 14 and above the junction therewith of the upper branch pipe 15 is a damper 34. Also within said main pipe 14 and beneath the junction therewith of the lower branch pipe 17 is a damper 35. Also within said main pipe 14 and between the junctions therewith of the upper branch pipe 15 and the intermediate branch pipe 22 is a damper 36. And, further, within said main pipe 14 and between the junctions therewith of the intermediate branch pipe 22 and the lower branch pipe 17 is a damper 37, all of said dampers 32, 33, 34, 35, 36 and 37 having operating handles therefor accessible from one side of the device.

Supporting the main pipe 14 are a number of legs 38 which are secured at their upper ends to the lower marginal portion of said pipe and which are formed at their lower ends with feet 39 having their footing on the floor 10 of the chamber X.

The thimbles 16 and 18 are snugly fitted in the openings 19 and 20 of the end wall 12 and likewise snugly fitted over the ends of the upper and lower branch pipes 15 and 17, said thimbles serving to steady the device in its upright position.

In applying my device to a chamber, it is preferably arranged near one of the end walls medially thereof. In thus locating the device, the air impelled from the main pipe 14 by the fan 25 is directed along the chamber medially longitudinally thereof in space which is ordinarily free from obstructions and which, in storage rooms, is ordinarily used as a central trucking passageway or aisle.

Any of numerous results may be secured in the operation of my improved device, some of the principal uses thereof being illustrated in the diagrammatical figures of the drawings numbered 3 to 10 inclusive. In illustrating the various damper adjustments in these various views, I have shown in each instance only such of the dampers as necessarily must be closed. The remaining dampers, which properly would be fully and partially opened, have been omitted to simplify the illustration.

With the dampers adjusted as shown in Fig. 3, the device serves as a recirculator, the air being drawn into the main pipe 14 at the upper portion of the chamber and expelled therefrom by the fan 25. Under the adjustment of valves shown in Fig. 4, the device also serves as a recirculator, the air in this instance being drawn into the main pipe 14 from the lower portion of the chamber. This latter adjustment of valves (Fig. 4) may be preferred over the adjustment (Fig. 3) first noted, under conditions where it is advisable to take into the main pipe 14 the relatively cold dry air from the floor rather than the relatively warm humid air at the ceiling. But, in instances where there is no such choice, both of the dampers 36 and 37 may be left open in the air recirculating process.

In adjusting the dampers as indicated in Fig. 5, the chamber is ventilated, the coldest driest air being exhausted from the chamber at the lower portion thereof. In the event that it is colder within the chamber than without, gravity assists in the forced ventilating process and, if desired, the fan 25 may be stopped and the ventilation carried on by gravity alone.

In Fig. 6, the indicated adjustment of dampers provides for forced ventilation, the warmest and most humid air being exhausted from the upper portion of the chamber. In case it is warmer inside than outside, the fan 25 is assisted by gravity in carrying on ventilation and, if desired, the fan may be stopped and ventilation effected by gravity alone.

Ventilation and recirculation combined is carried on with an adjustment of the dampers as illustrated in Figs. 7 and 8, the air, in the first instance, being exhausted from the floor of the chamber and, in the second instance, being exhausted from the ceiling thereof.

With an adjustment of the dampers, as indicated in Fig. 9, fresh air is forced into the chamber and the internal pressure built up. This condition, in some cases, is desired, ventilation being accomplished through the exhaustion of air from the chamber by leakage.

With the dampers set as indicated in Fig. 10 and the fan stopped, and with the temperature inside of the chamber higher than that outside thereof, ventilation is effected by gravity alone, the air in such case being exhausted from the chamber proper through the intermediate branch pipe 22. In thus taking the air from intermediate strata, as distinguished from the upper strata at the ceiling, the relative percentage of humidity in the air within the chamber is conserved.

Changes in the specific form of my invention, as herein disclosed, may be made within the scope of what is claimed without departing from the spirit of my invention.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

I claim:

1. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper end with the upper portion of the chamber and at its lower end with the lower portion of said chamber, legs supporting said main pipe, an upper branch pipe issuing from the upper portion of the main pipe through a wall of said structure and communicating with the outer atmosphere, a damper in said upper branch pipe, a lower branch pipe issuing from the lower portion of said main pipe through a wall of said structure and communicating with the outer atmosphere, a damper in said lower branch pipe, said branch pipes serving to steady said main pipe, an intermediate branch pipe issuing from the main pipe between the levels of said upper and lower branch pipes and communicating with the interior of the chamber, a fan within said intermediate branch pipe adapted to draw air from the main pipe and force it into the interior of the chamber, a motor mounted on the intermediate branch pipe for driving said fan, a damper disposed in the main pipe between the upper end thereof and the junction therewith of the upper branch pipe, another damper disposed in the main pipe between the lower end thereof and the junction therewith of the lower branch pipe, another damper disposed in said main pipe between the junction therewith of the upper and intermediate branch pipes, and another damper disposed in said pipe between the junctions

therewith of said intermediate branch pipe and the lower branch pipe.

2. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper end with the upper portion of the chamber and at its lower end with the lower portion of said chamber, an upper branch pipe issuing from the upper portion of the main pipe through a wall of said structure and communicating with atmosphere outside of said chamber, a damper in said upper branch pipe, a lower branch pipe issuing from the lower portion of said main pipe through a wall of said structure and communicating with atmosphere outside of said chamber, a damper in said lower branch pipe, an intermediate branch pipe issuing from the main pipe between the levels of said upper and lower branch pipes and communicating with the interior of the chamber, a fan within said intermediate branch pipe adapted to draw air from the main pipe and force it into the interior of the chamber, a damper disposed in the main pipe between the upper end thereof and the junction therewith of the upper branch pipe, another damper disposed in the main pipe between the lower end thereof and the junction therewith of the lower branch pipe, another damper disposed in said main pipe between the junctions therewith of the upper and intermediate branch pipes and another damper disposed in said pipe between the junctions therewith of said intermediate branch pipe and the lower branch pipe.

3. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper end with the upper portion of the chamber and at its lower end with the lower portion of said chamber, an upper branch pipe issuing from the upper portion of the main pipe and communicating with the outer atmosphere, a lower branch pipe issuing from the lower portion of said main pipe and communicating with the outer atmosphere, a damper disposed in the main pipe between the upper end thereof and the junction therewith of the upper branch pipe, a second damper disposed in the main pipe between the lower end thereof and the junction therewith of the lower branch pipe, a third damper disposed in said main pipe beneath the junction therewith of the upper branch pipe, and a fourth damper disposed in said pipe above the junction therewith of said lower branch pipe, said main pipe having an opening therein bringing the same into communication with the interior of the chamber at a point between said third and fourth dampers.

4. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper end with the upper portion of the chamber and at its lower end with the lower portion of said chamber, an upper branch pipe issuing from the upper portion of the main pipe and communicating with the outer atmosphere, a lower branch pipe issuing from the lower portion of said main pipe and communicating with the outer atmosphere, a damper disposed in the main pipe between the upper end thereof and the junction therewith of the upper branch pipe, a second damper disposed in the main pipe between the lower end thereof and the junction therewith of the lower branch pipe, a third damper disposed in said main pipe beneath the junction therewith of the upper branch pipe, and a fourth damper disposed in said pipe above the junction therewith of said lower branch pipe, said main pipe having an opening therein bringing the same into communication with the interior of the chamber at a point between said third and fourth dampers, and a fan for impelling air from said main pipe, through said opening, into said chamber.

5. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper end with the upper portion of the chamber and at its lower end with the lower portion of said chamber, an upper branch pipe issuing from the upper portion of the main pipe through a wall of said structure and communicating with the outside atmosphere, a damper in said upper branch pipe, a lower branch pipe issuing from the lower portion of said main pipe through a wall of said structure and communicating with the outside atmosphere, a damper in said lower branch pipe, an intermediate branch pipe issuing from the main pipe between the levels of said upper and lower branch pipes and communicating with the interior of the chamber, a fan within said intermediate branch pipe adapted to draw air from the main pipe and force it into the interior of the chamber, and means for selectively obstructing the passageway within said main pipe between the junctions therewith of the upper and intermediate branch pipes and between the junctions therewith of said intermediate branch pipe and the lower branch pipe.

6. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper end with the upper portion of the chamber and at its lower end with the lower portion of said chamber, an upper branch pipe issuing from the upper portion of the main pipe through a wall of said structure and communicating with the outside atmosphere, a lower branch pipe issuing from the lower portion of said main pipe through a wall of said structure and communicating

with the outside atmosphere, an intermediate branch pipe issuing from the main pipe between the levels of said upper and lower branch pipes and communicating with the interior of the chamber, a fan within said intermediate branch pipe adapted to draw air from the main pipe and force it into the interior of the chamber, and means for selectively obstructing the passageway within said main pipe between the junctions therewith of the upper and intermediate branch pipes and between the junctions therewith of said intermediate branch pipe and the lower branch pipe.

7. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper end with the upper portion of the chamber and at its lower end with the lower portion of said chamber, an upper branch pipe issuing from the upper portion of the main pipe and communicating with the outer atmosphere, a lower branch pipe issuing from the lower portion of said main pipe and communicating with the outer atmosphere, said main pipe having an opening therein bringing the same into communication with the interior of the chamber at an elevation between the junctions of said main pipe with said upper and lower branch pipes, and means for obstructing the passageway within said main pipe between said opening and one of said branch pipes.

8. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper end with the upper portion of the chamber and at its lower end with the lower portion of said chamber, an upper branch pipe issuing from the upper portion of the main pipe and communicating with the outer atmosphere, a lower branch pipe issuing from the lower portion of said main pipe and communicating with the outer atmosphere, said main pipe having an opening therein bringing the same into communication with the interior of the chamber at an elevation between the junctions of said main pipe with said upper and lower branch pipes, and means for obstructing the passageway within said main pipe between said opening and one of said branch pipes, and means for obstructing said passageway between the other branch pipe and the adjacent end of said main pipe.

9. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper end with the upper portion of the chamber and at its lower end with the lower portion of said chamber, an upper branch pipe issuing from the upper portion of the main pipe and communicating with the outer atmosphere, a lower branch pipe issuing from the lower portion of said main pipe and communicating with the outer atmosphere, said main pipe having an opening therein bringing the same into communication with the interior of the chamber at an elevation between the junctions of said main pipe with said upper and lower branch pipes, means for obstructing the passageway within said main pipe between said opening and one of the branch pipes, and means for obstructing the passageway within one of said branch pipes.

10. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper and lower ends with the interior of the chamber, a branch pipe issuing from the main pipe and communicating with the outer atmosphere, a second branch pipe issuing from said main pipe at a lower elevation than said first branch pipe and also communicating with the outer atmosphere, said main pipe having an opening therein bringing the same into communication with the interior of the chamber at an elevation above the junction between said main pipe and said second branch pipe, a fan for impelling air from said main pipe through said opening, and means for obstructing the passageway within said main pipe at an elevation above the junction between said main pipe and said second branch pipe, but beneath said opening and beneath the junction between said main pipe and said first branch pipe.

11. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper and lower ends with the interior of the chamber, a branch pipe issuing from the main pipe and communicating with the outer atmosphere, means for obstructing the passageway in said branch pipe, a second branch pipe issuing from said main pipe at a lower elevation than said first branch pipe and also communicating with the outer atmosphere, means for obstructing the passageway in said second branch pipe, said main pipe having an opening therein bringing the same into communication with the interior of the chamber at an elevation above the junction between said main pipe and said second branch pipe, a fan for impelling air from said main pipe through said opening, and means for obstructing the passageway within said main pipe at an elevation above the junction between said main pipe and said second branch pipe, but beneath said opening and beneath the junction between said main pipe and said first branch pipe.

12. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper and lower ends with the interior of the chamber, a branch pipe issuing from the main pipe and communicating with the outer atmosphere, a second branch pipe issuing from said main pipe at a lower elevation than said first branch pipe and also com-

municating with the outer atmosphere, said main pipe having an opening therein bringing the same into communication with the interior of the chamber at an elevation beneath the junction between said main pipe and said first branch pipe, a fan for impelling air from said main pipe through said opening, and means for obstructing the passageway within said main pipe at an elevation beneath the junction between said main pipe and said first branch pipe, but above said opening and above the junction between said main pipe and said second branch pipe.

13. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper and lower ends with the interior of the chamber, a branch pipe issuing from the main pipe and communicating with the outer atmosphere, means for obstructing the passageway in said branch pipe, a second branch pipe issuing from said main pipe at a lower elevation than said first branch pipe and also communicating with the outer atmosphere, means for obstructing the passageway in said branch pipe, said main pipe having an opening therein bringing the same into communication with the interior of the chamber at an elevation beneath the junction between said main pipe and said first branch pipe, a fan for impelling air from said main pipe through said opening, and means for obstructing the passageway within said main pipe at an elevation beneath the junction between said main pipe and said first branch pipe, but above said opening and above the junction between said main pipe and said second branch pipe.

14. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper and lower ends with the interior of the chamber, a branch pipe issuing from the main pipe and communicating with the outer atmosphere, a second branch pipe issuing from said main pipe at a lower elevation than said first branch pipe and also communicating with the outer atmosphere, said main pipe having an opening therein between its ends and communicating with the interior of the chamber through said opening, a fan for impelling air from said main pipe through said opening, and means for obstructing the passageway in said main pipe at various points relative to the open ends thereof and to said opening and to the junctions between said main pipe and said branch pipes.

15. In combination with a structure forming a chamber, a main pipe disposed in upright position therein and communicating at its upper and lower ends with the interior of the chamber, a branch pipe issuing from the main pipe and communicating with the outer atmosphere, means for obstructing the passageway within said branch pipe, a second branch pipe issuing from said main pipe at a lower elevation than said first branch pipe and also communicating with the outer atmosphere, means for obstructing the passageway within said second branch pipe, said main pipe having an opening therein between its ends and communicating with the interior of the chamber through said opening, a fan for impelling air from said main pipe through said opening, and means for obstructing the passageway in said main pipe at various points relative to the open ends thereof and to said opening and to the junctions between said main pipe and said branch pipes, whereby the controlled ventilation of the chamber may be effected concurrently with the recirculation of air within the room in selective circulatory directions.

In testimony whereof I have affixed my signature.

CHARLES A. MOORE.