Oct. 3, 1944. D. W. McLENEGAN 2,359,571

AIR CIRCULATING DEVICE

Filed Jan. 1, 1942 2 Sheets-Sheet 1

Fig. 1

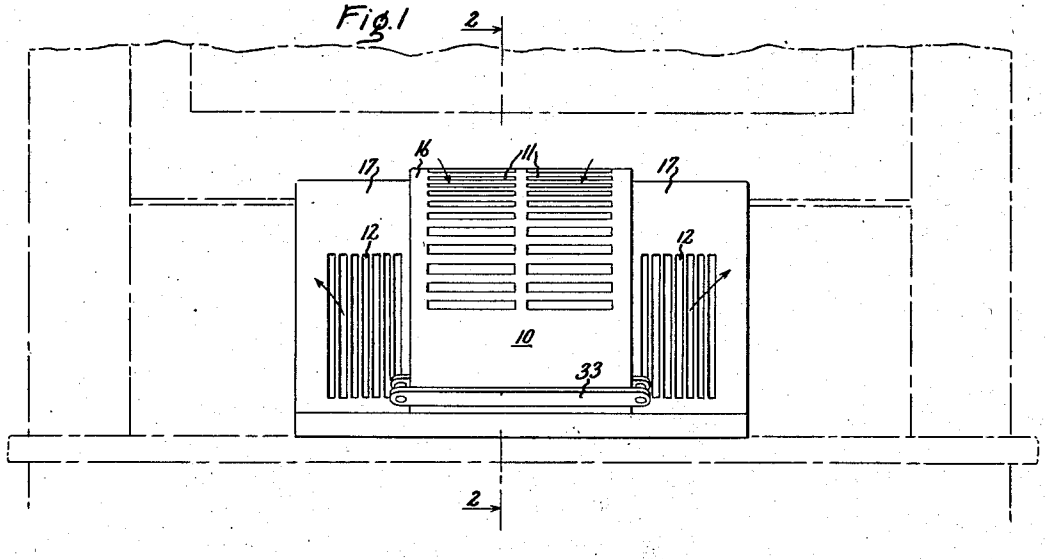
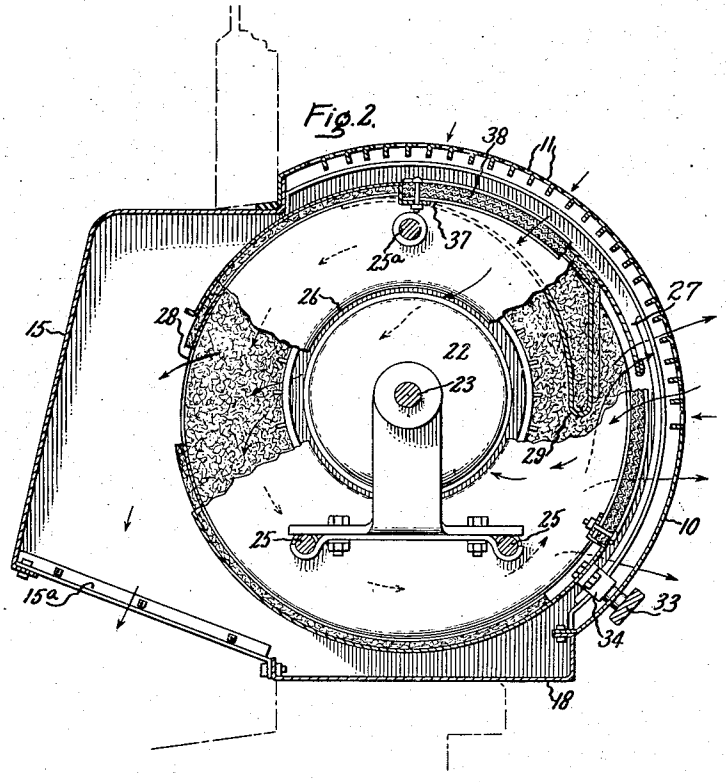


Fig. 2.



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Fig. 3.

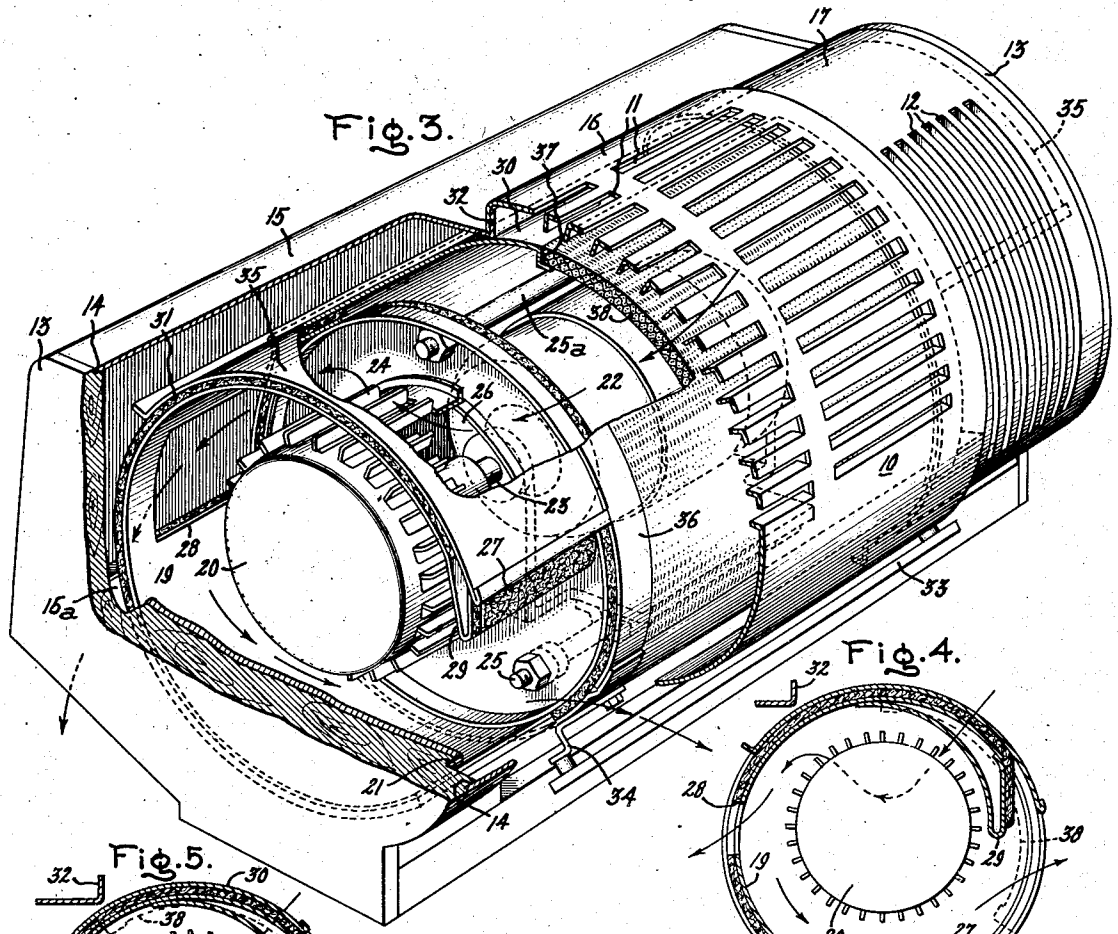


Fig. 4.

Fig. 5.

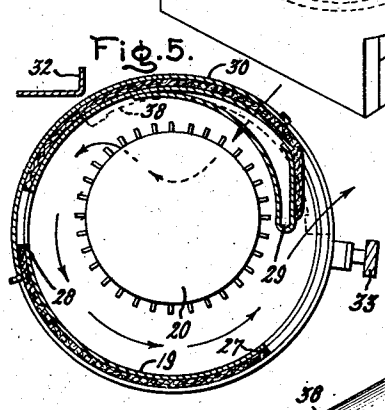


Fig. 6.

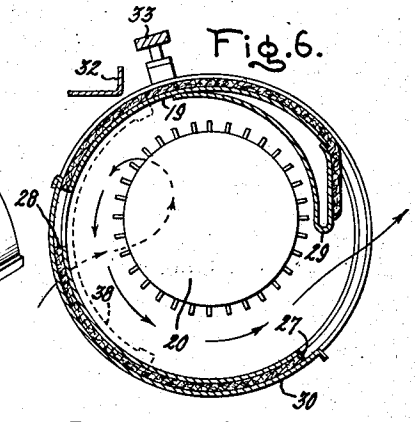
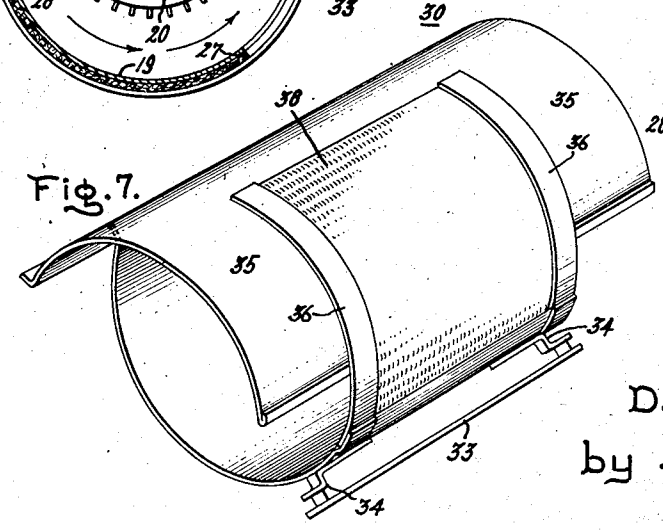


Fig. 7.



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UNITED STATES PATENT OFFICE

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AIR CIRCULATING DEVICE

David W. McLenegan, Caldwell, N. J., assignor to General Electric Company, a corporation of New York

Application January 1, 1942, Serial No. 425,329

14 Claims. (Cl. 98—94)

My invention relates to air circulating devices and particularly to such devices which may be mounted in a window opening for blowing air into or out of a room and for circulating air therein.

It is an object of my invention to provide an air circulating apparatus including an improved arrangement for selectively operating the apparatus to admit fresh air to a room or to discharge stale air therefrom.

Another object of my invention is to provide a simple and compact apparatus for admitting fresh air or a mixture of recirculated and fresh air to a room or for discharging stale air from a room.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawings in which Fig. 1 is a front elevation view of a ventilator embodying my invention illustrating the position of the ventilator in the window opening; Fig. 2 is an enlarged sectional view on the line 2—2 of Fig. 1; Fig. 3 is an enlarged perspective view, partly in section, of the ventilator shown in Fig. 1; Figs. 4, 5 and 6 are diagrammatic sectional views taken through the right-hand blower housing of Fig. 3 and illustrating three positions of the control damper, and Fig. 7 is a perspective view of the damper employed in the ventilator.

Briefly, the apparatus shown in the drawings comprises a casing arranged to be mounted in a window opening and having a longitudinally arranged cylindrical portion extending within the room. The casing is provided with an opening outside the room for communication with the outside air, with a central opening for receiving room air and with two side openings for discharging air into the room. Within the casing are arranged two centrifugal blowers and a cylindrical damper mounted for rotation about the blowers and so constructed that the position of the damper determines the path of air through the apparatus. In one position of the damper air is circulated directly from the outside opening through the blowers and into the room. In another position air from the room is circulated through the blowers and returned to the room. Positions intermediate these two positions provide for the admission to the room of various mixtures of fresh air and recirculated air. In another position room air is taken into the apparatus and a portion of the room air is discharged to the outdoors through the outdoor air opening, while the remaining portion is returned to the room. All the air admitted to the apparatus is cleaned by a filter mounted on the cylindrical damper, and the damper constitutes the sole control for determining the paths of the air through the apparatus.

Referring now to the drawings, in Fig. 1 I have shown a ventilating apparatus comprising a casing 10 arranged to be mounted in a window opening as indicated by the dotted lines, the portion of the casing shown being on the inside of the room to be ventilated. The casing is provided with a central louvered opening 11 for admitting room air to the casing and with openings 12 on either side of the opening 11 for discharging air into the room. The construction and arrangement of the parts of the ventilating apparatus are clearly shown in Figs. 2 and 3. The casing 10 is symmetrical about a central vertical plane and comprises end walls 13 provided with steps or shoulders 14 which receive the ends of the side walls of the casing. The end walls are substantially circular within the room and are provided with extensions arranged to project through the window opening. The side walls comprise a rear casing section 15 and three front sections including a central section 16 and lateral sections 17 on either side thereof, and section 16 being spaced from the lateral sections radially of the longitudinal axis of the unit. The sections 16 and 17 form a substantially cylindrical portion of the casing. A bottom wall 18 extends between the end walls and is arranged to rest on the window sill as indicated by the dotted lines in Figs. 1 and 2. The back wall 15 extends to the lower edge of the rear projections of the end walls 13 and an opening 15a is provided between the edge of the back 15 and the edge of the bottom wall 18 so that the interior of the casing communicates with the atmosphere outside the room. Two centrifugal blowers comprising scrolls or housings 19, and impellers 20 are arranged at the ends of the casing adjacent the openings 12 within the side wall portions 17, the scrolls 19 being mounted on shoulders 21 formed on the wooden end walls. A motor 22 is provided to drive the impellers 20 through a shaft 23 which extends from both ends of the motor. The motor is mounted between inner walls 24 of the blower housing on two bolts or other longitudinal

supports 25, and a third bolt or longitudinal support 25a is provided above the motor to cooperate with the bolts 25 and hold the blower housings rigidly in position. Each of the blower housings is provided with an inlet opening 26 and front and rear outlet openings 27 and 28, respectively, the opening 27 being adjacent the casing openings 12 so that air may be discharged from the blowers through the openings 12 to the room, and the openings 28 are arranged to communicate with the atmosphere outside the room through the rear opening 15a between the bottom wall 18 and the back wall 15. The shaft 23 which drives impellers 20 is displaced slightly from the center of the blower housings so that the space between the impellers and the blower housings approximates that within the conventional centrifugal blowers having scrolls formed as involutes, and the housings are formed to provide cutoffs 29 adjacent the front outlets 27.

In order to control the admission and discharge of air from the casing and to determine the direction of flow of air therethrough, I provide a substantially cylindrical damper 30 surrounding the blower housings and journaled for rotation thereon, pads of felt or similar material 31 being provided on the blower housings to minimize noise and to serve as bearing surfaces for the damper. The details of construction of the damper 30 are clearly illustrated in Fig. 7. The damper 30 lies closely adjacent the casing wall 15 along a line formed by an angle piece or corner 32 in the wall 15, the angle piece 32 serving to separate the upper portion of the casing into two sections one section communicating with the outdoors through the opening between the walls 15 and 18, and the other section communicating with the room through the opening 11. A handle 33 is provided to rotate the damper 30, the handle being connected to the damper 30 by offset members 34 arranged to extend through the space between the casing portions 16 and 17. The damper 30 is provided with portions 35 which extend over the width of the housings 19 beyond portions 36 of the damper which surround the housings 19 and provide the bearing surfaces for the damper. The extensions 35 of the damper are arranged to close the opening 28 when the handle 33 is rotated in a counterclockwise direction to its position as shown in Fig. 5.

The central portion of the damper 30 which extends between the two blower housings 19 provides an inlet chamber between the blowers in communication with the blower inlets 26. In order to admit air to the inlet chamber the damper 30 is provided with an opening 37 in which is mounted a suitable air cleaning screen or filter 38. By suitably positioning the damper 30 air may be admitted to the inlet chamber either from the room or from the atmosphere outside the room, and in intermediate positions, air from both sources may be admitted to the inlet chamber. In these intermediate positions portions of the filter lie on both sides of the angle 32 of the rear wall 15.

In Figs. 4, 5 and 6 I have shown sectional views through the right-hand blower housing 19 with the damper 30 in three different positions. In Fig. 4 the damper is in the same position as in Figs. 1 to 3. In this position air is admitted to the inlet chamber from the opening 11 and through the filter 38 and enters the blower through the opening 26. A portion of this room air is discharged from the blower through the opening 28 and passes to the atmosphere outside the room, and the remaining portion is discharged to the room through the opening 27.

By raising the handle 33 in a counterclockwise direction to its position shown in Fig. 5, the portion 35 of the damper is moved over the opening 28 so that this opening is closed. Air is then admitted to the inlet chamber through the filter 38 as before but is discharged only to the room through the opening 27, this being the position for recirculating air within the room.

When it is desired to ventilate the room by admitting fresh air, the handle 33 is moved in a counterclockwise direction to its uppermost position as shown in Fig. 6. The opening 37 and filter 38 are then on the outdoor side of the apparatus, and outside air is admitted to the inlet chamber from the outdoor opening 15a and through the filter. The portion 35 of the damper closes the opening 28 so that the fresh air admitted to the inlet chamber is discharged solely through the opening 27 and is admitted to the room.

The handle 33 may be moved to any desired position between its positions as shown in Figs. 5 and 6, and the opening 30 will then be in communication with both the outdoors and the room, and a mixture of room and outdoor air will be admitted through the inlet chamber and discharged to the room, the outlet 28 of the blower remaining closed.

From the foregoing it is readily apparent that by a single operation of selectively positioning the damper 30 the apparatus may be made to perform any one of a plurality of functions. It may be made to remove stale or vitiated air from the room by positioning the damper as shown in Fig. 4 or to ventilate the room by admitting solely fresh air to the blowers as shown in Fig. 6, or it may be made to circulate air within the room by positioning it as shown in Fig. 5, and a mixture of fresh air and room air may be circulated into the room by placing the damper in positions intermediate those shown in Figs. 5 and 6.

From the foregoing it is readily apparent that I have provided an improved apparatus of simple construction with a minimum number of moving parts for performing any one of a number of different air circulating functions.

While I have described my invention in connection with a particular form of ventilating apparatus, other applications will readily be apparent to those skilled in the art. I do not, therefore, desire my invention to be limited to the particular construction shown and described and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An apparatus for ventilating a room and for circulating air therein including a casing having therein an opening arranged to communicate with the atmosphere outside the room and a room air inlet opening and a room air outlet opening, a blower arranged in said casing and including a stationary housing having an air inlet communicating with said first mentioned opening and a first air outlet communicating with said room air outlet opening and a second air outlet arranged to communicate with the atmosphere outside the room, and a single movable damper having portions arranged to cooperate with said openings and with the inlet and outlets of said blower to control the passage of air therethrough and se-

lectively operable to one position for directing air from outside the room through said blower and into the room through said first outlet and to another position for directing air from said room air inlet opening and through said blower to the atmosphere outside the room through said second outlet.

2. An apparatus for ventilating a room and for circulating air therein including a casing having therein an opening arranged to communicate with the atmosphere outside the room and a room air inlet opening and a room air outlet opening, a blower arranged in said casing and including a stationary housing having an air inlet communicating with said first mentioned opening and a first air outlet communicating with said room air outlet opening and a second air outlet arranged to communicate with the atmosphere outside the room, and a single movable damper having portions arranged to cooperate with said openings and with the inlet and outlets of said blower to control the passage of air therethrough and selectively operable to one position for directing air from outside the room through said blower and into the room through said first outlet and to another position for directing into said blower air from said room air inlet opening, said damper when in said last mentioned position being so arranged that one portion of the air entering said blower is returned to the room through said first air outlet and another portion of the air entering said blower is discharged simultaneously to the atmosphere outside said room through said second outlet of said blower.

3. An apparatus for ventilating a room and for circulating air therein including a casing having therein an opening arranged to communicate with the atmosphere outside the room and a room air inlet opening and a room air outlet opening, a blower arranged in said casing and including a stationary housing having an air inlet communicating with said first mentioned opening and a first air outlet communicating with said room air outlet opening and a second air outlet arranged to communicate with the atmosphere outside the room, and a single movable damper having portions arranged to cooperate with said openings and with the inlet and outlets of said blower to control the passage of air therethrough and selectively operable to one position for directing air from outside the room through said blower and into the room and to another position for directing air into said blower from said room air inlet opening and for discharging the air to the atmosphere outside the room, said damper being operable to an intermediate position for directing air both from the atmosphere outside the room and from the room through said blower and into the room.

4. An apparatus for ventilating a room and for circulating air therein including a casing having therein a first opening for communication with the atmosphere outside of the room and having second and third openings for communication with the room, a blower arranged in said casing and including a stationary housing having an air inlet and two air outlets, and a substantially cylindrical damper rotatably arranged within said casing and around said blower and having a portion for controlling the admission of air to said blower inlet and another portion for controlling the passage of air from said blower, said damper being operable to one position where air is drawn into said air inlet from said first opening and is discharged to the room from one of said outlets through said second opening and operable to a second position where air enters said air inlet from said third opening and is discharged to the atmosphere outside the room through the other of said air outlets.

5. An apparatus for ventilating a room and for circulating air therein including a casing having therein a first opening for communication with the atmosphere outside the room and having second and third openings for communication with the room, a blower arranged in said casing and including a stationary housing having an air inlet and an air outlet, and means including a damper arranged within said casing and forming a chamber about said inlet and having an opening therein for admitting air to the chamber formed thereby for controlling the passage of air through said apparatus, said damper being rotatably mounted to bring the opening therein into communication selectively with said first and third openings and being operable to one position where air is drawn into said chamber from said first opening and is discharged to the room from said outlet through said second opening and operable to a position where air enters said chamber from said third opening and is discharged to the room through said second opening.

6. An apparatus for ventilating a room and for circulating air therein including a casing having therein a first opening for communication with the atmosphere outside of the room and having second and third openings for communication with the room, a blower arranged in said casing and including a stationary housing having an air inlet and two air outlets, and means including a damper arranged within said casing and forming a chamber about said inlet and having an opening therein for admitting air to the chamber formed thereby for controlling the passage of air through said apparatus, said damper being rotatably mounted and being operable to one position where air is drawn into said chamber from said first opening and is discharged to the room from one of said outlets through said second opening and operable to a second position where air enters said chamber from said third opening and is discharged to the atmosphere outside the room through the other of said air outlets.

7. An apparatus for ventilating a room and for circulating air therein including a casing having therein a first opening for communication with the atmosphere outside of the room and having second and third openings for communication with the room, a blower arranged in said casing and including a stationary housing having an air inlet and two air outlets, and a substantially cylindrical damper rotatably arranged within said casing and around said blower and providing an inlet chamber for said blower, said damper having an opening therein for admitting air to the inlet chamber and having a portion for controlling the passage of air through at least one of said blower outlets and being operable to one position where air is drawn into said air inlet from said first opening and is discharged to the room from one of said outlets through said second opening and operable to a second position where air enters said air inlet from said third opening and is discharged to the atmosphere outside the room through the other of said air outlets.

8. An apparatus for ventilating a room and for

circulating air therein including a casing having therein a first opening for communication with the atmosphere outside of the room and having second and third openings for communication with the room, a blower arranged in said casing and including a stationary housing having an air inlet and two air outlets, and a damper rotatably arranged within said casing and around said blower and providing an inlet chamber for said blower, said damper having an opening therein through which all the air flowing to the said inlet chamber must flow and having a portion for controlling the passage of air through at least one of said blower outlets, said damper being operable to one position where air is drawn into said inlet chamber from said first opening and is discharged to the room from one of said outlets through said second opening and operable to a second position where air enters said air inlet from said third opening and is discharged to the atmosphere outside the room through the other of said air outlets and operable to a third position where air enters said chamber from said first and third openings and is discharged to the room from said one of said outlets through said second opening, and a filter mounted on said damper for filtering the air passing through said opening in said damper to said inlet chamber whereby all the air entering said blower is filtered.

9. An air circulating apparatus including a casing having first, second and third openings therein, said first and third openings being arranged to communicate with different air spaces and said second opening being arranged to communicate with one of said spaces, a blower having a stationary substantially cylindrical housing arranged within said casing and having an air inlet and an air outlet, said outlet being arranged in communication with said second opening, a substantially cylindrical damper journaled on the outer cylindrical walls of said blower housing and providing an inlet chamber about said blower inlet, said damper having an opening therein for admitting air to said inlet chamber and being rotatable to one position where air is admitted to said inlet chamber from said first opening and is discharged from said casing through said second opening and rotatable to a second position where air is admitted to said chamber from said third opening and is discharged from said casing through said second opening.

10. An air circulating apparatus including a casing having first, second and third openings therein, said first and third openings being arranged to communicate with different air spaces and said second opening being arranged to communicate with one of said spaces, a blower having a stationary substantially cylindrical housing arranged within said casing and having an air inlet and two air outlets, one of said outlets being arranged to communicate with said second opening in said casing and the other of said outlets being arranged to communicate with said first opening, and means including a substantially cylindrical damper providing an inlet chamber about said inlet and rotatably mounted on the outer cylindrical wall of said housing for controlling the passage of air through said apparatus, said damper having an opening therein for admitting air to said inlet chamber and having a portion for controlling said other outlet of said blower, said damper being operable to one position for admitting air to said blower from said first opening and for discharging air through said second opening and being operable to a second position for admitting air to said chamber from said third opening and for discharging air through said other outlet of said blower.

11. An apparatus for ventilating a room and for circulating air therein including a casing having therein a first opening for communication with the atmosphere outside the room and having a second opening for the admission of air to the casing from the room and outlet openings on either side of said second opening for the discharge of air into the room, a pair of axially spaced centrifugal blowers arranged in said casing and having substantially cylindrical housings each provided with an inlet and a first outlet and a second outlet, and a substantially cylindrical damper arranged to surround a portion of said housings and journaled for rotation on said housings for controlling the circulation of air through said casing, said damper being operable to one position for directing air from said first opening through said first outlets of said blowers to the room through said outlet openings and being operable to a second position for directing air from said second opening through said blowers to the atmosphere outside the room through said second outlets of said blowers.

12. An apparatus for ventilating a room and for circulating air therein including a casing having therein a first opening for communication with the atmosphere outside the room and having a second opening for the admission of air to the casing from the room and outlet openings on either side of said second opening for the discharge of air into the room, a pair of axially spaced centrifugal blowers arranged in said casing and having substantially cylindrical housings each provided with an inlet and an outlet, the outlet of said blowers being arranged in communication with said outlet openings of said casing, a substantially cylindrical damper arranged to surround a portion of said housings and journaled for rotation on said housings for controlling the circulation of air through said casing, said damper forming an inlet chamber adjacent the inlets of said blowers and having an opening therein for admitting air to said chamber, said damper being operable to one position for directing air from said first opening and through said chamber to the room through said outlet openings and being operable to a second position for directing air from said second opening through said chamber to the room through said outlet opening, and a filter mounted on said damper adjacent the opening therein for filtering the air admitted to said inlet chamber.

13. An apparatus for ventilating a room and for circulating air therein including a casing having therein a first opening for communication with the atmosphere outside the room and having a second opening for the admission of air to the casing from the room and outlet openings on either side of said second opening for the discharge of air into the room, a pair of axially spaced centrifugal blowers arranged in said casing and having substantially cylindrical housings each provided with an inlet and a first outlet and a second outlet, a substantially cylindrical damper arranged to surround a portion of said housings and journaled for rotation on said housings for controlling the circulation of air through said casing, said damper forming an inlet chamber between said housings and having an opening

therein for admitting air to the chamber, said damper being operable to one position for directing air from said first opening through said inlet chamber to the room through said first outlets of said blowers and being operable to a second position for directing air from said second opening into said chamber and through said blowers to the room through said outlet openings and being operable to a third position for directing air from said second opening through said chamber and through said second outlets of said blowers to the atmosphere outside the room.

14. An apparatus for ventilating a room and for circulating air therein including a casing having therein a first opening for communication with the atmosphere outside the room and having a second opening for the admission of air to the casing from the room and outlet openings on either side of said second opening for the discharge of air into the room, a pair of axially spaced centrifugal blowers arranged in said casing and having substantially cylindrical housings each provided with a inlet and a first outlet and a second outlet, a substantially cylindrical damper arranged to surround a portion of said housings and journaled for rotation on said housings for controlling the circulation of air through said casing, said damper forming an inlet chamber between said housings and having an opening therein for admitting air to the chamber, said damper being operable to one position for directing air from said first opening through said inlet chamber to the room through said first outlets of said blowers and being operable to a second position for directing air from said second opening into said chamber and through said blowers to the room through said outlet openings and being operable to a third position for directing air from said second opening through said inlet chamber and out of the casing through both outlets of both of said blowers, said damper being adjustable to positions intermediate said first and second positions for admitting to said inlet chamber air from both of said first and second openings of said casing.

DAVID W. McLENEGAN.