Dec. 21, 1943. E. C. HACH ET AL 2,337,325

AIR CIRCULATING DEVICE

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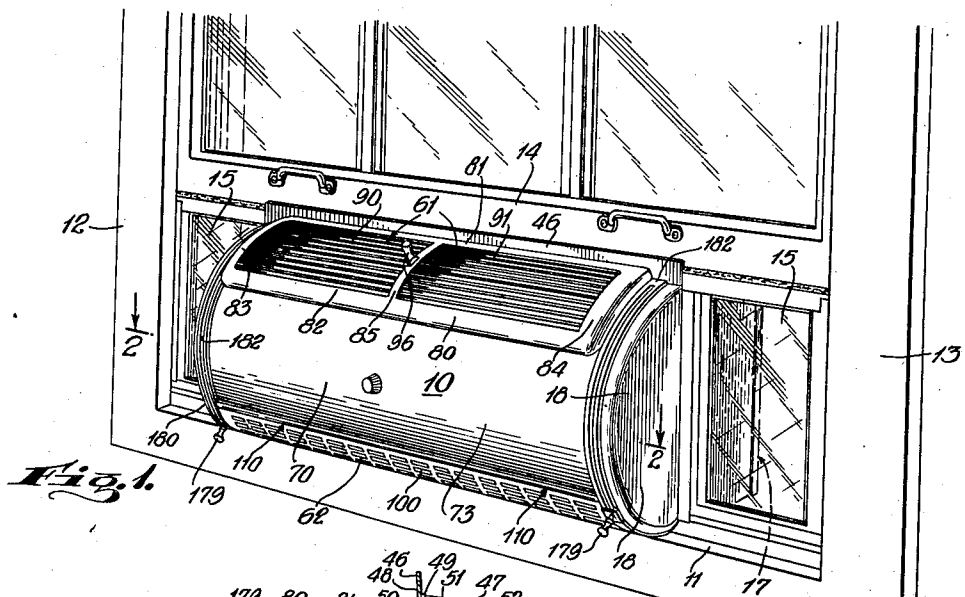


Fig. 1.

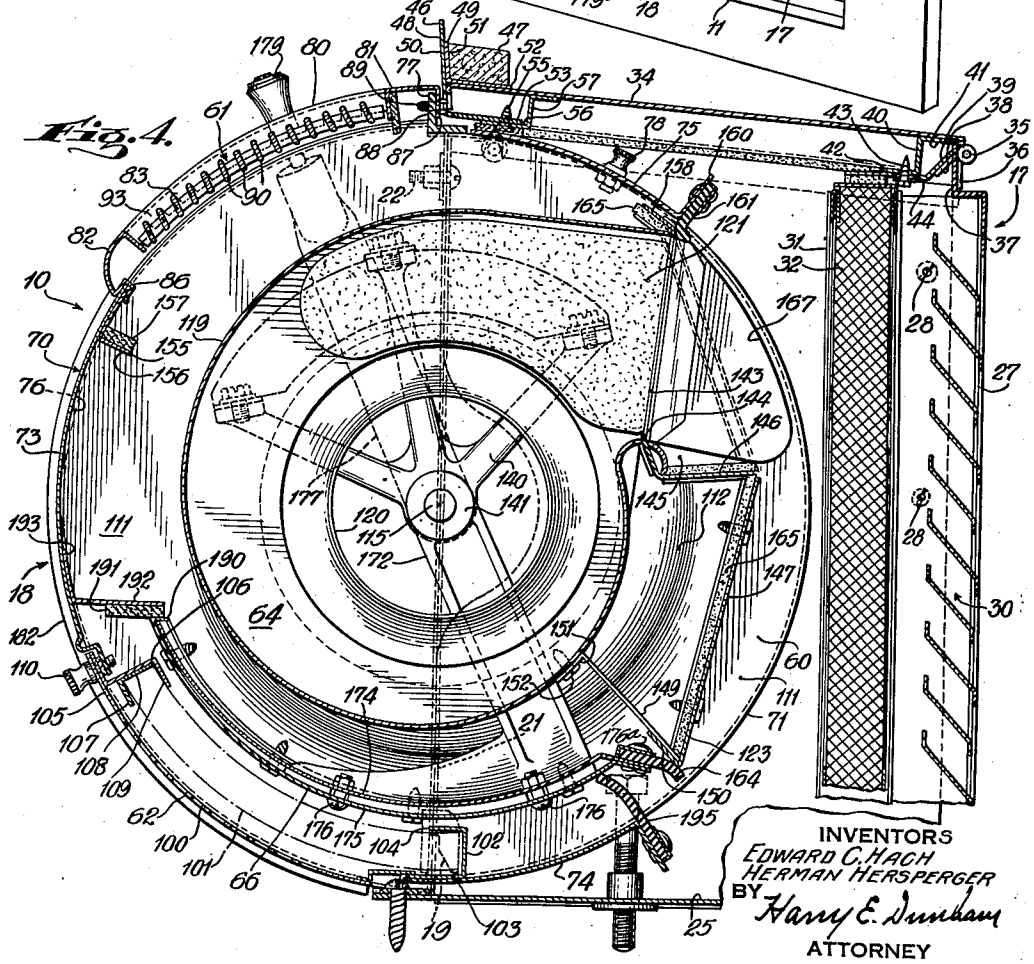


Fig. 4.

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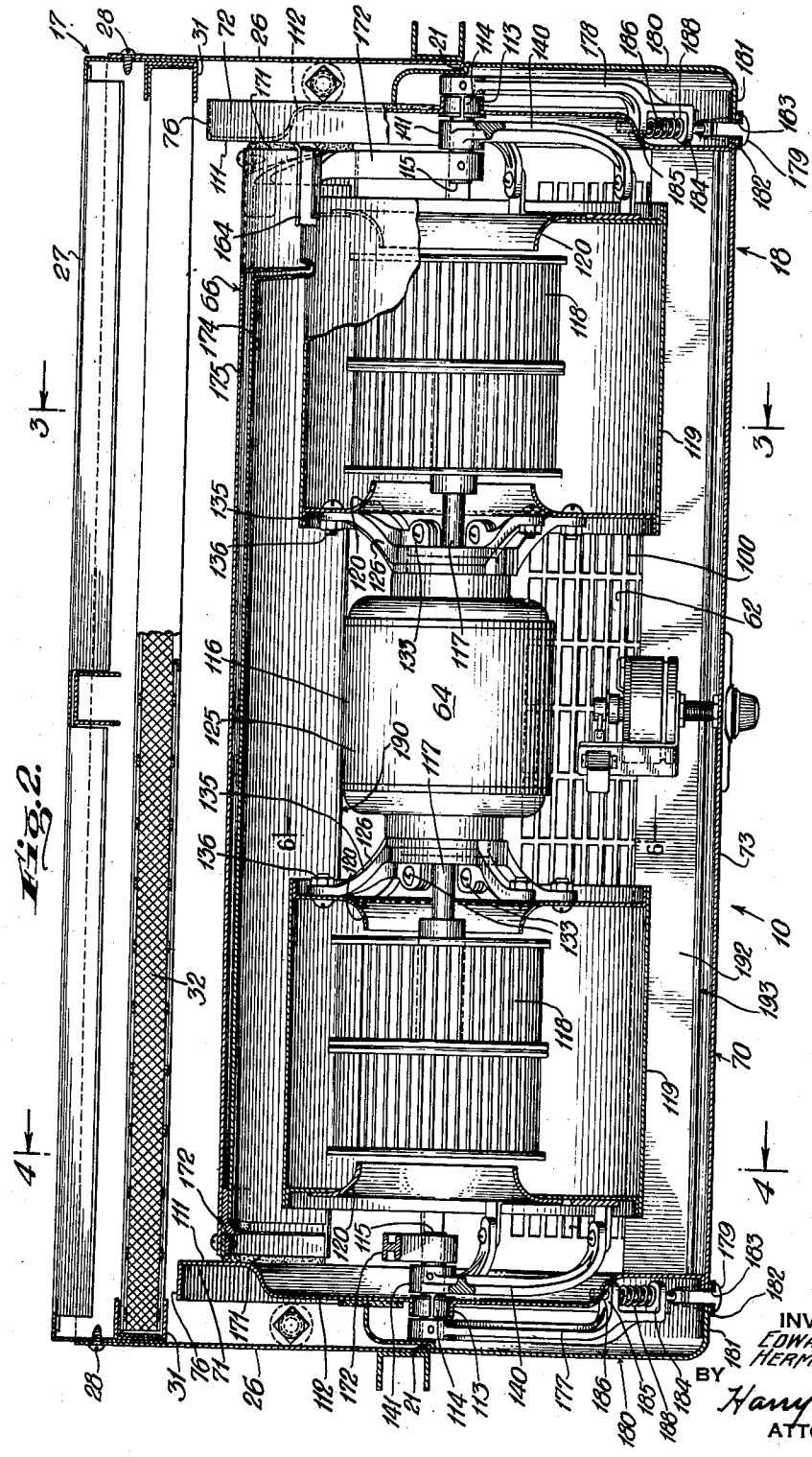


Fig. 2.

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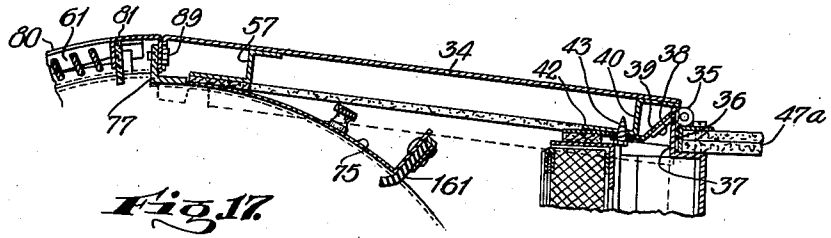


Fig. 1.

Fig. 3a.

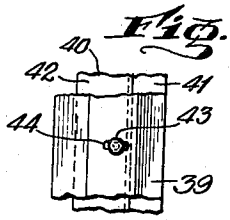


Fig. 3.

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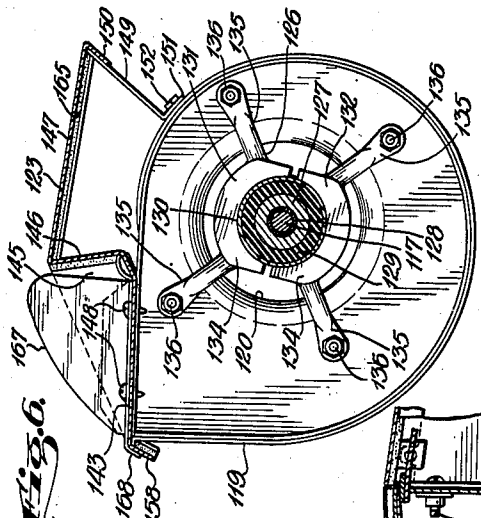


Fig. 6.

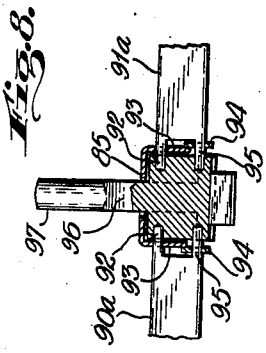


Fig. 8.

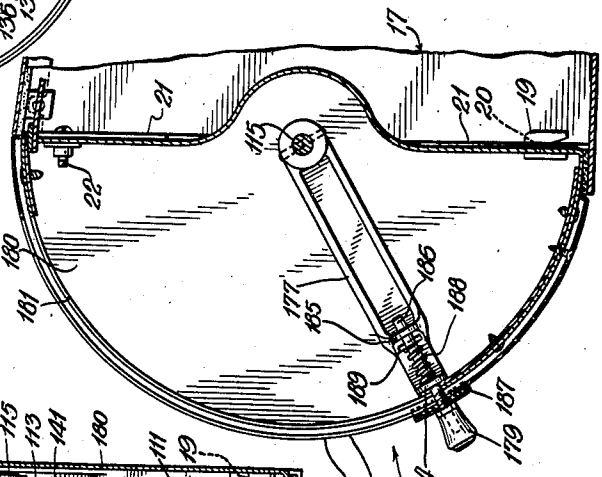


Fig. 7.

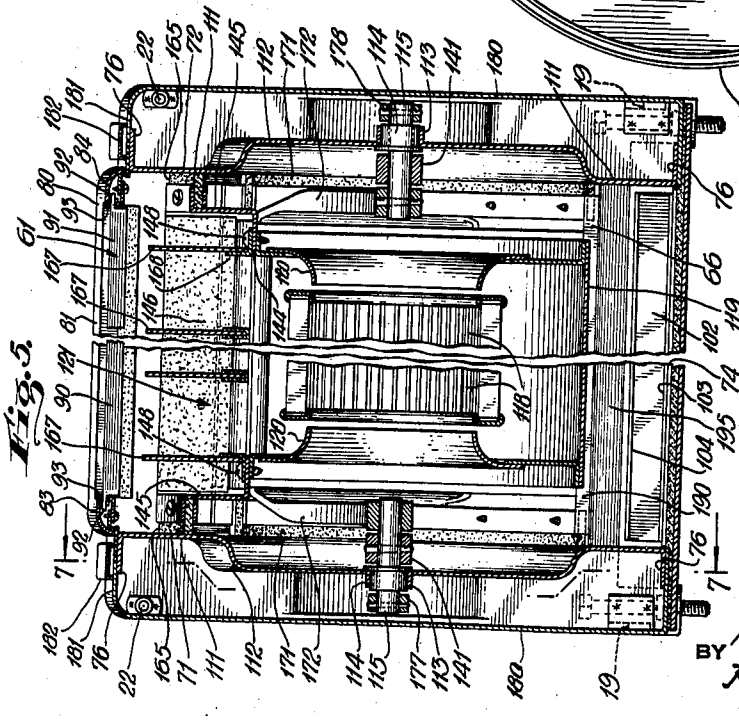


Fig. 5.

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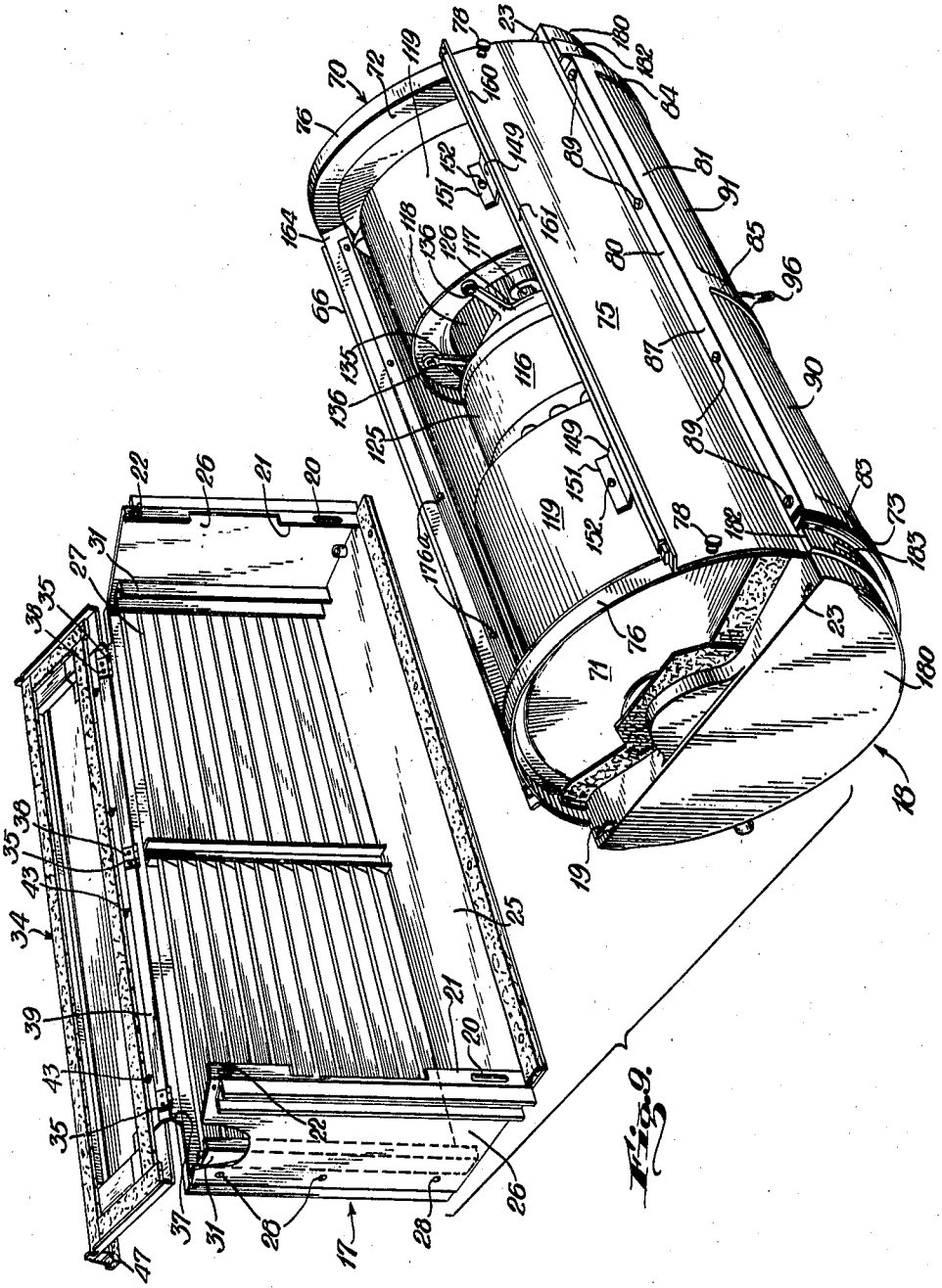


Fig. 9.

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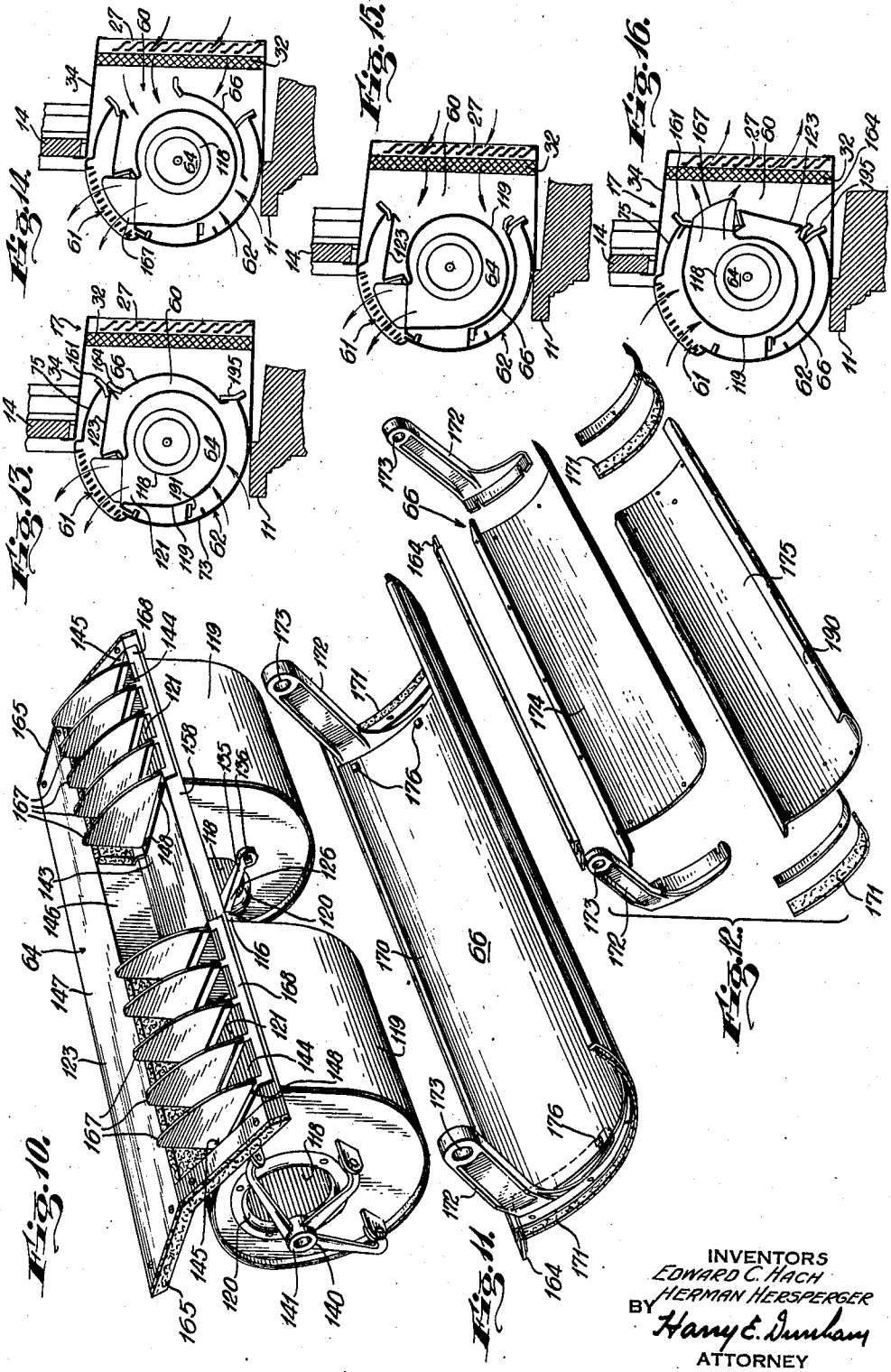


Fig. 14.

Fig. 15.

Fig. 16.

Fig. 13.

Fig. 12.

Fig. 10.

Fig. 11.

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Patented Dec. 21, 1943

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UNITED STATES PATENT OFFICE

2,337,325

AIR CIRCULATING DEVICE

Edward C. Hach, Westfield, and Herman Hersperger, Roselle, N. J., assignors to General Electric Company, a corporation of New York

Application January 10, 1941, Serial No. 373,990

8 Claims. (Cl. 98—94)

This invention relates to air circulating devices, and has for a general object to provide a device of this character which is of improved construction and arrangement of parts.

The invention consists in the novel construction and combination of parts, to be more fully described hereinafter, and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings, to be taken as a part of this specification, we have fully and clearly illustrated a preferred embodiment of our invention, in which drawings—

Fig. 1 is a perspective view illustrating our improved air circulating device as installed within a window opening;

Fig. 2 is an enlarged horizontal sectional view of the device illustrated in Fig. 1, the section being taken on the line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view of the device on a still further enlarged scale, the view being taken on the line 3—3 of Fig. 2;

Fig. 3ª is a fragmentary horizontal section taken on the line 3ª—3ª of Fig. 3;

Fig. 4 is a vertical sectional view similar to Fig. 3 and taken on the line 4—4 of Fig. 2, and showing the motor blower unit as adjusted to discharge room air to the outside atmosphere;

Fig. 5 is a vertical longitudinal section of our improved air circulating device, the section being taken on the line 5—5 of Fig. 3, and being on the same scale as Fig. 2, the intermediate portions of the device having been omitted so as to illustrate more clearly the detail structure at the opposite ends of the device;

Fig. 6 is a fragmentary transverse vertical section taken on the line 6—6 of Fig. 2, and illustrating the manner in which the blower housings are rigidly connected to the ends of the motor shaft;

Fig. 7 is a fragmentary transverse vertical section taken on the line 7—7 of Fig. 5;

Fig. 8 is an enlarged transverse section taken on the line 8—8 of Fig. 3, and illustrating the manner in which the bars forming the supply grille may be adjusted to direct air in different desired directions;

Fig. 9 is an exploded perspective view illustrating the two principal component parts of the air circulating device and how they may be readily attached and detached from one another;

Fig. 10 is a detail perspective view showing the rotatable motor blower assembly which is one of the principal elements of our improved device;

Fig. 11 is a detail perspective view of the rotatably adjustable damper;

Fig. 12 is an exploded view illustrating the various component parts of the damper shown in Fig. 11;

Figs. 13, 14, 15 and 16 are diagrammatic views illustrating the different positions of adjustment of the rotatable motor blower unit and the rotatable damper to secure the different operating functions possible with our improved device; and

Fig. 17 is a fragmentary transverse section taken on the same plane as Fig. 3 and illustrating the manner in which certain of the parts may be removed and the remaining parts adjusted so as to provide a different type of window installation than is shown in the other views.

Referring now, in detail, to the construction illustrated, the reference numeral 10 indicates our improved ventilating device in its entirety. The particular embodiment which we have elected to show is adapted to be mounted in close proximity to a window opening of a room space, and is operable to introduce air into the room space from the exterior atmosphere, and is also operable to exhaust air from the room space to the exterior atmosphere. The device is also operable to discharge into the room space air withdrawn from the room space along with the air from the outside atmosphere, and the device may be adjusted to vary the proportions of room air and outside air introduced into the room space.

In Figs. 1 and 3 we have shown a typical installation of our device in a double-hung window. The device 10 is shown as being supported by the window-sill 11, and centrally located in the window opening between the window jambs 12 and 13. The lower sash rail 14 of the window has a detachable sealing engagement with the top of the device 10, and filler panels or blocks 15 serve to close the space between the ends of the device 10 and the window jambs. The filler blocks 15 are rigidly secured in position with respect to the ends of the device 10, the window sill 11 and the jambs 12 and 13, but have a detachable sealing engagement with the lower sash rail 14 of the window similar to that between the sash rail 14 and the top of the device 10.

The ventilating device is shown in Fig. 9 as being divided generally into two main parts, one of which may be termed a rear housing unit, indicated at 17 and adapted to be permanently installed within a window opening, and the other of which may be termed a front casing assembly or unit, indicated at 18, which is detachably

secured to the rear housing unit by means of hooks 19 at the ends thereof adapted to fit within slots 20 in inwardly turned vertical flanges 21 formed on the front of the housing unit 17, and by screws 22 at the top of the flanges 21 fitting within threaded openings 23 provided at the top and ends of the removable unit 18. The removable unit 18 contains all of the operating parts of the unit 10 and is constructed in this manner so that it may be removed and taken to a service shop for repair or adjustment without inconveniencing the customer and without affecting the permanent installation of the rear housing part 17 in the window. Furthermore, this arrangement makes possible the standardization of the construction of the removable unit 18 and to vary the construction of the rear housing unit 17 to suit the particular requirements of any installation.

In the construction shown, the rear housing unit comprises bottom wall 25, end walls 26, which are permanently connected together either by welding or being formed of one piece of metal. The unit 17 also comprises a rear louvre assembly 27 fitting between the end walls 26 and the bottom wall 25 at the rear thereof, and secured in position by suitable screws 28 extending through the ends walls 26. The louvre assembly 27 provides a rear opening 30 for the ventilating unit 10 which communicates with the outside atmosphere and through which outside air may be drawn into the room, or room air may be exhausted to the outside. The louvre assembly is provided along its forward vertical edges with channels 31 which slidably receive a filter 32 which may be inserted or removed, when desired, by a vertical sliding movement within the channels, as will be readily appreciated.

The unit 17 also comprises a rear top cover 34, which is connected at its rear by hinges 35 to the top of the louvre assembly 27. One part 36 of each of the hinges 35 is spot-welded to a vertical flange 37 carried by the louvre assembly, and the other part 38 of the hinge 35 is spot-welded to a plate member 39 extending transversely across the rear of the unit 17. The cover 34 is provided at its rear edge with a Z-bar 40, one flange 41 of which is spot-welded to the cover and another flange 42 extends forwardly and is provided wtih screw threaded opening which receives attaching screws 43 serving to rigidly connect the rear of the cover to the plate 39. The plate 39 is provided with slots 44 through which the screws 43 extend, and this screw-and-slot connection permits forward and rearward adjustment of the top cover 34 with respect to the remaining portions of the unit 17.

A weathering angle 46 is detachably secured to the forward edge of the top cover 34 and carries a sealing material, such as felt 47, which is engaged by the lower sash rail 14 of the window and thus provides the detachable sealing engagement between the window and the unit 10 previously referred to. The weathering angle 46 comprises two angle members 48 and 49 with flanges 50 and 51 spot-welded together and with flanges 52 and 53 spaced from one another and receiving therebetween the forward edge of the cover 34. The weathering angle 46 is detachably secured in position on the forward edge of the cover 34 by screws 55 extending through the flange 53 and also through a flange 56 forming a part of a Z-bar 57 which is spot-welded to the cover.

The screw and slot connection 43, 44 combined with the detachable weathering angle 46 provides for an alternate installation of the rear housing unit in a window. For example, if it is desired that the rear housing unit 17 be so mounted in a window that the rear is adjacent the plane of the window sash, the weathering angle 46 may be removed and the space between the forward edge of the cover 34 and the removable unit 18 closed by moving the cover forwardly. The connection provided by the screws 43 and slot 44 permits this adjustment of the rear cover. In such an installation, the sealing felt 47a may be attached to the rear parts of the housing unit 17. In Fig. 17 the angle 46 has been removed and the forward adjustment of the cover completed.

As stated previously, the removable front casing assembly 18 carries all of the working parts of our improved ventilating device and is detachably secured in position within the permanently mounted rear housing 17. The casing unit 18 is provided across its rear part with a first or outdoor air opening 60, across its forward upper part with a second or room air opening 61 and across its forward lower part with a third or room air opening 62. The second and third openings 61 and 62 communicate with the room space, and the first opening 60 communicates through the filter 32 and opening 30 with the outside atmosphere. Within the casing assembly 18 is rotatably supported a motor blower unit 64 which, as will presently appear is supported for rotary movement about a fixed axis extending substantially parallel to the window sash, and which may be rotatably adjusted about its axis of support to either one of two positions, in one of which the unit 64 draws air into the unit 10 through the rear openings 30 and 60 and room opening 62, and discharges such air from the unit 10 into the room through the opening 61, and in the other such position the blower unit 64 operates to draw room air through the opening 61 and discharge such air to the outdoors through the rear openings 60 and 30. When the blower is in the first-named position, a rotatably mounted damper 66 in the unit 18 can be adjusted to close off either the rear opening 60 or the room opening 62 and thereby serves as a means for proportioning the amounts of outdoor air and recirculated room air introduced into the room through the opening 61.

The removable front casing assembly 18 may be divided for the purposes of description into a cylindrical casing 70, the motor-driven blower unit 64, and the damper 66. The motor-driven blower unit 64 is shown by itself in Fig. 10, and the damper unit in Figs. 11 and 12. We have not shown the casing 70 separate from the assembly 18, as it is believed to be unnecessary to a clear understanding thereof.

As stated, the casing 70 is cylindrical in form. The casing 70 when secured in position in the rear housing unit 17 is arranged with the axis thereof extending substantially parallel to the plane of the window sash, which axis, as will presently appear, is approximately the same as the rotary axis of support of the motor blower unit 64.

The casing 70 comprises a pair of spaced cylindrical end walls or drums 71 and 72, respectively, and a cylindrical side wall composed of a main front wrapper sheet 73, a lower rear wrapper sheet 74 and an upper rear wrapper sheet 75. The front wrapper sheet 73 is fixed at its ends by welding to an outwardly extending rim or flange 76 formed on each of the end drums 71

and 72. The upper part of the wrapper sheet 73 is cut away and provides the room air opening 61. A strengthening angle 77 extends across the casing 70 at the top thereof and is spot-welded at its ends to the flanges 76 of the drums 71 and 72. The lower rear wrapper sheet 74 is arranged with its forward edge spaced from the bottom edge of the wrapper sheet 73 to provide the room air opening 62. The wrapper sheet 74 is also rigidly secured at its ends to the drums 71 and 72 by welding its lateral edges to the flanges 76. The upper rear wrapper sheet 75 is arranged at the rear of the angle 77 and is detachably secured by screws 78 to the rims 76 of the drums 71 and 72. The space between the rearmost edges of the wrapper sheet 74 and the detachable wrapper sheet 75 provides the rear opening 60. The structural arrangement of the two drums 71 and 72 with the wrapper sheets 73, 74, and 75 and strengthening angle 77 secured at their ends or lateral edges to the drums in the manner just described, effectively provides for the openings 60, 61 and 62, and at the same time provides a strong and rigid casing structure which is relatively simple and inexpensive.

A rectangular supply grille unit 80 is detachably secured within the opening 61. The unit 80 comprises upper and lower longitudinal frame members 81 and 82, spaced end frame members 83 and 84 connecting the ends of the members 81 and 82, and an intermediate frame member 85 connecting the intermediate portions of the upper and lower members 81 and 82. The lower edge of the bottom frame member 82 is suitably bent to form a channel 86 which detachably receives the lower edge of the opening 61, and the top edge of the upper member 81 is provided with a downwardly extending flange 87 which is adapted to fit alongside the vertical flange 88 of the stiffening angle 77, and to be detachably secured thereto by suitable screws 89. Extending between the end frame members 83 and 84 and the intermediate frame member 85 are two sets of pivoted grille bars 90 and 91. Each grille bar is provided at its ends with upper pivot pins 92 which fit within downwardly extending flanges 93 carried by the end and transverse frame members 83, 84 and 85. The grille bars forming each set at each side of the intermediate transverse member are connected together for operation in unison by a link 94 having openings receiving pins 95 extending from the adjacent lower ends of each grille bar (see Fig. 8). An operating lever 96 is pivotally connected to fulcrum about extensions of pivot pins 92 extending from adjacent ends of two selected bars 90^a, 91^a arranged at opposite sides of the intermediate member 85. The lower end of the operating lever 96 is pivotally connected at its sides to extensions of the pins 95 formed on the two selected grille bars 90^a and 91^a. The lever 96 is provided with an operating handle 97 which extends upwardly from the grille 80. Thus, the grille bars may be readily adjusted to direct the air to different desired portions of the room by rotatably adjusting the handle 97 about the fulcrum axis provided by the pivot pins 92 of the selected grille bars 90^a and 91^a. As the grille bars of one set are connected by a link 94 with the grille bar 90^a, and as the grille bars of the other set are connected by a similar link 94 with the grille bar 91^a, it will be readily appreciated that all of the grille bars are simultaneously adjusted by a movement of the handle 97 about the fulcrum axis formed by the pivot pins 92 of the bars 90^a and 91^a.

The room opening 62 is provided with a detachable grille member 100 which carries a filter 101 for separating out of the room air entering the motor blower unit 64 any solid particles in suspension. The grille member 100 is formed with an openwork central portion through which the air flows into the casing 70. The grille member comprises a lower longitudinal frame member 102 offset at 103 to receive the forward edge of the wrapper sheet 74 and extending rearwardly from the forward edge and bent at its rear edge to form a longitudinal channel 104 slidably receiving the rear longitudinal edge of the filter 101. The grille member 100 also comprises an upper or forward frame member 105 to which is spot-welded a Z-bar 106 extending longitudinally of the forward edge and cooperating with a flange 107 of an angle 108 spot-welded to the Z-bar, to form a second longitudinally extending channel 109 which slidably receives the upper or forward longitudinal edge of the filter 101. The upper frame member is detachably secured to the bottom edge of the wrapper sheet 73 by screws 110. Thus, by loosening the screws 110 the forward or upper edge of the grille member 100 may be lowered and the grille member then removed by moving the same forwardly, which will detach the rear or bottom frame member 103 from the wrapper sheet 74, as will be readily understood. With the grille member 100 removed, the filter 101 may be removed and replaced by simply sliding the same lengthwise along the channels 104 and 109.

Each of the end drums 71 and 72 is formed with a peripheral, annular portion 111 disposed in a substantially vertical plane, and is formed with a central dished-out hub portion 112 having an opening in its center. The opening is defined by an outwardly turned, cylindrical flange 113 within which is secured a bearing 114 receiving a stub shaft 115 for rotatably supporting and adjusting the motor blower unit 64 and the damper 66, as will presently appear.

In Fig. 10 the motor-driven blower unit 64 is shown in its entirety. The unit 64 comprises a centrally disposed motor 116 having a shaft 117 extending outwardly from both ends thereof, a pair of impellers 118 fixed, respectively, to the outward extensions of the motor shaft 117, and a pair of blower housings 119 enclosing, respectively, said impellers, and each housing having at each side thereof an axially disposed air inlet or eye 120, and having a tangential discharge outlet 121. The discharge outlets 121 of the two blower housings 119 are similarly disposed, and the two housings connected together to form a rigid unit by a partition member 123 which, as will later appear, has a sealing connection at its peripheral edges with parts of the casing 70 when the blower is adjusted to either of its two positions, and thereby serves to separate the discharge outlets 121 from the inlets 120.

The motor 116 comprises a casing 125, and the latter is connected at each of its ends to the adjacent, blower housing 119 by means of a spider bracket 126. As shown in Fig. 6, each end of the motor casing 125 is provided with a cylindrical hub 127 which carries a bearing 128 for the shaft of the motor. About the outer surfaces of this hub 127 is secured a rubber ring 129, and to the outer surfaces of this ring is secured the relatively thin metal protecting ring

130. The spider bracket 126 is formed in two parts 131 and 132 secured together by suitable bolts 133. Each part comprises a half hub portion 134 clamped by the bolts 133 about the outer surfaces of the ring and a pair of arms 135 suitably connected by bolts 136 to the side of the motor housing 119. This construction provides an effective means for supporting the motor from the blower housings, and will also aid the partition 123 in rigidly connecting the housings 119 together to form therewith a single rotatable unit.

It will be appreciated that insofar as the broader aspects of our invention are concerned, the motor 116 need not necessarily be supported from the blower housings 119, for other means for supporting the motor may be devised. For example, the motor may be supported from the bottom of the casing 70 and additional stiffening members provided for connecting the blower housings to assure the required rigidity of the motor blower unit 64.

To the outer end wall of each housing 119 is bolted a spider 140, which is provided with a central hub portion 141 receiving the stub shaft 115 extending inwardly from the adjacent end drum 71 or 72. Thus, the two stub shafts 115 carried in bearings 114 in the two end drums 71 and 72 form a means by which the entire motor blower unit 64 may be rotatably adjusted about a fixed central axis.

The partition member 123 is shown as being advantageously formed from a single piece of sheet metal, and is bent to form a wall 143 having openings 144 registering, respectively, with the discharge openings 121 of the blower housings 119, end walls 145 arranged at opposite ends of the wall 143, an upstanding air-directing wall 146 at the rear of the wall 143, and a rearwardly extending wall 147. The partition member 123 is rigidly connected to each of the blower housings 119 by means of suitable screws 148 and by means of spaced brackets 149 spot-welded at their upper ends to an inwardly-turned rear flange 150 of the wall 147, and provided at their lower ends, respectively, with feet 151 suitably secured to the housings 119 by screws 152.

As stated, a detachable sealing connection is provided between the forward and rear longitudinal edges of the partition member 123 and the casing 70, and between the two lateral edges of the partition 123 and the casing 70, so that there will be no short-circuiting of air from the discharge outlets 121 of the fan housings to the air inlets 120 when the motor blower unit 64 is in either its position to discharge air through the opening 61 into the room, as shown in Fig. 3, or in its position to discharge room air to the outdoors through the rear openings 60 and 30, as shown in Fig. 4. The casing 70 is provided at the forward and lower longitudinal edge of the discharge opening 61 with an angle member 155 which is suitably spot-welded to the wrapper sheet 73, and is provided with an internally extending flange 156 to which is secured a suitable sealing material 157, such as a strip of felt. As shown in Fig. 3, when the unit 64 is in position to discharge through the opening 61, a downwardly turned, forward edge 158 of the partition 123 has a sealing engagement with the strip of felt 157. The detachable wrapper sheet 75 is provided at its rear edge with an outwardly extending flange 160, to which is clamped a longitudinally extending strip 161 of flexible sealing material, such, for example, as rubber. The strip extends inwardly, as shown in Fig. 3, and engages the longitudinal rear edge of the partition member 123, and thereby provides an air seal therebetween at the same time the forward edge 158 of the partition engages the strip of felt 157.

In Fig. 4, when the blower unit 64 is in position to discharge room air to the outdoors, the forward longitudinal edge of the partition 123 is in engagement with the flexible sealing strip 161, and the rear longitudinal edge of the partition 123 is in engagement with a flexible sealing strip 164 clamped to the rear edge of the damper 66. By way of example, the strip 164 may also be formed of rubber. Thus air cannot bypass the forward and rearward longitudinal edges of the partition member 123 when the blower unit 64 is also in position to discharge room air to the outdoors.

In order to prevent the bypassing of air from the discharge openings 121 to the inlets 120 around the lateral edges of the partition 123, a strip of suitable sealing material 165, such as felt, is clamped to each lateral edge of the partition member 123, and these sealing strips are in continuous engagement with the inner faces of the annular peripheral portions 111 of the end drums 71 and 72 (see Figs. 2 and 5).

The bending of the partition to form the downwardly extending forward edge 158 and to provide the upwardly extending air-directing wall 146, and the inwardly extending rear edge 150 serves to secure the additional desired function of stiffening the blower unit 64 and thereby resisting any torsional strains placed thereon while moving the same to the two different positions of adjustment previously referred to. In addition to performing this function, the partition member 123 also serves as a conduit means for connecting the two discharge outlets of the blower with either the room opening 61 or the outdoor air opening 60. This conduit is, in effect, an outward extension of the discharge outlets 121. The end walls 145 and the air-directing wall 146 admirably serve to direct the air through the opening 61 with the minimum of loss due to eddy currents. In order to further promote the efficient movement of air from the blower through the opening 61, we also provide a plurality of splitter-vanes 167 in each of the openings 121 which may be conveniently adjusted by bending to efficiently distribute the air from the two blower outlets across the width of the single outlet 61. The splitter-vanes 167 of each discharge outlet 121 are mounted in a frame member 168 which is suitably secured to the wall 143 of the partition by the screws 148.

In Figs. 11 and 12 we have shown the detail construction of the damper 66. In general, the damper comprises an arcuate-shaped damper element 170 with sealing felt strips 171 suitably clamped to the two lateral edges thereof, and a pair of supporting brackets 172 fixed, respectively, to the opposite ends thereof. The inner ends of the brackets 172 are formed with axially alined openings 173 therethrough which receive the inner ends of the stub shafts 115 carried by the end drums 71 and 72 (see also Figs. 2 and 5). The felt strips 171 along the lateral edges of the damper are also in continuous sealing engagement with the inner vertical faces on the annular peripheral portions 111 of the end drums, and thereby effectively prevent the bypass of air around the ends of the damper.

In Fig. 12 it is noted that the damper element 170 comprises two arcuate-shaped sheets 174 and 175 conveniently secured together by screws 176 which screws may also be used to secure the supporting brackets 172 to the damper element 170. Split rivets 176a secure the strip 164 to the rear longitudinal edge of the damper, as viewed in Fig. 4, and they also serve to secure the sheets 174 and 175 together.

The motor blower unit 64 and the damper 66 are adapted to be rotatably adjusted about their axis of support by means of manually operable lever arms 177 and 178, respectively. The arms 177 and 178 are keyed, respectively, to outer extensions of stub shafts 115 and the arms extend radially outward from their respective stub shafts and are provided at their outer extremities with knobs 179 which are adapted to be grasped by hand for the purpose of moving the lever arms and their respective stub shafts about the central supporting axis. One of the lever arms when rotated, may serve to rotatably adjust the motor blower unit 64 and the other of the lever arms adjust the damper 66. This is effected in the construction shown simply by keying the spider 140 at the left-hand end of the blower unit, as viewed in Fig. 2, to its stub shaft 115, and by keying to the stub shaft 115 at the other end of the casing 70, the right-hand damper supporting bracket 172. Thus, in the construction shown, the lever arm 177 can be moved by hand to rotatably adjust the motor blower unit 64, and the lever arm 178 can be moved manually to adjust the position of the damper 66.

At each end of the casing 70 is provided an end cover 180 (see Figs. 2, 5, and 7). Each cover is secured to its end of the casing by spot-welding an in-turned peripheral flange 181 thereof to the rim flange 76 of its respective end drum 71 or 72. A pair of suitable moulding strips 182 are secured, respectively, to the ends of the casing 70 and they serve to cover the joints between the inner edges of each flange and the adjacent lateral edge of the wrapper sheet 73. The moulding strips are provided, respectively, with slots 183 through which the outer ends of their respective operating levers extend.

In Fig. 7, we have shown the lever arm 177 as being so constructed that it will remain in any desired position of adjustment. The arm 178 is similar in construction. The outer end of the arm 177 is shown as being provided with a pair of spaced laterally extending flanges 184 and 185, respectively. The flanges have alined openings through which extend a pin 186 to the outer end of which the knob 179 is secured. The pin 186 also extends through an opening in a friction plate 187 arranged between the knob 179 and the moulding strip 182. A coil spring 188 surrounds the pin 186 and abuts at its outer end the flange 184, and is fixed at its inner end by cotter-pin 189 to the pin 186. It will thus be seen that the spring 188 serves to move the pin and plate 187 inwardly and effect a frictional engagement between the inner surface of the plate 187 and the moulding strip 182. The friction between the surfaces may be readily relieved by pulling the knob 179 outwardly before adjusting the position of the lever arm 177.

One of the features of our improved ventilating device is that whenever the motor blower unit 64 is adjusted to exhaust room air to the outdoors, the outdoor air opening 60 will always be wide open This is made possible by the fact that the path of movement of the damper 66 is approximately the same as that of the motor blower unit 64. Each time the motor blower unit is rotated to the position to exhaust room air, the rear longitudinal edge 150 of the partition 123 will engage the flexible strip 164 of the damper and will move the damper therewith to a position where the opening 60 is wide open; provided, of course, that the damper had been previously adjusted to a position partially or completely closing such opening 60. Fig. 4 shows the position of the parts when the motor blower unit 64 is adjusted to exhaust air to the outdoors. In this position the forward longitudinal edge 190 of the damper 66 is in sealing engagement with a felt strip 191 carried by a flange 192 of an angle member 193 which is spot-welded to the inner lower part of the wrapper sheet 73. This provides a detachable air-sealing engagement between the forward longitudinal edge of the damper 66 and the casing 70. In order to prevent bypass of outdoor air into the room through opening 62 and to assure the correct proportioning of room and outdoor air entering the unit 64, an inwardly extending flexible sealing strip 195 has a continual air-sealing engagement with the bottom of the damper 66. The strip 195 is clamped to the rear longitudinal edge of the wrapper sheet 74.

From the above description it will be apparent that we have provided an improved form of ventilating apparatus which will effectively perform the advantageous functions of admitting to the room any desired quantities of fresh and room air and which can be readily adjusted to exhaust varying quantities of room air from the room. In Figs. 13, 14, 15, and 16, we have shown the various positions of adjustment which may be made with our unit 10 to secure the several described operating functions. In Fig. 13 the motor blower unit 64 is shown as being adjusted to discharge air directly through the room opening 61. The damper 66 is shown as closing completely the opening 60. Therefore, all of the air entering the blower is recirculated room air through the opening 62. In Fig. 14 the motor blower unit 64 is in the same position of adjustment as in Fig. 13, but the damper has been adjusted to partially cut off the amount of room air entering the opening 62 and to partially open the outdoor air opening 60. In this position of adjustment, the air entering the room is partly fresh air and partly recirculated air. In Fig. 15 the motor blower unit 64 is in the same position of adjustment as in Figs. 13 and 14, and the damper 66 has now been adjusted to completely close the room air opening 62 to open wide the outdoor air opening 60. In this position all of the air entering the room is fresh air through the opening 60. In Fig. 16 the motor blower unit has been rotatably adjusted so that the discharge outlet is now directed to discharge the room air entering through the opening 61 directly to the outdoors through the rear openings 60 and the opening 30.

Those skilled in this art will readily appreciate that our novel air circulating device possesses many advantages made possible by the numerous novel structural features and combinations contained therein. As an example, the motor blower unit 64 and the casing 70 are so constructed that a detachable sealing connection can be had with the casing 70 in either position of adjustment of the unit 64 without restricting in any way the free flow of air to the inlets 120 from the openings 60 or 61. This is due to the fact that the

conduit provided by the partition 123 is an extension of the outlets 121 and is therefore spaced a greater radial distance from the central supporting axis of the unit 64 than those portions of the housings 119 which lie closest to the particular opening 60 or 61 through which air may be flowing to the inlets 120. Also, because the housings 119 are scroll-shaped and the discharge outlets 121 tangential, a greater radial distance is required to make the connection with either one of the openings 60 or 61 than is required to clear the portion of the housings 119 nearest the other of such openings. Thus, a clearance is had between either of such openings 60 or 61 and the nearest surface of the housings 119 when the unit 64 is adjusted to discharge through the other of such openings and air may therefore flow freely to such inlets 120 without requiring specially constructed conduits and valves.

What we claim and desire to secure by Letters Patent of the United States is:

1. A ventilating device comprising a centrifugal blower including a motor having a shaft extending outwardly from both ends of the motor, a pair of impellers fixed, respectively, to the outward extensions of said shaft, and a pair of housings enclosing said impellers and having axial inlets and similarly disposed peripheral discharge outlets, respectively; means supporting both of said housings for rotary movement about the motor shaft axis; a partition separating the inlets of both said housings from the outlets thereof and joining together said housings to form therewith a rotatable unit; a casing enclosing said rotatable unit and having a pair of spaced openings therein adapted to communicate, respectively, with separate atmospheres, and said openings being so arranged with respect to said housings and their rotary supporting means that said unit may be rotatably adjusted about the shaft axis to direct said outlets toward either of said openings; and sealing means cooperating with said partition and said casing to prevent bypass of air between said outlets and said inlets when said housing unit is in a position to discharge air through either of said openings.

2. A ventilating device comprising a motor-driven centrifugal blower including a motor having a shaft extending outwardly from both ends of the motor, a pair of impellers fixed, respectively, to the outward extensions of said shaft, and a pair of housings enclosing said impellers and having axial inlets and similarly disposed peripheral discharge outlets, respectively; means joining said housings together and supporting them for rotary movement as a unit about the axis of said shaft; a casing enclosing said blower unit and having a pair of spaced openings adapted to communicate, respectively, with separate atmospheres, and said openings being so arranged with respect to said housings and their rotary supporting means that said discharge outlets may be directed toward either of said openings; conduit means including a partition extending longitudinally of said housing for preventing short-circuiting of air from said outlets to said inlets, said conduit means being movable with said rotatable housing unit and forming an outward extension of said outlets and connectible with either of said openings so that by rotary adjustment of said unit air may be drawn into said inlets from either of said casing openings and discharged from said outlets and said conduit means through the other of said openings.

3. A ventilating device comprising a motor-driven centrifugal blower including a motor having a motor casing and a shaft extending outwardly from both ends of the motor, a pair of impellers fixed, respectively, to outward extensions of said shaft, and a pair of housings enclosing said impellers and having axial inlets and similarly disposed peripheral discharge outlets, respectively; means supporting said housings for rotary movement about the shaft axis; means joining said motor casing with both of said housings to provide therewith a rotatable unit; a casing enclosing said rotatable unit and having a pair of spaced openings adapted to communicate, respectively, with separate atmospheres, and said openings being so arranged with respect to said housings and their rotary support that said unit may be rotatably adjusted about the shaft axis to direct said outlets toward either of said openings; and means including a partition secured to said housings and extending longitudinally of said casing for providing an air sealing connection between the outlets and said casing when said unit is adjusted to direct said outlets toward either of said openings, said partition being arranged to prevent short-circuiting of air from said outlets to said inlets.

4. A ventilating device comprising a motor-driven centrifugal blower including a motor having a shaft extending outwardly from both ends of the motor, a pair of impellers fixed, respectively, to the outward extensions of said shaft, and a pair of housings enclosing said impellers and having axial inlets and similarly disposed peripheral discharge outlets, respectively; a casing enclosing said blower and including a pair of end walls arranged, respectively, adjacent the outer sides of said housings and transversely of said shaft axis, and side walls joining said end walls; means carried by each of said end walls and supporting the housing adjacent thereto for rotary movement about the shaft axis; means joining said housings together for rotation as a unit; said casing side walls having a pair of openings therein adapted to communicate, respectively, with separate atmospheres and said openings being so arranged with respect to said housings and their rotary support that said units may be rotatably adjusted to direct said outlets toward either of said openings; and means including a partition secured to said housings and extending longitudinally of said casing for providing an air sealing connection between said outlets and said casing when said housing unit is rotatably adjusted to direct said outlets toward either of said openings, said partition being arranged to prevent short-circuiting of air from said outlets to said inlets.

5. A ventilating device comprising a motor-driven centrifugal blower including a motor having a shaft extending outwardly from both ends of the motor, a pair of impellers fixed, respectively, to the outward extensions of said shaft, and a pair of housings enclosing said impellers and having axial inlets and similarly disposed peripheral discharge outlets, respectively; a casing enclosing said motor-driven blower and including a pair of end walls arranged, respectively, adjacent the outer sides of said housings and transversely of the motor shaft axis, and side walls joining said end walls; supporting means carried by each of said casing end walls and providing a rotary support for the adjacent housing which is coaxial with said shaft;

said casing side walls having a pair of openings therein adapted to communicate with separate atmospheres, respectively, and being so arranged with respect to said housings and their rotary support that said outlets may be directed toward either opening; conduit means forming an outward extension of said outlets and connectible with either of said openings and including a partition extending longitudinally between and joining together said housings as a rotatable unit so that by rotary adjustment of said unit air may be drawn into said inlets from either of said casing openings and discharged from said outlets and said conduit means through the other of said openings.

6. A ventilating device comprising a motor-driven centrifugal blower including a motor having a motor casing and a shaft extending outwardly from both ends of the motor, a pair of impellers fixed, respectively, to outward extensions of said shaft, and a pair of housings enclosing said impellers and having axial inlets and similarly disposed peripheral discharge outlets, respectively; a casing enclosing said blower and including a pair of end walls arranged, respectively, adjacent the outer sides of said housings and transversely of said shaft axis, and side walls joining said end walls; means carried by each of said end walls and supporting the housing adjacent thereto for rotary movement about the shaft axis; means joining said motor casing with both of said housings to provide therewith a rotatable unit; said casing side walls having a pair of openings therein adapted to communicate, respectively, with separate atmospheres and said openings being so arranged with respect to said housings and their rotary support that said unit may be rotatably adjusted to direct said outlets toward either of said openings; a partition separating the inlets of said housings from said outlets and extending between said housings to form a part of said rotatable unit and serving as a stiffening means for said rotatable unit; and means providing an air sealing connection between said partition and said casing when said unit is adjusted to direct said outlets toward either of said openings.

7. A ventilator for room spaces and comprising a casing having a first opening to communicate with the atmosphere outside of a room space, and having second and third openings to communicate with the room space; a power-operated blower including a blower housing operable in one position of adjustment to draw outside and room air through said first and third openings, respectively, and to discharge such air into the room space through said second opening and operable in an exhaust position to draw room air through said second room opening and to exhaust such air through said first opening; control means providing for the selective operation of said blower housing in said one and said exhaust positions; a damper movable across said first and third openings to proportion the relative amounts of air flowing therethrough when said blower housing is operating in said one position; and means operable when said control means is adjusted to effect operation of said blower housing in said exhaust position, for moving said damper from any position restricting or preventing flow of air through said first opening to a position where said first opening is open.

8. A ventilator for room spaces and comprising a casing having a first opening for communication with the atmosphere outside of a room space and having second and third openings for communication with the room space; a power-operated blower in said casing and including a blower housing having an air inlet and a discharge outlet and being supported for rotary movement about a fixed axis; a damper within said casing supported for rotary movement about approximately the same axis as said blower; said casing openings being so arranged with respect to said blower housing and said damper that said blower housing may be rotatably adjusted to one position where said outlet is directed toward said second opening and air may enter said inlet from said first and third openings and may be adjusted to an exhaust position where said outlet is directed toward said first opening and air may enter said inlet through said second opening, and being so arranged that said damper may be moved between two extreme positions closing, respectively, said first and third openings so as to proportion the amounts of air entering said blower inlet when in said one position; and means movable with said blower housing and engageable with parts of said damper when said blower housing is moved to exhaust position so as to move said damper to the extreme position closing said third and opening said first opening.

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