Jan. 20, 1942. C. E. MEYERHOEFER 2,270,823

HEAT EXCHANGE AND VENTILATING SYSTEM

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Fig. 1

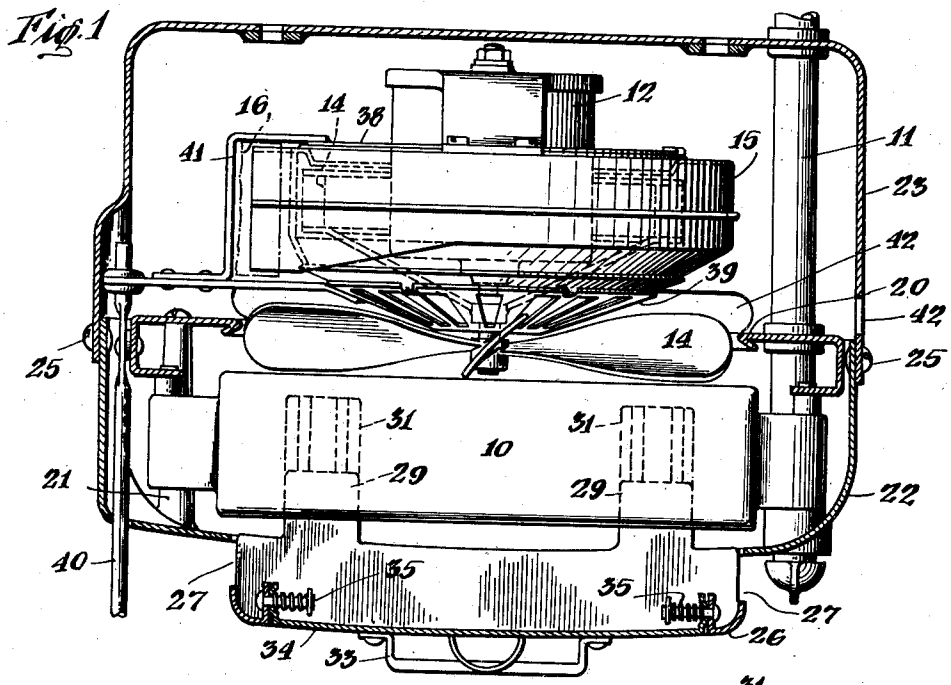


Fig. 2

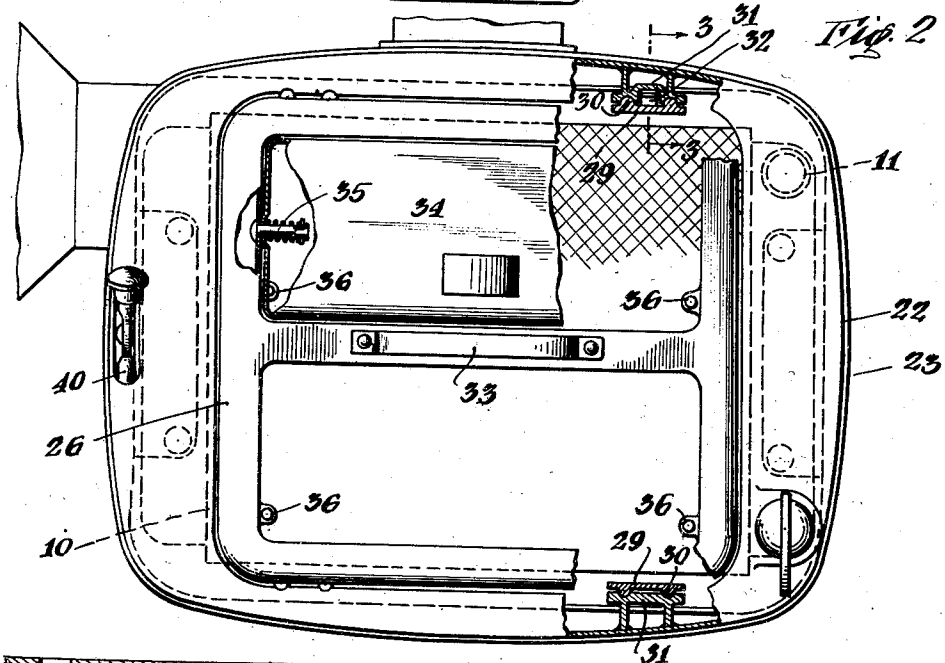
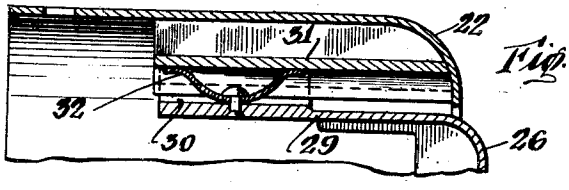


Fig. 3



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Fig. 4

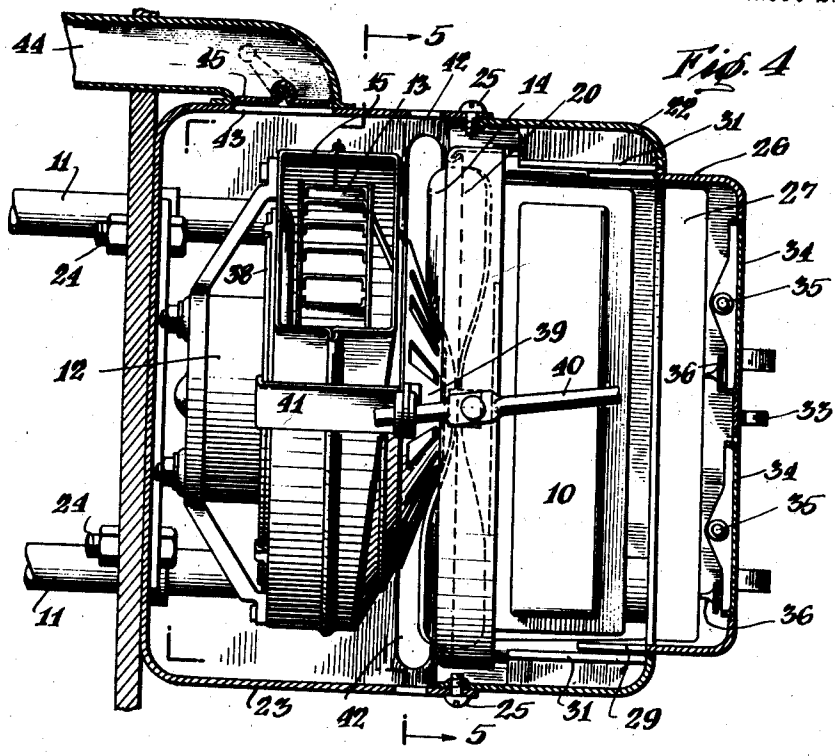
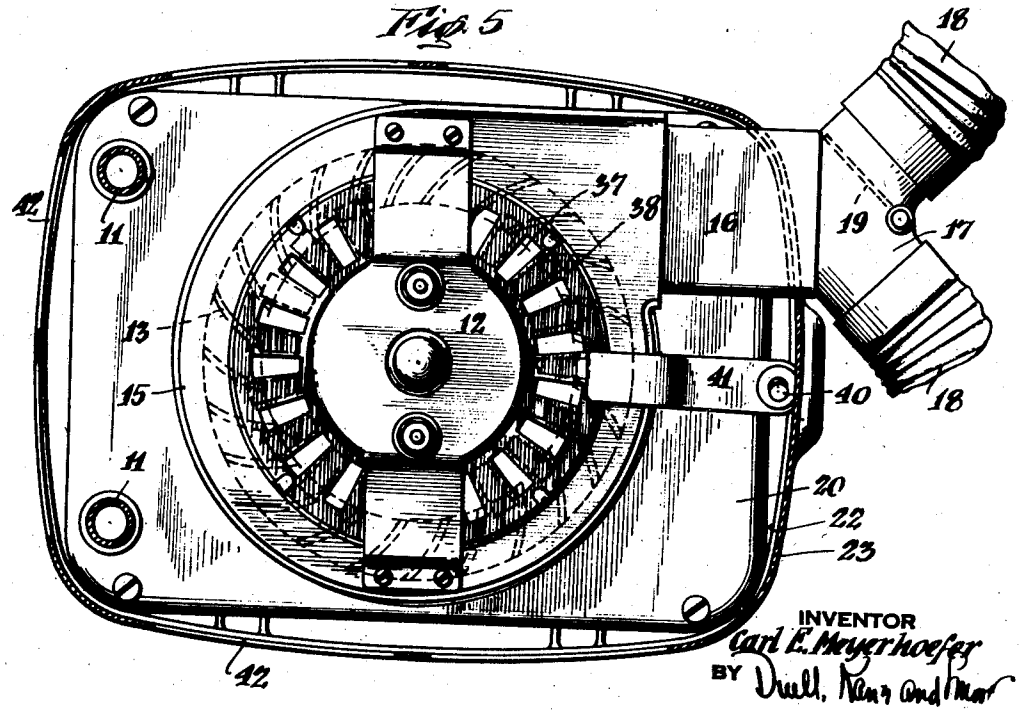


Fig. 5



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Fig. 6

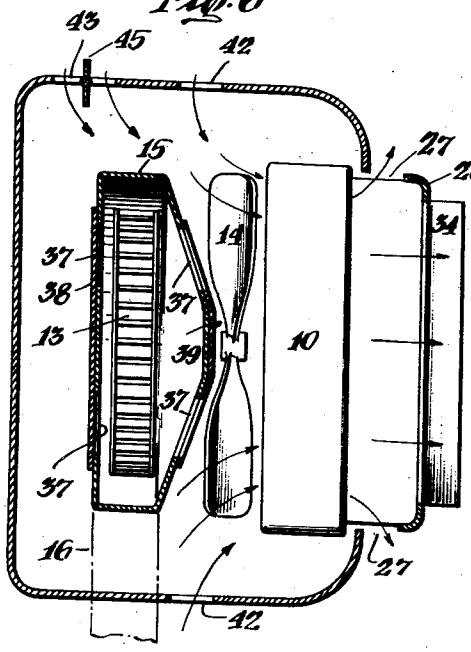


Fig. 7

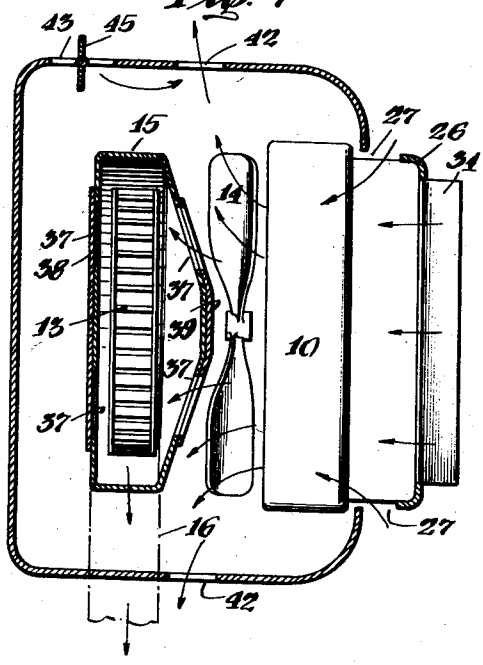


Fig. 8

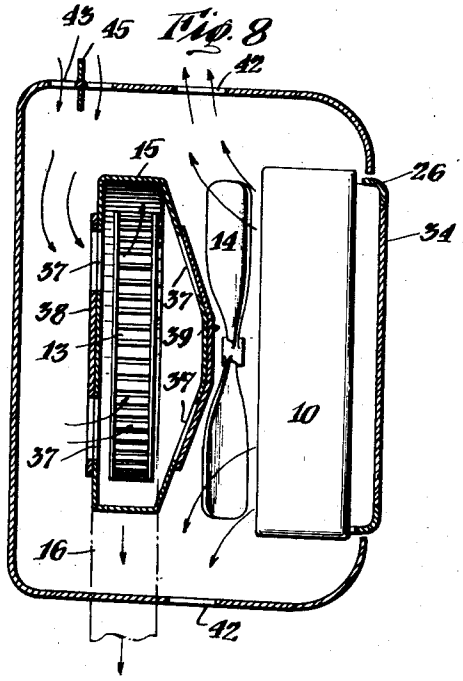
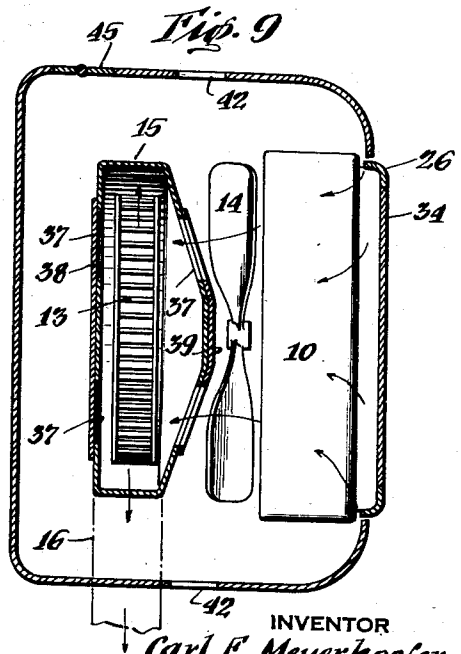


Fig. 9



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UNITED STATES PATENT OFFICE

2,270,823

HEAT EXCHANGE AND VENTILATING SYSTEM

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Application December 9, 1938, Serial No. 244,740

4 Claims. (Cl. 257—137)

This invention relates to a structurally and functionally improved heat exchange and ventilating system capable of use in numerous different associations but primarily intended to be employed in connection with spaces of relatively confined area, such as are present in the enclosed body of a motor vehicle.

It is an object of the invention to furnish a unit of this character and which may be built into a vehicle at the time of manufacture of the latter, or which may be applied with facility to an heretofore constructed vehicle.

A further object of the invention is that of constructing an apparatus of this nature which will embody an improved series of controls such that the flow of air may be controlled with facility aside from the fact that an operator—to effect such control—need not be especially skillful.

Another object is that of providing a heat exchange apparatus and a system which will embody relatively few parts, each individually simple and rugged in construction and operating over long periods of time with freedom from all difficulties.

With these and other objects in mind, reference is had to the attached sheets of drawings illustrating one practical embodiment of the invention, and in which:

Fig. 1 is a sectional plan view taken through the casing of the apparatus and showing the parts contained therein in elevation;

Fig. 2 is a front view of the apparatus with certain parts broken away to disclose underlying construction;

Fig. 3 is a fragmentary sectional view taken along the lines 3—3 and in the direction of the arrows as indicated in Fig. 2;

Fig. 4 is a sectional side view of the unit as shown in Fig. 1;

Fig. 5 is a transverse sectional view taken along the lines 5—5 and in the direction of the arrows as indicated in Fig. 4; and

Figs. 6 to 9 inclusive, are sectional side views of a somewhat diagrammatic nature and illustrating the various alternative forms of flow which may be achieved.

As afore brought out, the present apparatus is primarily intended for use as a heat exchange assembly and ventilating system. As such, it may be employed for the purpose of cooling as well as heating the interior of a space. Usually however, the present form of apparatus will be coupled to, for example, the cooling system of the motor vehicle and thus serve to heat air which may be distributed as hereinafter brought out.

Thus, referring primarily to Figs. 1 to 5 inclusive, the numeral 10 indicates a core and heat assembly which may be of any desired construction so long as interstices are present and through which the air may flow in heat exchange relationship. This core is connected by tubes 11 with, for example, the cooling system of a motor; this method of coupling being well understood by those skilled in the art and, therefore, not requiring any detailed description. At the rear of the core, a motor 12 is provided and this motor serves to drive a blower wheel 13 as well as a fan 14. In the interests of furnishing a compact structure, the blower wheel may be spaced from and concentrically disposed with respect to the motor casing and the latter is connected to a source of current supply. By means of a switch (not shown), but which may be in the nature of a variable or tapped resistance with cut-off and which, for a purpose hereinafter brought out, will preferably embody a reversing structure, the polarity of the motor 12 may be reversed so as to cause the latter to be driven in either a clockwise or counterclockwise direction.

The blower wheel is encircled by a casing 15 from which a duct 16 extends, the latter being coupled to, for example, a Y-shaped fitting 17, to the arms of which tubes 18 are connected. These tubes may extend to a point adjacent the windshield or the rear compartment of the vehicle, or may be otherwise disposed as may be most convenient, but in accordance with conventional construction it is preferred that a valve 19 be furnished to permit the flow of air through either or both of the tubes. The fan 14 is encircled by a shroud plate 20 and the latter may be supported upon posts 21 which form a part of a shell enclosing the core and associated structure.

While this shell may take numerous different forms, it is preferred that it include a pair of sections 22 and 23. The latter is furnished with openings through which bolts 24 may pass for the purpose of anchoring the apparatus to the dash or other suitable supporting structure. This section also provides openings for the passage of tubes 11 and duct 16. Sections 22 and 23 are secured against movement as, for example, by bolts 25, and the first section is provided with an opening in line with the face of the core.

A louvre or shutter structure is preferably associated with the latter opening and if such a structure is employed, it preferably should be in

the nature of that illustrated in Figs. 1 to 4. Thus, it will be seen that the numeral 26 indicates a housing preferably extended rearwardly adjacent its top and bottom edges and providing openings 27 at its sides. The rearwardly extending portions as especially shown in Figs. 1 and 2, may be continued in the form of projections 29 presenting ribs 30 in their upper faces. These ribs extend into grooves forming parts of brackets 31 and mounted by the shell section 22, a spring 32 being preferably associated with the upper assemblies and interposed between the projections and brackets so as to prevent any rattling of the parts. This housing may be shifted outwardly or moved inwardly as, for example, by a handle 33 to expose to a greater or lesser extent the openings 27. The housing 26 is also furnished with openings which may be closed by louvres 34 pivotally mounted as at 35 and cooperative with stop elements 36 which limit their movement. Also, as shown, springs may be associated with pivots 35 in order to present a structure which will permit of the shutter elements being adjusted to any desired position and retaining such position.

The housing 15 enclosing the blower wheel is furnished with an air controlling structure preferably in each of its side faces. While this structure may be of any desired type, it preferably includes an annular series of openings 37 in the rear and front walls of the casing, and which openings are overlain by damper plates 38 and 39 respectively. A control lever 40 may be pivotally secured by any suitable supporting structure such as the shroud plate 20, and is coupled to a forked bracket 41, one arm of which is secured to the damper 39, while the other arm is coupled to damper 38. The openings in the front and rear walls of housing 15 and the dampers associated therewith are so correlated that when the openings in one face are closed, the openings in the other are open. It follows that if lever 40 extends beyond the shell as shown in Fig. 1, an operator by simply swinging this element may alternately close the front or rear faces of the blower wheel housing.

Preferably the rear shell section 23 also encloses the sides of the motor and is furnished with side openings 42 through which air may flow, and is moreover furnished with an opening 43 to which a duct 44 may be coupled. This duct may connect with the cool ventilator or may otherwise communicate with the outer air. A valve 45 is conveniently located within this duct and serves to prevent or permit a flow of air through the same and to the interior of the shell.

Considering now the operation of the mechanism, attention is invited to Fig. 6 in which the motor is driving the fan in a direction such that the latter operates efficiently. In other words, the blades of the fan are curved so that with a given rotation of the fan, an air flow of maximum volume and/or velocity will occur, while if a reverse rotation was resorted to, a lesser volume and/or velocity will occur. The first named condition is present in this figure. The air so drawn will enter, for example, through openings 42 and be distributed outwardly through the space intervening shell 26 and shell 22, as well as between the louvres. This will heat the interior of the compartment within which the unit is disposed, it being, of course, understood that if shell 26 is shifted inwardly to the position shown in Figs. 8 and 9, that air will nevertheless be distributed so long as the louvres 34 are opened. Under either of these circumstances it is to be understood that the blower wheel 13 will be running in a reverse direction so that only a minimum amount of air will be drawn through the openings of damper 39 and distributed through duct 16.

In Fig. 7 it is assumed that the direction of rotation of the motor has been reversed. Under this circumstance, the fan is operating relatively inefficiently, but the blower wheel is operating with maximum efficiency. Accordingly, air is drawn through the openings of damper 39 and distributed through tubes 18. A certain amount of air will, of course, be drawn through the core by fan 14 and a portion of this air will be impelled towards the openings of damper 39. The remainder of the same will be expelled through openings 42. Again, it will be understood that shell 26 may be projected or retracted as desired in that sufficient air will pass between the louvres 34 should shell 26 be so retracted.

In Fig. 8 it is to be assumed that the fan and blower wheel are driven in the same direction as that specified in Fig. 7. However, in this view the damper 39 has been closed and the damper 38 opened. Moreover, the shutters 34 have been closed and the shell 26 has been retracted. Under these circumstances, the air supplied to the blower wheel will not pass through the core 10 but will rather flow from the exterior of the shell sections to the interior of the same, and thence be distributed. In view of the fact that the fan 14 does not create high velocities and pressure differentials, the amount of air flowing through the core, under these circumstances, will be negligible, or in fact may cease altogether. However, should the shutters 34 be opened, a relatively small amount of air will be impelled by the fan through the core and distributed through the openings 42.

Now, considering the condition illustrated in Fig. 9, it will be observed that the same operation as that described in Fig. 7 occurs, excepting that shutters 34 and shell 26 have been moved to their closed positions. Thus, air will not be distributed by fan 14, but it is found that the air seepage occurring between the adjacent edges of the shutters and the shell sections is adequate to supply air in sufficient volume to the blower wheel to permit of a steady flow through duct 16 and tubes 18.

Reviewing the several functions of the apparatus, it will be understood that the condition set forth in Fig. 6 assures an efficient heating of the space within which the unit is disposed. Also, a certain—although relatively reduced—amount of air is, under these circumstances, distributed by the blower wheel. Under the conditions set forth in Fig. 7, the temperature within the space accommodating unit 7 will be maintained by the air which will be expelled through openings 42 and warm air will be supplied to the blower wheel so that defrosting and similar operations may be achieved with maximum efficiency.

In both of the foregoing views as well as in Fig. 8, the valve 45 has been shown in open position. It will be appreciated that this need not necessarily be the case, in that if the valve is closed, all air moved by the impelling means will simply flow through the shell by way of the openings 42 and the core. However, should valve 45 be partially or wholly opened, a certain amount of fresh air will be supplied to the blower

wheel and fan under the circumstances depicted in Fig. 6, while under the conditions illustrated in Fig. 7, substantially all of the fresh air will be expelled through openings 42 into the compartment or interior of the vehicle.

Now, in Fig. 8 with valve 45 opened, the maximum amount of air distributed through the blower wheel will be fresh air and even a certain amount of the air impelled by fan 14 may be fresh air. This is a condition which is especially desirable when it is primarily sought to distribute unheated fresh air throughout a given space. Where air flow in this direction occurs, it will, of course, be understood that due to the fact that the forward face of the casing 15 is preferably somewhat inclined, it will serve to assist in a diversion of air by the fan 14 towards the openings 42.

Finally, referring to Fig. 9, it will be understood that the condition therein shown is one which is preferably resorted to where the windshield or other portions of the vehicle, are to be supplied with warm air, but where it is not desired to generally heat the interior of the vehicle. Of course, the control may be further modified especially with reference to the flow of heated air incident to the fact that the core may be disconnected from the source of heated fluid, such as the cooling jacket of the engine. Moreover, it will be understood that in certain respects the present apparatus lends itself ideally to coupling with a source of cooled fluid where it is desired to reduce the dry bulb temperature of a given space.

Thus among others the several objects of the invention as specifically aforenoted are achieved. Obviously numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

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

1. An apparatus of the character described including in combination a core to receive fluid and presenting interstices for the flow of air, a fan disposed adjacent said core, a blower wheel coupled to said fan and also disposed adjacent said core, a shell enclosing said core and fan and blower wheel, said shell being formed with inlet and outlet openings through which air may flow, an auxiliary fresh air opening associated with said shell, valve means carried by said shell adjacent said auxiliary opening for rendering the same inoperative, means for rotating said wheel and fan in either direction, said wheel and fan being so designed that rotation thereof in either direction will draw fresh air into the interior of said shell when said valve means is in open position, a casing enclosing said blower wheel and formed with inlet openings in its opposite side faces and dampers connected to said casing and controlling the flow of air through said openings to said blower wheel when the latter is in motion.

2. An apparatus of the character described including in combination a core to receive fluid and presenting interstices for the flow of air, a fan disposed adjacent said core, a blower wheel coupled to said fan and also disposed adjacent said core, a shell enclosing said core and fan and blower wheel, said shell being formed with inlet and outlet openings through which air may flow, an auxiliary fresh air opening associated with said shell, valve means carried by said shell adjacent said auxiliary opening for rendering the same inoperative, means for rotating said wheel and fan in either direction, said wheel and fan being so designed that rotation thereof in either direction will draw fresh air through said auxiliary opening into the interior of said shell when said valve means is in open position, supplementary damper means associated with the inlet openings in said shell whereby said fan and blower wheel may be supplied with fresh air when said fresh air valve is open and said supplementary damper closed and with re-circulated air when said fresh air valve is closed and said supplementary damper open.

3. In a heater of the class described, a casing having an opening in a wall thereof, a housing having a front wall and two rearwardly extending walls, said latter walls mounted for telescopic movement within said casing opening, whereby said front wall can be spaced from or caused to completely obstruct said opening, and louvres carried by said front wall, said louvres being shiftable to allow or obstruct air-flow through said front wall.

4. An apparatus of the character described including in combination a core to receive fluid and presenting interstices for the flow of air, a fan disposed adjacent said core, a blower wheel coupled to said fan and also disposed adjacent said core, a shell enclosing said core and fan, a housing for said wheel, said shell being formed with an outlet opening through which air may flow and also an auxiliary fresh air opening, valve means carried by said shell adjacent said auxiliary opening for preventing a flow of air therethrough, means for rotating said wheel and fan in either direction, said wheel and fan being so designed that rotation thereof in either direction will draw fresh air through said auxiliary opening into the interior of said shell when said valve means is in open position and dampers carried by said blower wheel housing and adjustable to admit fresh air to said housing when said wheel is moving in one predetermined direction only.

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