June 2, 1953 J. M. AUFIERO 2,640,407

AUTOMOBILE HEATER

Filed July 19, 1949 2 Sheets-Sheet 1

Fig. 2

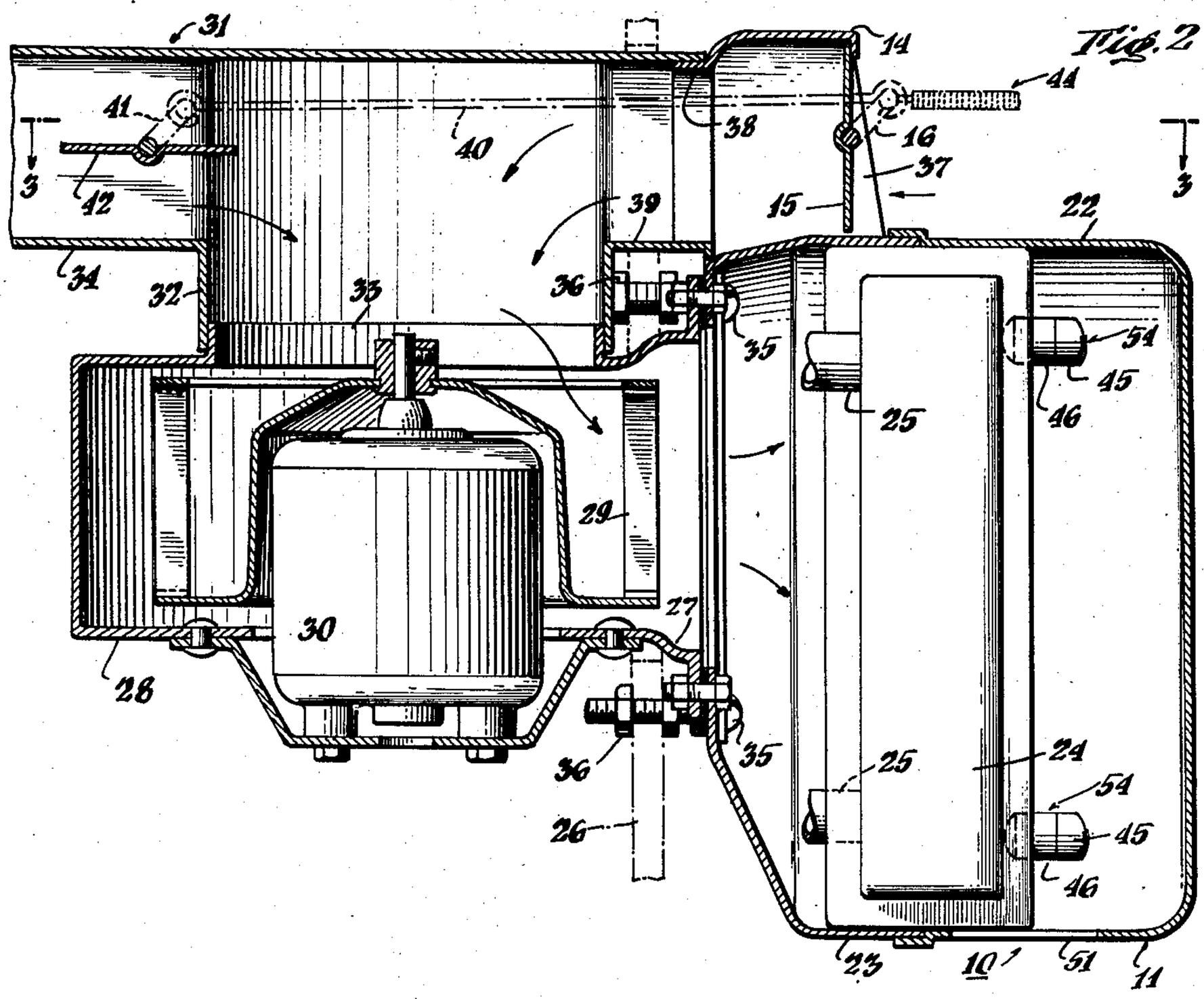
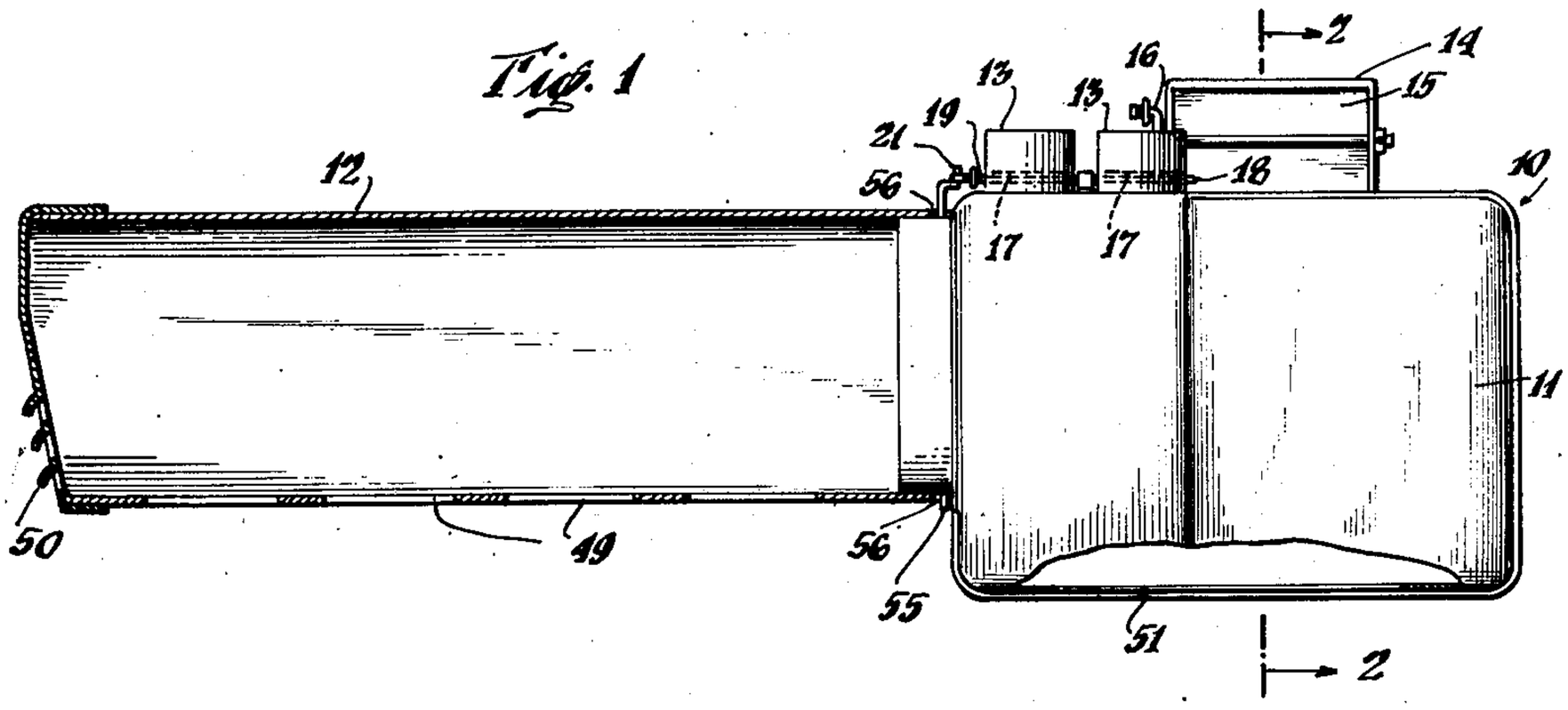


Fig. 1



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2 Sheets-Sheet 2

Fig. 4

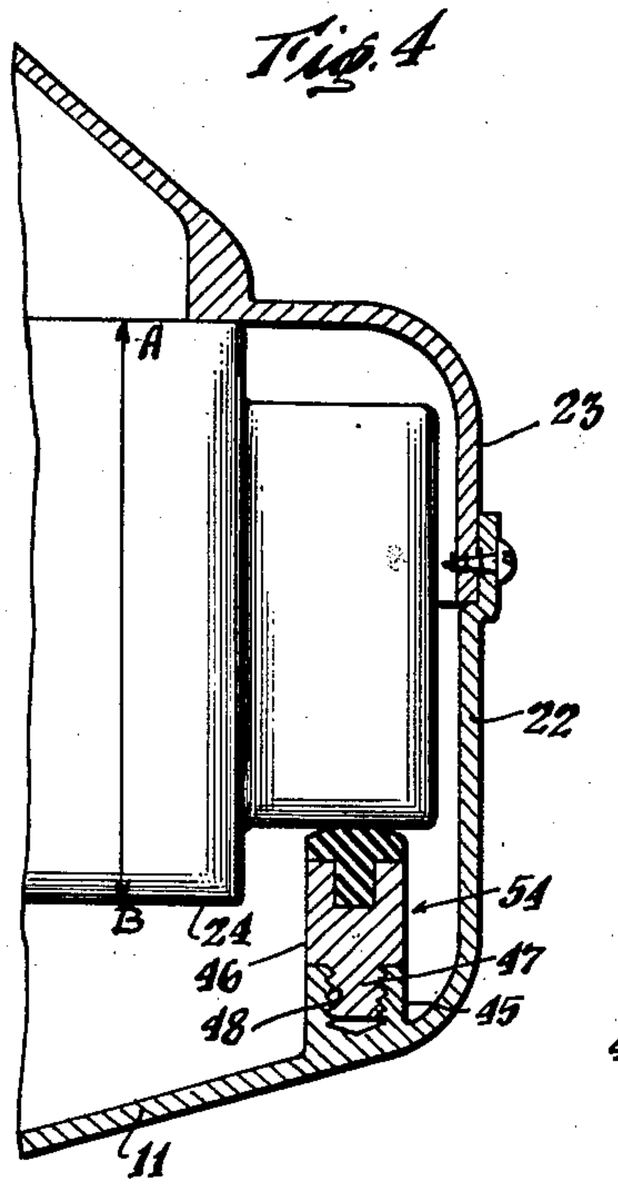
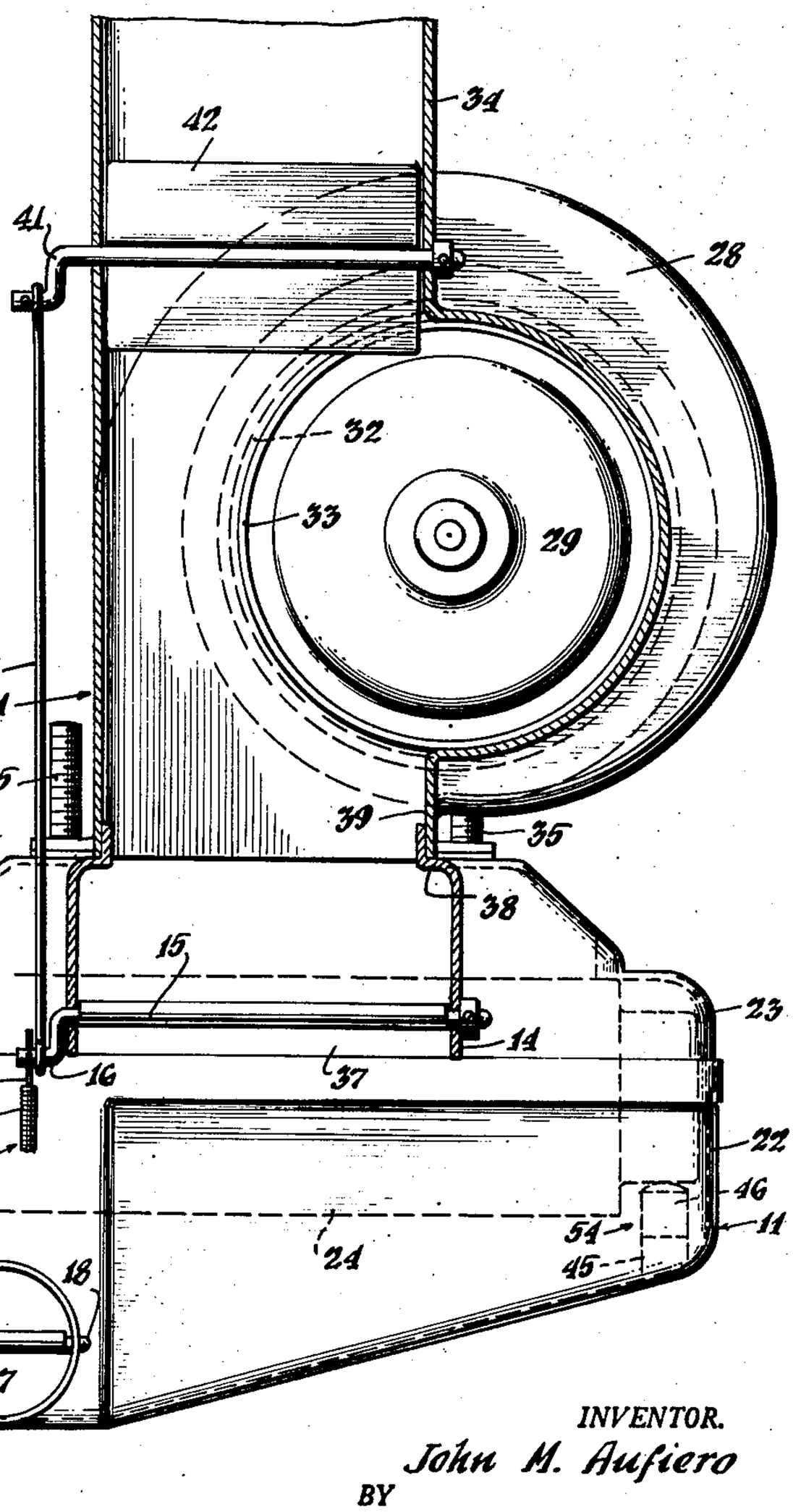


Fig. 3



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UNITED STATES PATENT OFFICE

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AUTOMOBILE HEATER

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Application July 19, 1949, Serial No. 105,552

1 Claim. (Cl. 98—2)

1

This invention relates to an improved heater and particularly to a heater for use in automobiles

It is an object of this invention to provide a heater which has adaptability to air cooling and defrosting as well as heating.

It is another object of this invention to provide a structure which can be adjusted to receive cores of different sizes.

It is a further object of this invention to provide a heater in which the motor moving the air is on one side of the dividing wall between the engine and passenger compartments and the ducts delivering the heated air are on the other side of such dividing wall.

It is still another object of this invention to provide a unit which includes relatively few parts each individually simple and rugged in construction and capable of manufacture by quantity production; such parts when assembled 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 practical embodiments of the invention and in which:

Fig. 1 is a front view of the heater of this invention shown partly in section;

Fig. 2 is a vertical section of the heater taken on line 2—2 of Fig. 1 in the direction of the arrows;

Fig. 3 is a plan view of the heater partly in horizontal section taken on line 3—3 of Fig. 2; and

Fig. 4 is an enlarged horizontal section of a portion of the core and casing of the heater showing a modification of the core supporting means.

In general this invention comprises a heater providing simplicity in operation, adaptability to air cooling, defrosting or heating, and ease of manufacture.

Referring to Fig. 1, it will be seen that a heater 10 having a casing 11 has extending from the left side of the casing 11 as shown in Fig. 1 a duct 12. From the upper surface of the casing 11 two defroster ducts 13 extend perpendicularly and side by side to receive two defroster tubes (not shown). Also on the upper surface of the casing 11 is a recirculation intake duct 14 having a control valve 15 actuated by a crank 16. Control valves 17 for the control ducts 13 are shown in dotted outline and are mounted on a shaft 18 which is turned by a crank 19. A valve 20 controlling the flow of air into duct 12 is turned by a crank 21.

2

Referring to the vertical section of Fig. 2, the casing 11 is shown to have two parts, a front half 22 and a rear half 23. Inside of these two sections of the casing is a core 24 in which extend two circulation pipes 25 which may be connected to the cooling jacket of the automobile engine for the supply of flowing heated water to the core 24. A wall 26 is the wall between the body compartment and the engine compartment of the automobile. The wall 26 will hereinafter be referred to as the fire wall 26. The heating assembly 10 is secured to the fire wall 26 by bolts 35 and nuts 36. The position of the bolts 35 is merely suggestive. A ring 27 through an aperture in the fire wall 26 connects the interior of the casing 11 to the interior of a blower casing 28. The blower casing 28 contains a blower fan 29 driven by a suitable motor 30. An air duct system 31 shown above the blower 29 has a flanged port 32 which extends down and encloses a rim 33 around an aperture in the upper surface of the blower casing 28. The fresh air is drawn into the heating system from the forward part of the automobile through a forwardly extending portion 34 of the duct 31. The air is drawn into the blower through port 32 and past rim 33 and is expelled by the blower 29 from the lower casing 28 through the ring 27 into the heater casing 11 and against the core 24. The distribution of air to the body compartment is effected through the vertical slots 49 in the duct 12 and the end louvre openings 50. A small slot 51 may be provided in the bottom surface of the casing 11 to provide a bleeding off of air to the body compartment when the flap 20 closes the duct 12 and prevents the escape of heated air through the slots 49 and louvre 50.

The air passes through interstices in the core 24 and becomes warmed. The warmed air urged by the pressure from the blower fan 29 escapes from the casing 11 through the defroster ducts 13, the slot 51 and duct 12 whence it is distributed through the body compartment.

The recirculation intake 14 on the top of the casing 11 has an intake opening 37 and an exit port 38 discharging into a rearwardly extending duct 39 of the duct 31. The valve 15 controls the passage of air through the intake opening 37. Referring to the plan view of Fig. 3, the valve 15 is shown controlled by the crank arm 16. A rod 40 connects the crank 16 with a crank 41 which controls a valve 42 positioned in the forwardly extending duct 34. The cranks 16 and 41 cooperate through the rod 40 to control the relative passage of air through forward duct 34 and the rear duct 39. A Bowden wire 44 at-

tached to the crank 16 holds the valves 15 and 42 in a normally predetermined position in which valve 15 is fully closed and valve 42 is fully opened.

The forward extending duct 34 carries fresh air to the heater from the forward part of the car in the vicinity of the radiator. A valve not shown is provided at some point in the pipes 25. This valve can either shut off completely or decrease the flow of water through the pipes 25 and consequently the core 24. This valve is remotely controlled as by a Bowden wire. If fresh cool air alone is desired the heater 10 may be used to supply the body compartment with fresh cool air during the warm periods of the year simply by setting in closed position a control of the circulation of heating liquid through the core and allow the core to remain cool. The blower fan 29, duct system 31 and distribution duct 12 and slot 51 then serve to cool the body compartment and thus serve a dual purpose. The heater is thus simple and yet adaptable to heating, defrosting and air cooling.

The occasion may arise, however, when introducing air in through duct 34 should be limited either because it is too cold to be adequately heated by the core to provide a desired degree of warmth, or because of congested traffic or for other reasons it is not desired to draw air from in front of the automobile. Under these circumstances it is best to close off the forward extending duct 34 and draw the air for heating purposes out of the body compartment through the blower and core. This may be done by recirculating air from the body compartment through the blower 29 and the heater core 24 and provide a more rapid and more efficient heating of the air in the body compartment. The arrangement of the duct 32 with its forwardly extending portion 34 and rearwardly extending portion 39 and the recirculation intake 14 is such as to be able to feed air either from the front of the car or the body compartment through the blower and heater casing 11 equally easily and efficiently. As shown in Figs. 2 and 3, valve 15 controls the entry of air through the intake 37 of the recirculation duct 14 while valve 42 controls the passage of air through the forward extending duct 34. The valves 15 and 42 as mentioned above are connected and mutually controlled through a rod 40 and cooperating crank arms 16 and 41 on the straight shanks of which the valves 15 and 42 are mounted. The valves 15 and 42 are so mounted on the crank arms 16 and 41 that when valve 15 is fully opened valve 42 is fully closed and vice versa. Similarly, when valve 15 is half open valve 42 is also at the half-way position. The Bowden wire 44 whose flexible covering 53 is suitably anchored has a moving wire 52 which being attached to crank arm 16 operates the entire control valve assembly for the recirculating intake 14 and the forwardly extending duct 34. As the central wire 52 is advanced from its flexible covering 53 the crank arm 16 is rotated counterclockwise moving the valve 15 in a similar direction to open the intake port 37 simultaneously the rod 40 is moved in a forward direction rotating crank arm 41 also in a counterclockwise direction and the valve 42 in a counterclockwise direction to close the forward extending duct 34. Thus a delicate control of the positions of valves 15 and 42 may be obtained through the Bowden wire 44. As the valve 15 in the port 37 is opened a suction is created through the port 37 by the blower 29. This suction is

aided by the blocking of the entry of air through duct 34. The cooperation of the valves 15 and 42 through rod link 40, therefore not only decreases the amount of air that is drawn through duct 34 as the port 37 is opened but also increases the suction created through port 37 as this port is opened. The desired action in closing the valve 42 and opening the valve 15 is therefore increased by the cooperation of these parts. Conversely, on closing valve 15 and opening valve 42 the decrease of the suction through the intake port 37 increases the suction pressure exerted through the duct 34 and assists the intake of fresh air from the front of the car.

The core 24 is held in position in the casing 11 by studs 54. These studs 54 are made up of bases 45 which are integral with the casing wall and onto which removable projections 46 may be fitted and secured. As shown in the section of Fig. 4, the projection 46 is fastened in this modification to the base 45 by a threaded lug 47 on the projection 46 screwing into a threaded recess 48 in the base 45. Cores having variations in the depth dimension may be fitted into a uniform sized casing by substitution of projection portions 46 of various compensating lengths on the bases 45 in the uniform sized casing 11. Thus in the case of the heater 10 shown, if it were desired to insert a core having a narrower dimension from A to B as shown in Fig. 4, the casing 11 could be adapted to receive and securely hold such narrower core by inserting stud projections 46 of greater length which would take up the space and hold the studded core as securely as the core shown in the figures.

The valves 17 cooperate synchronously with the valve 20 through a rod link 43 which connects cranks 19 and 21. The positioning of the rod link 43, the cranks 19 and 21 and the valves 17 and 20 may be accomplished in any desired manner by crank, knob, or otherwise, including control by suitable power apparatus. As shown in Fig. 3, the valves 17 are fully opened and the valve 20 is fully closed. In this position all of the output of the heater core 24 would be delivered to the defrosters. By moving rod link 43 rearwardly the crank 21 is rotated clockwise as seen in Fig. 3 and the crank 19 is rotated upwardly as seen in Fig. 3. This motion simultaneously closes the valves 17 and opens the valve 20. At the full completion of the motion of the rod link 43 away from the position shown in Fig. 3, valve 20 is fully opened and valves 17 are fully closed. In this way the opening and closing of the valves 17 and the valve 20 are synchronized. Thus, when desired, a delivery of the entire output of the heated air can be made to the defroster tubes. However, when such a concentration of heat is not necessary the supply of heat to the defroster tubes can be slowly diminished and the excess heated air be fed into duct 12. In stating that the full supply of the output of the core 24 is directed into the defroster tube it is borne in mind that there will be a certain limited escape of heated air to the body compartment through the slot 51 when the valve 12 is completely closed.

The duct 12 is cast integrally with the casing 11. The duct 12 therefore has a front half which is integral with front half 22 of the casing and has a rear half which is integral with rear half 23 of the casing. The valve 20 is mounted on a shaft 55 of the crank 21. The shaft 55 is held in position in the duct 12 between the front half 22 and the rear half 23 of

the duct 12. Recesses 56 in the wall of the duct 12 at the point of securing the shaft 55 act as bearings for the shaft 55. The two halves of the casing 11 and the duct 12 are suitably held together. Thus a simple construction is provided whereby the assembly of the two halves of the casing and duct serves also to clamp and secure the valve 20 in position.

Thus the many advantages of the heater of this invention are achieved. A heater is provided in which the only parts of the heater within the body compartment are the heater core and distribution duct and defroster tubes. Yet it is possible to provide recirculation with the heater of this invention without a second opening for passage of air through the fire wall. This is of importance as automobiles are manufactured with a single aperture through the fire wall. To cut another aperture through the fire wall would be troublesome. At the same time the recirculation of the air in the body compartment and the cutting off of the draft of fresh cool air from outside of the body compartment is an important feature. This invention advantageously supplies a heater having the motor and blower of the heater outside the body compartment, a duct drawing air from the front of the engine compartment, and a recirculation duct carrying air from the body compartment through the blower and back into the heating core through a single aperture in the separating wall between the engine and body compartments.

Among other advantages of this invention is the adjustability provided for the mounting of the heater core in the casing. A simplicity of manufacture is created as a result of this adjustability, as it will be possible to mount various sized cores in a single standard sized coring.

Further advantages of this invention are found in the synchronous operation of the control valves. The valves which control the supply of air to the blower cooperate to maintain a delivery of a certain minimum volume of air to the blower. Without this minimum the blower does not operate efficiently. However, if too much air is supplied to the blower the heater core cannot provide a satisfactory degree of warmth to the air. It is therefore imperative that without regard to where the air is drawn from, either uncirculated or recirculated, that the overall volume be maintained in a certain range. This is achieved by synchronous cooperation in the movement of the control valves 15 and 42. Similarly, the synchronous operation of the valves 17 and 20 provides an efficient distribution of the heated air to the body compartment. This is, in a manner, the converse of the synchronous cooperation of the valves 15 and 42. In the synchronous cooperation of the operation of the valves 17 and 20, the heated air is distributed so that it is always efficiently employed. If it is not desired

to use the full delivery from the heated core, with the exception of that which bleeds through slot 51, either through the defroster tubes or the distribution duct, it is possible to divide up the distribution of the heated air between these two escapes.

The heater of this invention has the advantage of being simple and rigid in construction and fool-proof in operation. Thus among others the several objects of the invention as specifically aforementioned are accomplished. Obviously numerous changes in construction and arrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claim.

I claim:

An automobile heater cooperable with the fire wall of an automobile passenger body including in combination a duct system combined with a blower casing in the motor compartment adjacent said fire wall; a rotary blower fan in said casing; a central duct in said duct system adjacent and axial to said blower fan; a heater core in the passenger compartment adjacent said fire wall and radial to said blower fan; a ring extending through an opening in said fire wall connecting said heater core to said casing of said blower fan; a second duct extending through said opening in said fire wall from said passenger compartment and connected to said central duct; an orifice defining an entrance into said duct system on the opposite side of said central duct from said second duct for providing fresh air to said automobile heater; valve means for controlling the introduction of air to said duct system, said casing and said blower fan through said entrance orifice and additional valve means for controlling the introduction of air to said duct system, said casing and said blower fan through said second duct, means attached to the respective valve means to actuate said valve means so that as the one valve closes the other opens and vice versa whereby air may be drawn from said passenger compartment through said second duct and through said blower fan alone or together with air from said entrance orifice and then through said ring to said passenger compartment and said heater core in a direction opposite to its original path of flow through said second duct.

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