

Dec. 30, 1952

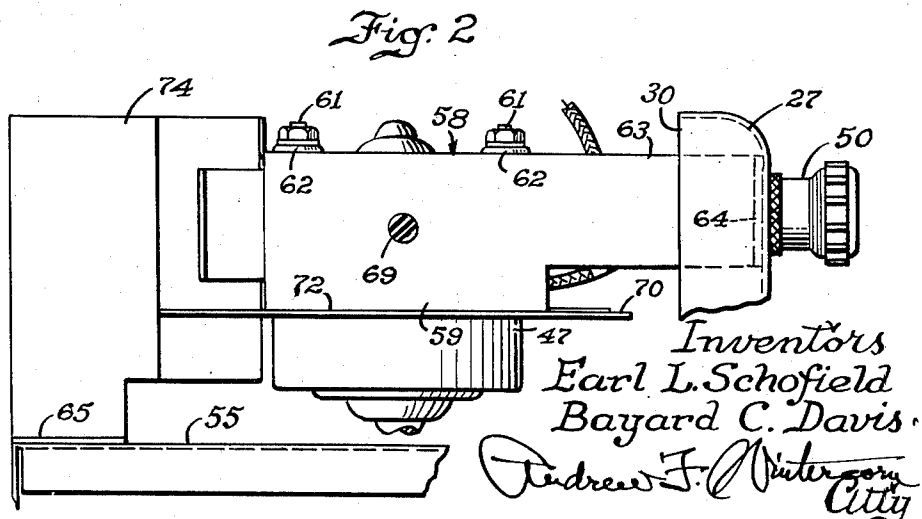
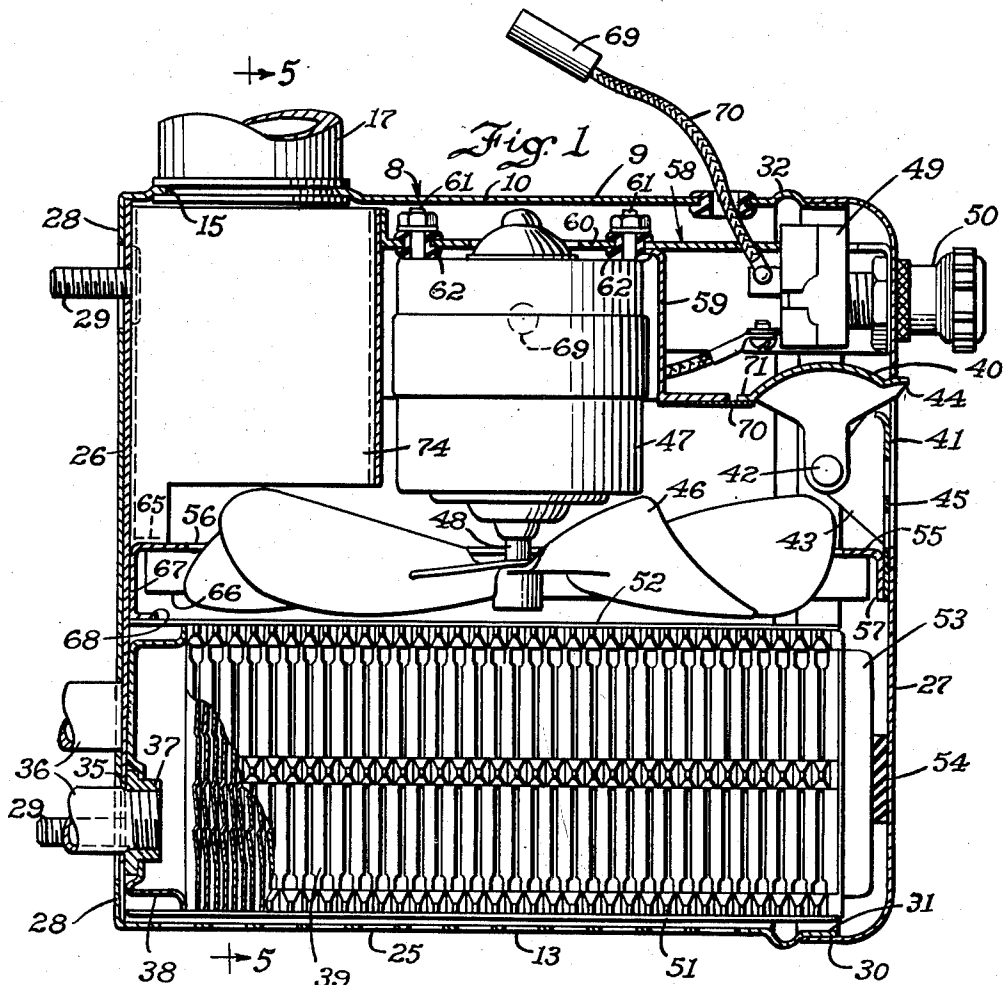
E. L. SCHOFIELD ET AL

2,623,735

RECIRCULATING AIR HEATER

Filed Dec. 16, 1948

4 Sheets-Sheet 1



Inventors
Earl L. Schofield
Bayard C. Davis.

Andrew J. Wintergorn
Att'y

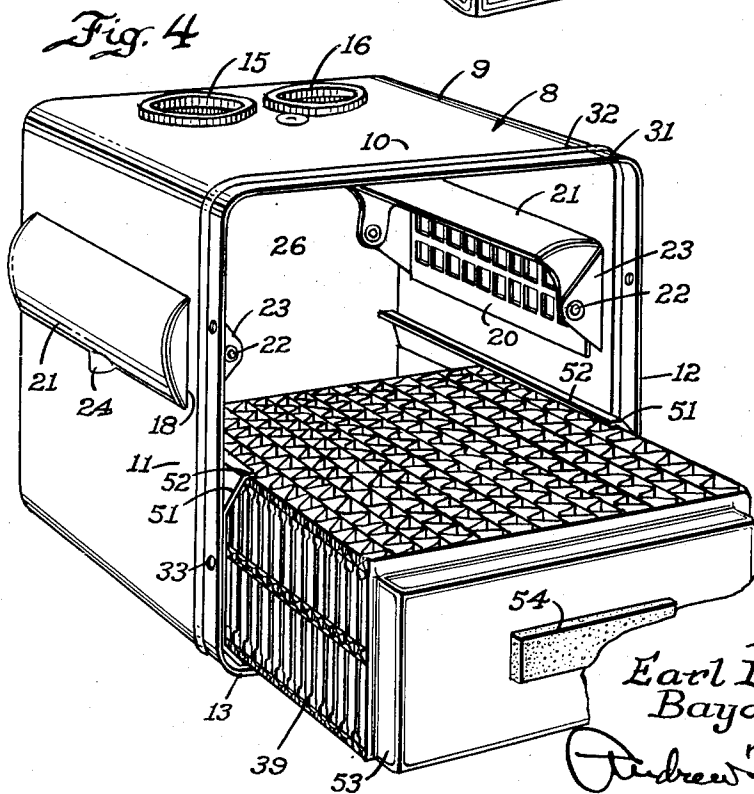
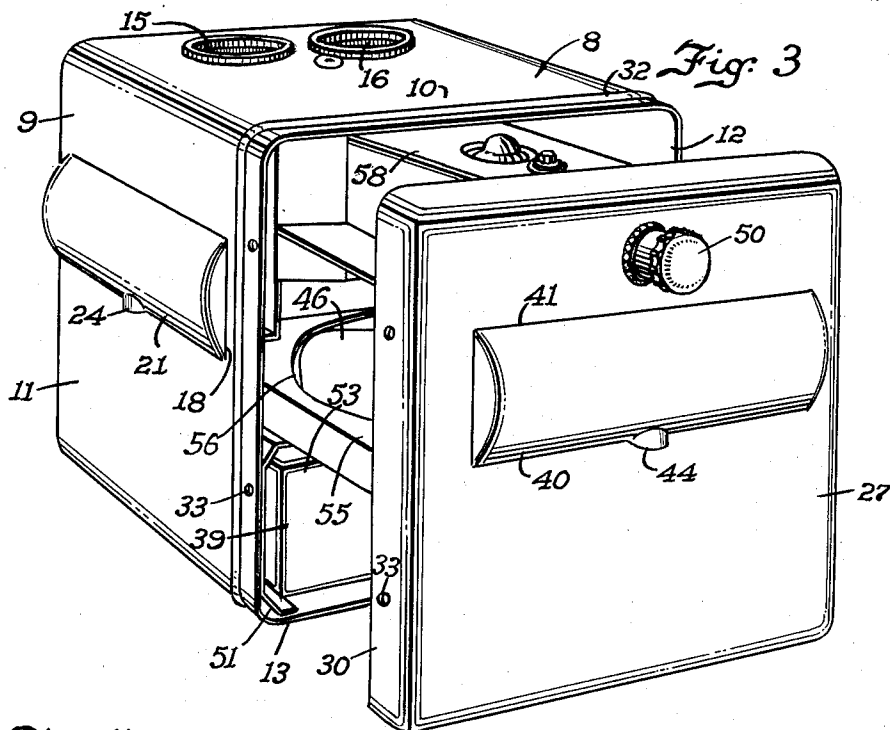
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4 Sheets-Sheet 2



Inventors
Earl L. Schofield
Bayard C. Davis

Andrew J. Wintercorn
Att'y

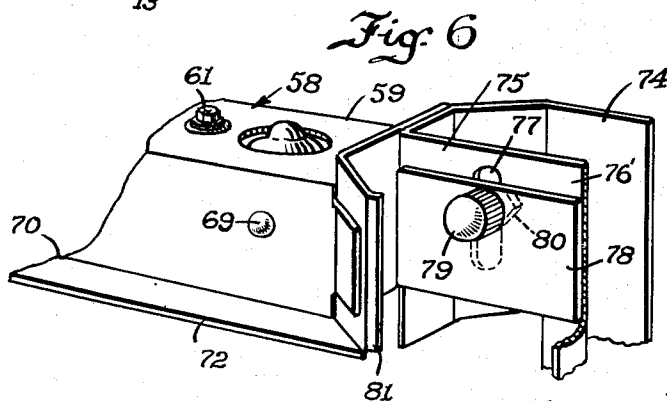
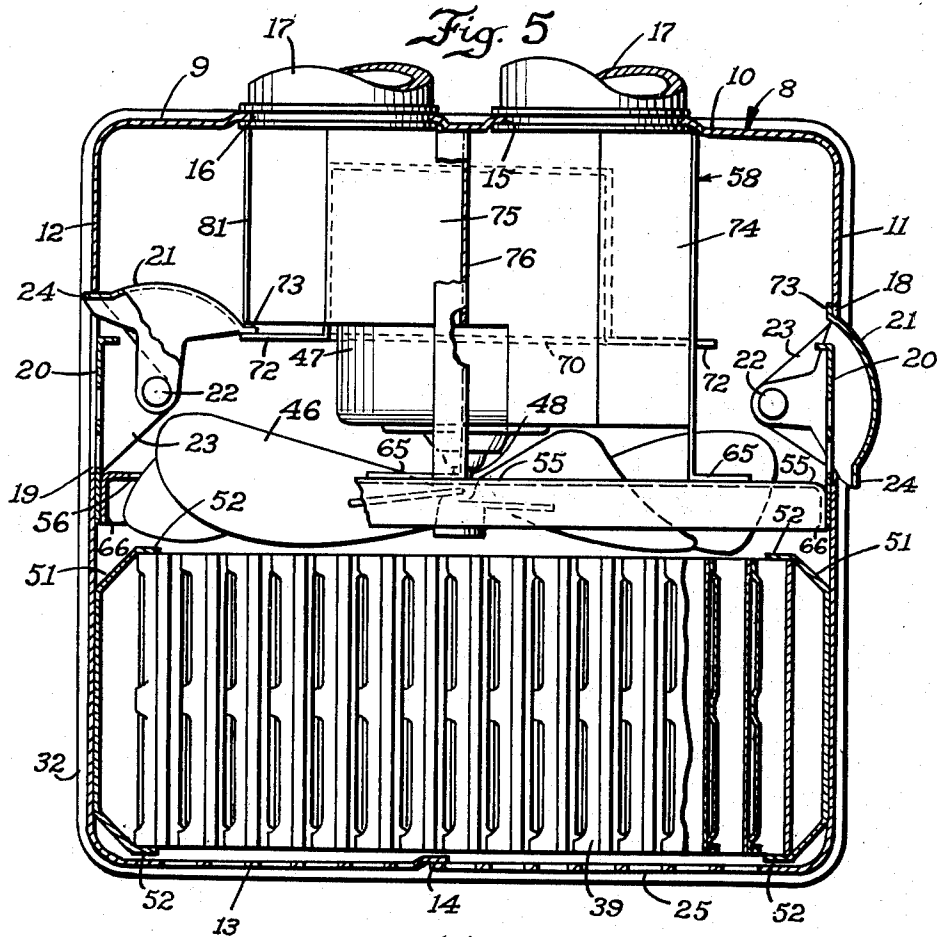
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Inventors
Earl L. Schofield
Bayard C. Davis
Andrew F. Wilbourn
Atty

Dec. 30, 1952

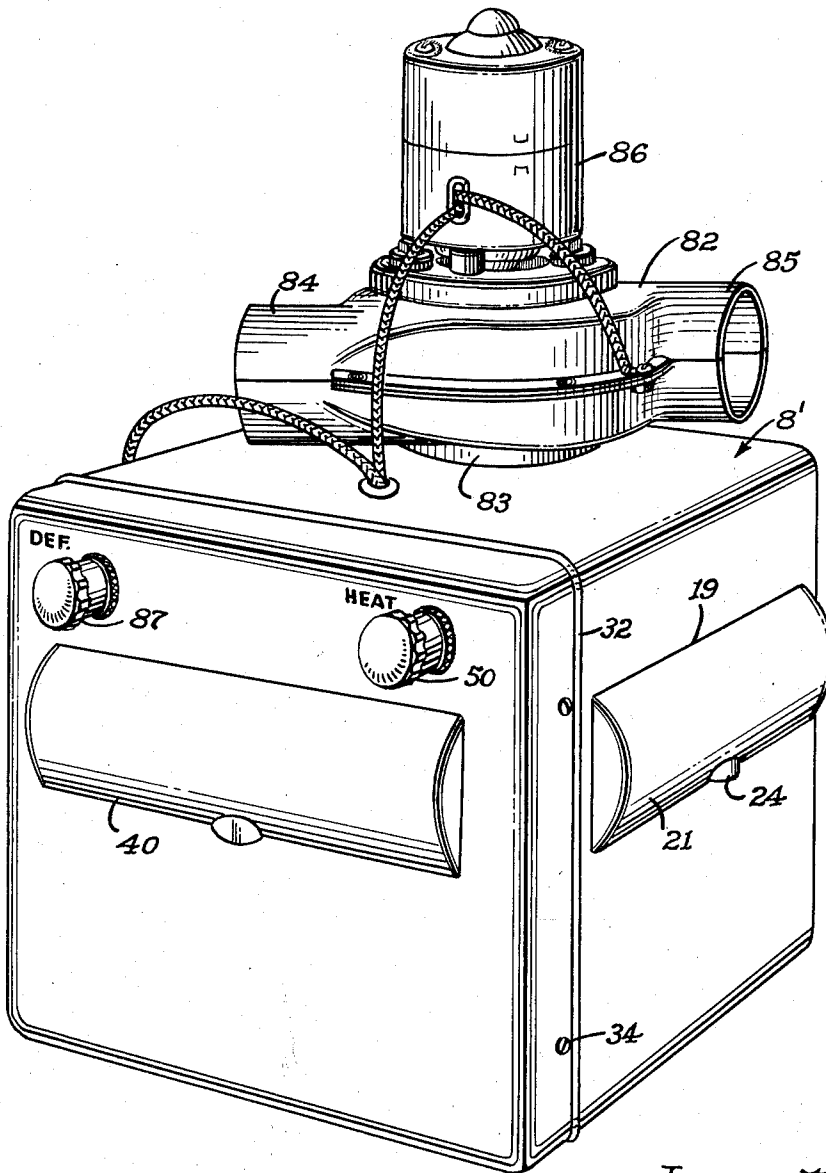
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Fig. 7



Inventors
Earl L. Schofield
Bayard C. Davis
Andrew J. Wintercorn
Atty

UNITED STATES PATENT OFFICE

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RECIRCULATING AIR HEATER

Earl L. Schofield and Bayard C. Davis, Rockford, Ill., assignors to E. L. Schofield, Incorporated, Rockford, Ill., a corporation of Delaware

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8 Claims. (Cl. 257—137)

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This invention relates to recirculating air heaters especially designed and adapted for use in motor vehicles.

The principal object of our invention is to provide a heater of generally improved design and construction with a view to increased heat exchange efficiency and improved distribution and direction of the air heated, so that when heat is being used for defrosting there is still ample heat left for car heating, and effective defrosting, which is so essential for safe driving, is possible under even the most severe and adverse weather conditions and is never dependent upon the driver's reserving all of the heater's discharge for that purpose alone at a sacrifice to his own personal comfort.

A salient feature of our heater is the provision of a quickly removable and replaceable service head, consisting of electric motor and fan and control switch, this head being on a bracket extension provided as a rigid part of the easily removable front plate, so that the motor is assured of good rigid support even though only sheet metal is used in the construction of the bracket and front plate, but, what is even more important, all of the movable working parts of the heater are quickly removable for servicing and inspection, as when the motor requires oiling if it gets noisy, or when the motor must be removed for rewinding, or the switch must be removed for replacement when it has burned out. The advantages of this removable service head are multiplied when these heaters are installed in a fleet of cabs or trucks, because in such cases the service department can arrange to have on hand a number of spare heads as standbys and when a heater on one of the cabs or trucks get out of order it takes only a few minutes to substitute another head and put the heater back into good working order instead of having to keep a cab or truck laid up in the garage for hours (or even days) while necessary repairs are made on the heater.

Another important feature of our heater is its novel arrangement of the radiator core slidably mounted at its opposite side edges between the flanges of channel-shaped sheet metal guides provided in the opposite sides of the main housing for good support and quick and easy assembly and disassembly, whereby to enable convenient removal occasionally for flushing out of any sludge that has collected therein or to repair any leaks that might occur, the radiator being connectible with the hot water supply and return hoses by nipples which are extended from the ra-

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diator through holes in the back wall of the heater housing.

The invention is illustrated in the accompanying drawings, in which—

Fig. 1 is a vertical longitudinal section through a heater made in accordance with our invention;

Fig. 2 is a side view of the removable service head, which includes the easily removable front plate of the heater housing;

Fig. 3 is a perspective view of the heater, illustrating the mode of assembly of the service head in the heater housing;

Fig. 4 is a perspective view of the heater housing from which the service head has been removed, illustrating the mode of assembly of the radiator core in said housing;

Fig. 5 is a cross-section through the heater in the vertical plane of line 5—5 of Fig. 1;

Fig. 6 is a fragmentary perspective view of the rear portion of the baffle structure forming a part of the service head, illustrating a modified or alternative construction in so far as the defroster section of said baffle structure is concerned, and

Fig. 7 is a perspective view of another heater, similar to the heater of Figs. 1 to 5 in all respects, but having only one defroster outlet opening in the top wall of the housing in connection with which a booster fan is provided to increase the hot air flow to the windshield.

Similar reference numerals are applied to corresponding parts throughout the views.

Referring first to Figs. 1 to 5, the heater comprises a housing, indicated generally by the reference numeral 8, which is of rectangular form, the main body portion 9 of which is made of a single piece of sheet metal bent to provide a top wall 10, opposed side walls 11 and 12, and a bottom wall 13 at the middle portion of which the ends of the piece of sheet metal are overlapped, as indicated at 14 in Fig. 5, and welded together. Holes 15 and 16 are provided in the top wall 10 at the rear for discharge of hot air to the left and right hand halves of the windshield for defrosting purposes, rubber hoses, or the like, being usually inserted into these openings to conduct the hot air to the windshield, as indicated at 17 in Figs. 1 and 5. Side door openings for discharge of hot air for car heating purposes, are provided in the upper portions of the side walls 11 and 12, as indicated at 18 and 19, grille plates 20 being preferably welded to the inner sides of the side walls more or less as guards for these openings, as indicated in Figs. 4 and 5, and curved

louvers or doors 21 being provided as closures for said openings and, as will soon appear, also as baffles or deflectors for directing the hot air laterally from the opposite sides of the heater. The louvers 21 are pivoted at their ends, as at 22, on ears 23 that are bent inwardly from the side walls 11 and 12 and have outwardly embossed finger grip portions 24 on their edge portions for convenient operation of these louvers in either direction. The bottom wall 13 of the heater housing is perforated to provide an integral grille 25 for intake of the fresh air to be heated. A back plate 26 and front plate 27 close the open ends of the body portion 9 of the heater housing, the back plate being spot welded to flanges 28 and carrying studs 29 by means of which the heater is adapted to be secured to the dash of the automobile or truck in which it is installed for use, and the front plate 27 having a rearwardly projecting marginal flange 30 adapted to have a telescoping fit on the front edge portion 31 of the heater housing in front of the peripheral bead 32 and to be fastened in place by self-tapping screws entered through the registering holes 33, as shown at 34 in Fig. 7. Holes 35 are provided in the back plate to permit connection of the two nipples 36 in fittings 37 provided in the back wall of the rear header tank 38 of the hot water radiator core 39, it being understood, of course, that the present heater is one designed to utilize the hot water or other liquid of the motor vehicle's engine cooling system and that the nipples 36 will extend through holes in the dash and have hoses connected thereto from the engine side of the dash to conduct the heating medium to and from the radiator while it is being continuously heated by the engine by circulation through the jacket passages thereof. A louver or door 40, similar in design to the louvers 21, is provided as a closure for the opening 41 in the upper portion of the front plate 27, and serves, like the side louvers 21, both as a closure and as a baffle to direct the hot air forwardly from the heater. It is pivoted at its ends, as at 42, to ears 43 bent inwardly from the front plate and has a finger grip portion 44 for moving it in either direction. Here again a grille plate 45 is provided welded to the inside of the front plate to serve more or less as a guard for the opening 41 when the louver is raised.

A suction fan 46 driven by an electric motor 47, on whose armature shaft 48 the same is mounted, is disposed for operation in a horizontal plane in spaced relation to and above the top of the radiator core 39, whereby when the fan is operated fresh air is drawn upwardly through the open bottom 25 of the heater housing and through the radiator core to be heated by contact with the many heat transfer fins thereof, the air thus heated being discharged then through the front and side openings, assuming the louvers 40 and 21 have been opened, and being also discharged onto the windshield for defrosting thereof by way of hose connections 17. Naturally, if all of the three louvers 21 and 40 are closed and the fan 46 is turned on, only the defroster slots of the windshield are supplied with hot air and it is only reasonable to say that maximum defrosting is then possible. However, as will soon appear, the present heater is so designed that efficient defrosting is not dependent upon diversion of heat from the car. Switch 49 for control of the operation of motor 47, preferably of a plural speed type so as to permit manual control of the motor speed and thereby regulation of the heat output of the heater, is operable manually by a knob 50 pro-

jecting from the top portion of the front plate 27.

The radiator core 39 collects a certain amount of sludge in it, and the core should, therefore, be removed occasionally for flushing out. Our construction enables easy removal and replacement of the core, there being two channel-shaped metal guides 51, similar to drawer guides, welded in the opposite sides of the lower portion of the heater housing in which the core is easily slidable endwise, as illustrated in Fig. 4, into abutment with the back plate 26. It is not even necessary to remove the nipples 36 from the fittings 37 on the header tank 38, it being sufficient merely to disconnect the hot water supply and return hose connections. The flanges 52 extending the full length of the guides 51 provide full length support for the core, so that there is no danger of any damage to the thin walls thereof. Naturally, when the radiator core is removed, any leaks that might have developed in service can be easily located and repaired. The header tank 53 on the front end of the radiator core carries a rubber cushion pad 54, which is compressed between the radiator and the front plate 27 when the latter is assembled on the heater, whereby to insure holding the radiator pressed resiliently against the back plate 26 and thus avoid any likelihood of clatter or rattle in the event of vibration when the car is in motion.

Similarly to the radiator core, the service head for this heater, consisting of the motor 47, fan 46, and switch 49, is removable as a unit from the heater, the service head being carried by the front plate 27 so as to be removable from the heater with it. Thus, a horizontal sheet metal shroud plate 55, which has a circular center hole 56 therein for the fan 46, forms the lower part of a bracket extension on the front plate for support of the motor and fan, this shroud plate being welded with the grille 45 to the front plate by means of its downwardly bent front flange 57. A sheet metal baffle structure 58 is in the top portion of the compartment above the shroud plate 55 and includes a central square pocket or box-like portion 59 on the top wall 60 of which the motor 47 is suspended on two diametrically opposed bolts 61, rubber cushioning grommets 62 being provided in these mountings to absorb vibration and deaden sound. An integral extension 63 of the baffle structure is welded to the front plate 27 by flanges 64 to form the upper part of the bracket extension on the front plate for support of the motor and fan, and there are also flanged foot portions 65 on the rear bottom portion of the baffle structure which are welded to the top of shroud plate 55, as illustrated in Fig. 2, to complete the tie-up of the top and bottom portions of the bracket extension. It is clear, therefore, that with this service head so easily removable the motor 47 is easily accessible for oiling or any repairs that may be found to be necessary after the heater has been in service for some time. The switch 49 is likewise easily accessible for inspection whenever there is any occasion for it, and if the switch burns out a new one can be substituted easily. With most other heater constructions, one cannot get at either the motor or switch without first removing and then dismantling the heater. It is easy to appreciate how the advantages of the removable service head are multiplied when a series of these heaters are installed in a fleet of cabs, trucks, or rental cars, because in such cases a few standby service heads can be purchased by the concern's service department and when a heater in one of the cabs, trucks, or cars gets out of order, it takes only

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a few minutes to remove the service head from that heater and replace it with a standby and thus put the vehicle back into service right away instead of losing service and revenue by having it laid up a long time for what may be a relatively minor heater repair. There are also obvious advantages from the standpoint that whatever repairs may be necessary on the service head or heads removed can be taken care of as and when that may be convenient, instead of having to be rushed through at the particular time the failure of a unit occurs. The side portions of the shroud plate have downwardly bent flanges 66, which have slidable engagement on the grilles 20 for lateral stability of the service head relative to the heater housing. At the rear of the heater housing, the shroud plate is slanted downwardly, as at 67, for abutment with the back plate 26, and the lower edge portion of the flange is bent forwardly, as at 68, for sled runner sliding engagement at its opposite ends on top of the top flanges 52 of the channel guides 51, so that the service head is slidable into and out of the heater housing, like a drawer, similarly as the radiator 39. Slip connectors 69 are provided on the electrical conductors 70, by means of which the motor 47 is connected with the car battery and to ground for its operation, so that removal and replacement of the service head is further facilitated. In passing, attention is called to the rubber bumpers 69 provided on the side walls of the box-like central portion 59 of the baffle structure 58, which engage the diametrically opposite sides of the motor 47 in a plane at right angles to the diametrical plane of the bolts 61 to absorb vibration and deaden sound, the two diametrically opposed mountings 61 in the one plane and the two diametrically opposed bumpers 69 in the other plane at right angles to the first plane affording four-way stability as well as cushioning and sound deadening for the motor.

The shroud plate 55 with its circular center hole 56 to receive the fan 46 forms a partition separating the upper compartment in the heater housing from the lower radiator compartment, and boosts the efficiency of the fan by preventing parasitic eddy currents at the periphery of the fan blades where the maximum air handling capacity of the fan is concentrated. The fresh air to be heated is, therefore, drawn upwardly through the radiator core 39 quite efficiently, and the baffle structure 58 cooperating with the louvers 21 on the sides of the heater and louver 40 on the front direct the hot air in a substantially horizontal direction out into the car with the least possible loss in velocity. For this purpose the baffle structure includes a horizontally extending baffle flange 70 extending transversely of the front portion of the structure behind and in spaced relation to the grille 45 in the front opening 41, and this flange 70 is so disposed with respect to the louver 40 that when the louver 40 is raised to the open position, as shown in Fig. 1, the edge portion 71 of the louver rests on top of the edge portion of the flange 70 so that the louver 40 blocks upward travel of the hot air discharged by the fan 46 and directs it forwardly through the opening 41 into the car for heating purposes. In a similar manner, horizontally extending baffle flange 72 are provided on opposite sides of the baffle structure 58 in a similar relationship to the louvers 21 on the sides of the heater and cooperate with these louvers, as indicated in Fig. 5, where the left hand louver 21

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is open and its edge portion 73 rests on the flange 72 blocking upward travel of hot air discharged by the fan and directing it with minimum loss in velocity laterally from the heater.

On the back of the baffle structure 58 are two ducts 74 and 75 extending directly upwardly from the fan to conduct hot air discharged by the fan upwardly through the openings 15 and 16, respectively, for discharge through the flexible hose connections 17 to the two halves of the windshield for defrosting purposes. The duct 74, it will be noticed terminates close to the horizontal plane of the top of the fan blades 46, because it is important to have maximum efficiency of defrosting on the left hand half of the windshield in front of the driver, the other duct 75 being purposely cut off at a higher elevation and the vertical wall or baffle 76 separating the two ducts being cut off at that same elevation, so as to allow some of the hot air that might otherwise flow through duct 75 to be entrained with the greater volume flowing upwardly through duct 74. This gives a distribution of approximately sixty per cent (60%) of the available hot air to the left hand half of the windshield and approximately forty per cent (40%) to the right hand half. However, we may slot the baffle 76 vertically, as shown at 77 on the baffle 76' in Fig. 6, and provide an adjustable baffle plate section 78, the vertical adjustment of which will determine the heat distribution as desired, a bolt 79 being provided extending through a hole in the plate 78 and through the slot 77 to thread in a nut 80 on the other side of the baffle 76' to clamp the adjustable baffle 78 in its adjusted position. The fact that the duct 74, which is open on its rear side, is closed by abutment with the back plate 26, as shown in Fig. 1, insures a good flow of hot air to the driver's half of the windshield, substantially unaffected by the opening and closing of the louvers 21 and 40. The other duct 75 is only partially enclosed, the vertical flange 81 bent diagonally relative to the rear corner of the box-like portion 59 of the baffle structure, as shown in Fig. 6, serving to partially isolate the duct 75 from the rest of the interior of the heater casing, enough to provide for the amount of hot air flow to the right hand half of the windshield considered to be sufficient for the defrosting thereof.

Where, as in a bus, truck, or taxicab, for example, or as deluxe equipment for a regular motor car, it is desired to insure a more abundant and higher velocity flow of hot air to the windshield for defrosting, we provide a heater of the design shown in Fig. 7, which is the same as that of Figs. 1 to 5 but has only a single large duct for defrosting purposes, comparable to the duct 74, and we provide a booster fan 82 of the centrifugal type, mounted on top of the heater casing 8', having its axial inlet neck 83 in open communication with the upper end of said duct, and having its tangential discharge necks 84 and 85 directed toward the left hand and right hand halves of the windshield and adapted to have flexible hose connections, like those shown at 17 in Figs. 1 and 5, attached thereto. A separate electric motor 86 serves to drive the squirrel type rotor of the fan 82 and has a separate control switch therefor operable by knob 87. The suction fan 46 inside the heater has its motor 47 controlled as before by a switch operable by a knob 50. This heater operates otherwise the same as that of Figs. 1 to 5. The increased air flow through the radiator 39 induced when the

booster fan is operated is localized to the area of the core under the duct 74 that supplies the hot air to the booster fan 92, and, consequently, there is no evidence of any drop-off in car heating efficiency.

It is believed the foregoing description conveys a good understanding of the objects and advantages of our invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

We claim:

1. A device of the class described comprising a casing of generally rectangular form having opposed side walls in fixed relationship and back and top walls, the front being open and likewise the bottom, a radiator mounted horizontally in the open bottom of said casing, means whereby said radiator is connected with a source of heating fluid supply, a front closure removably secured to the casing, said casing having air discharge openings in the upper portion of the opposed side walls thereof above the radiator, said front closure also having an air discharge opening provided in the upper portion thereof above the radiator, a rotary fan for drawing air upwardly through the radiator for discharge through said openings, a motor having an armature shaft connected to and driving said fan, a substantially horizontal shroud plate in the plane of said fan having a substantially circular opening provided therein in which said fan operates, said plate being secured to said front closure and removable therewith from said casing, and means for supporting said motor on said shroud plate for removal of the motor and fan with the shroud plate from said casing.

2. A device of the class described comprising a casing of generally rectangular form having opposed side walls in fixed relationship and back and top walls, the front being open and likewise the bottom, a radiator mounted horizontally in the open bottom of said casing, means whereby said radiator is connected with a source of heating fluid supply, a front closure removably secured to the casing, said casing having air discharge openings in the upper portion of the opposed side walls thereof above the radiator, said front closure also having an air discharge opening provided in the upper portion thereof above the radiator, a rotary fan for drawing air upwardly through the radiator for discharge through said openings, a motor having an armature shaft connected to and driving said fan, a substantially horizontal shroud plate in the plane of said fan having a substantially circular opening provided therein in which said fan operates, said plate being secured to said front closure and removable therewith from said casing, and a baffle structure supporting said motor and fan and secured to the front closure and shroud plate for removal from the casing with said closure, said baffle structure extending circumferentially relative to the motor above the fan and serving to deflect air outwardly through the side and front discharge openings.

3. A device of the class described comprising a casing of generally rectangular form having opposed side walls in fixed relationship and back and top walls, the front being open and likewise the bottom, substantially horizontal guides in said casing projecting inwardly from the lower portions of said side walls, a radiator slidably mounted in said guides so as to be removable and replaceable through the open front of said casing, means whereby said radiator is detachably

connected with a source of heating fluid supply, a front closure removably secured to the casing, a rotary fan in said casing above said radiator for drawing air upwardly through said radiator, one of said casing and closure having an air discharge opening provided therein above the level of said radiator and on the pressure side of said fan, a horizontal shroud plate having an opening provided therein in the plane of said fan wherein the fan operates, said plate having lateral edge portions resting slidably on top of said guides for support and guidance, said plate being rigidly connected to said front closure for removal therewith from said casing, a motor having an armature shaft connected to and driving said fan, and means mounting said motor on said closure and shroud plate for removal therewith from said casing.

4. A device of the class described comprising a casing of generally rectangular form having opposed side walls and back and top walls in fixed relationship, the front being open and likewise the bottom, a radiator mounted horizontally in the open bottom of said casing, means whereby said radiator is connected with a source of heating fluid supply, a front closure removably secured to the casing having an air discharge opening provided in the upper portion thereof above the radiator, said casing having an air discharge opening in the top wall thereof adjacent the back wall, a rotary fan for drawing air upwardly through the radiator for discharge through said openings, a motor having an armature shaft connected to and driving said fan, a substantially horizontal shroud plate in the plane of said fan having a substantially circular opening provided therein in which said fan operates, said plate being secured to said front closure and removable therewith from said casing, and means for supporting said motor on said front closure and shroud plate for removal of the motor and fan with the shroud plate from said casing.

5. A device as set forth in claim 4, wherein the casing also has air discharge openings provided in the upper portion of the opposed side walls thereof above the radiator.

6. A heater device for automobiles and the like comprising a casing of generally rectangular form having opposed side walls and back and top walls in fixed relationship, the front being open and likewise the bottom, a radiator mounted horizontally in the open bottom of said casing, means whereby said radiator is connected with a source of heating fluid for circulation through the radiator, a rotary fan for drawing air upwardly through said radiator, a motor having an armature shaft connected to and driving said fan, a substantially horizontal shroud plate in the plane of said fan having a substantially circular opening provided therein in which said fan operates, a closure member constituting the front wall of said casing and which is removably attached to said casing, said shroud plate being secured to said closure member and removable therewith, means supporting said motor on said front closure and shroud plate for removal with said front closure and shroud plate, and an air discharge opening in a wall of said casing at the discharge side of said fan.

7. A heater device as defined in claim 6 wherein the side walls include horizontally extending guide flanges within said casing, the upper sides of said flanges constituting a sliding support for said shroud plate.

8. A heater device as defined in claim 7 where-

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in said radiator is removable from said casing and the under sides of said guide flanges engage said radiator for maintaining the radiator in position.

EARL L. SCHOFIELD.
BAYARD C. DAVIS.

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